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Abhijit Sen Gupta on India's Foreign Exchange Reserves

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PURPOSE

India Policy Forum 2008–09 comprises papers and highlights of the discussions from the fifth India Policy Forum (IPF) conference, held on July 15 and 16, 2008, in New Delhi. IPF is a joint venture of the Brookings Institution and the National Council of Applied Economic Research (NCAER) that aims to examine India's reforms and economic transition using policy-relevant empirical research. The sponsoring organizations acknowledge the continuing generous support of Tata Sons, State Bank of India, Citigroup, and HDFC Ltd.

The objective of the IPF is to generate theoretically rigorous, empirically informed research on important current and unfolding issues of Indian economic policy. A rotating panel of established local and overseas researchers interested in India has agreed to support this initiative through advice, personal participation, and contribution of papers. Overall guidance is provided by a distinguished international advisory panel.

Papers appear in this publication after presentation and discussion at a yearly conference in New Delhi. During discussions at the conference, the authors obtain helpful comments and criticism about various aspects of their papers. These comments are reflected in the journal as discussants' comments. The papers, however, are finally the authors' products and do not imply any agreement by either those attending the conference or those providing financial support. Nor do any materials in this journal necessarily represent the views of the staff members or officers of the NCAER and the Brookings Institution.

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Correspondence regarding papers in this issue should be addressed to the authors. Manuscripts are not accepted for review because this journal is devoted exclusively to invited contributions. Feedback on the journal may be sent to NCAER, Parisila Bhawan, 11, I.P. Estate, New Delhi 110 002 or at ipf@ncaer.org.

Editors' Summary

The fifth annual conference of the India Policy Forum was held on July 15 and 16 of 2008 in New Delhi. This issue of the journal contains the papers and discussion presented at the conference. A total of five papers were presented. The first paper examines the growth of private schools in India and their influence on school quality. It is an extension of recent issues of this journal that have evaluated the performance of India's education system. The second paper addresses a major question of why the growth of manufacturing output and employment in India has been disappointingly low. The final three papers share a common focus on India's external financial relations. The third paper analyzes the process of capital account liberalization and the integration of India's financial institutions into the global financial system. The fourth paper measures the evolution of prices in the nontradable and tradable sectors of the Indian economy and seeks explanations for the rise in the relative price of nontradables. The last paper addresses the issue of the adequacy of India's current foreign exchange reserves.

Although the growth of private schooling in India is ubiquitous even in rural areas, the contours and implications of this change remain poorly understood, partially due to data limitations. Official statistics often underestimate private school enrollment and our understanding of the effectiveness of private education in India is also limited. If we assume that parents know what is best for their children and that what is beneficial privately is also beneficial socially, their decision progressively to opt for private schools would suggest the superiority of the latter over public schools.

In their paper, Sonalde Desai, Amaresh Dubey, Reeve Vanneman, and Rukmini Banerji point out, however, that this is not a foregone conclusion. The vast body of research on school quality, especially that relating to the United States, suggests that much of the observed difference in school outcomes results from differences in parental background and levels of parental involvement with children going to different schools. In the Indian context, one runs the additional risk that many private schools are poorly endowed with resources, unrecognized (lack accreditation), and have untrained teachers. A proper empirical examination is essential to arrive at an informed assessment.

The authors use data generated from a new survey, the India Human Development Survey 2005 (IHDS), jointly conducted by researchers from the University of Maryland and the National Council of Applied Economic Research. These data allow them to explore some of the links between private school growth and school quality in India. They begin by providing a description of public and private schools in India as well as some of the considerations that guide parents in selecting private schools. They then examine whether private school enrollment is associated with superior student performance and whether this relationship is concentrated in certain sections of the population.

The IHDS data show considerably higher private school enrollment, particularly in rural areas, than documented in other studies. The authors place private school enrollment (including in schools receiving grants-in-aid from the government) among children aged 6–14 years at 58 percent in urban and 24 percent in rural areas. Private school enrollment is particularly high in India's most populous state, Uttar Pradesh. In terms of outcomes, based on specially designed reading and arithmetic tests administered to children aged 8–11 years, those in private schools exhibit better reading and basic arithmetic skills than their counterparts in government schools.

But since these children also come from higher income households and have parents who are better educated and more motivated to invest in their children's education, it is important to control for selectivity bias. The paper utilizes a variety of techniques (including multivariate regression, switching regression, and family fixed effects) to examine the relationship between private school enrollment and children's reading and arithmetic skills. While no model is able to completely eliminate possible biases—there is a different source of bias left in each case—taken together, the results strongly indicate that private school enrollment is associated with higher achievements in reading and arithmetic skills. The magnitude of the gain from private school enrollment varies from one-fourth to one-third standard deviation of the scores.

The paper also distinguishes the relative magnitudes of the benefits from private schooling to children with rich versus poor economic backgrounds. It finds that the benefits to private school enrollment for children from lower economic strata are far greater than those for children from upper economic strata; at upper income levels, the difference between private and government school narrows considerably. This seems plausible since at upper income levels, students are likely to have better access to alternative educational resources including well-educated parents.

While the results of the paper point to positive benefits from private schools, especially for the underprivileged, the authors emphasize that their analysis does not imply that private schooling is the elixir that will cure the woes of primary education for children from poor families. They argue that both empirical results based on the IHDS data and theoretical considerations point to the need for caution.

Empirically, the paper finds that while private school students perform better than their counterparts in government schools, these effects are modest in comparison to other factors influencing the outcomes. For example, the results show substantial inter-state variation in the scores of both government and private school students. Controlling for parental characteristics, government school students in states as diverse as Kerala, Himachal Pradesh, Chhattisgarh, and West Bengal perform at a higher level than private school students in many other states. More importantly, the private school advantage seems to be concentrated in states such as Bihar, Uttar Pradesh, Uttarakhand (formerly Uttranchal), and Madhya Pradesh—states known for poorly functioning public institutions as well as high rates of poverty or low per capita incomes.

These results suggest that before a blanket embrace of private schooling, it may be worthwhile to understand why some government schools function well and others do not. Blaming teacher absence is superficially appealing, but theoretical considerations suggest that the complete story may be more complex. If the classroom environment in private schools is favorably impacted by the demands made by paying middle-class parents, a voucher program that brings a large number of poorer parents to the schools may dilute this effect. But this argument would seem to be undermined by the fact that the authors themselves find the private school effect to be significant in poor states with many students coming from poor families.

Nevertheless, the authors are correct in noting that it will be useful to further examine the processes that give rise to different classroom environments as between government and private schools before jumping to wholesale voucher programs leading to privatization of education. We must know, for example, whether children from poor households in private schools benefit because their parents are able to prevent teachers from resorting to physical punishment. And if so, would this benefit be diluted when vouchers rather than parents pay for the tuition? Can we devise mechanisms to ensure that government school teachers do not resort to discriminatory behavior when dealing with students from poor families? To date, the discourse on the benefits of private schooling in a developing country context has focused on teacher absence, lack of accountability, and lower costs of private schooling. While these are important issues, perhaps future research could try to shed additional light on other processes that establish different environments in private and public schools.

The promotion of manufacturing, particularly for export, has been a key pillar of the growth strategy employed by many successful developing countries, especially those with abundant labor. India's recent experience is puzzling on two accounts. While India's economy has grown rapidly over the last two decades the growth momentum has not been based on manufacturing. Rather the main contributor to growth has been the services sector. Second, the relatively lackluster performance of Indian manufacturing cannot be ascribed to a lack of policy initiatives. India introduced substantial product market reforms in its manufacturing sector starting in the mid-1980s, but the sector has never taken off as it did in other high-growth countries. Moreover, insofar as subsectors within manufacturing have performed well, these have been the relatively capital or skill-intensive industries, not the labor-intensive ones as would be expected for a labor abundant country like India.

One of the main components of reforms in India was the liberalization of the industrial licensing regime, or "delicensing." Under the Industries Development and Regulation Act of 1951, every investor over a very small size needed to obtain a license before establishing an industrial plant, adding a new product line to an existing plant, substantially expanding output, or changing a plant's location.

Over time, many economists and policymakers began to view the licensing regime as generating inefficiencies and rigidities that were holding back Indian industry. The process of delicensing started in 1985 with the dismantling of industrial licensing requirements for a group of manufacturing industries. Delicensing reforms accelerated in 1991, and by the late 1990s, virtually all industries had been delicensed. Large payoffs were expected in the form of higher growth and employment generation with this policy reform.

However, the payoffs to date have been limited. It could be argued that a lag between the announcement and implementation of the policy, and also a lag between implementation and the payoffs may be responsible. However, as many as 20 years have passed since the first batch of industries was delicensed, and the last batch of industries was delicensed almost a decade ago; the view that payoffs would occur with a lag is no longer easy to sustain.

What then could be the reasons for the rather lackluster performance of the industrial sector? The following factors are usually cited: (*a*) strict labor laws have hindered growth, especially of labor-intensive industries; (*b*) infrastructure bottlenecks have prevented industries from taking advantage of the reforms; and (*c*) credit constraints due to weaknesses in the financial sector may be holding back small- and medium-sized firms from expanding.

More recently, two other factors have also been raised. First, it has been pointed out that the evolution of Indian industry may be influenced by path dependence or hysteresis so that despite the reforms of the mid-1980s and the early 1990s the relative profitability of capital and skill-intensive activities remains higher than that of labor-intensive activities. Second, the major reform initiatives undertaken so far—focused mainly on product market reforms—have been national ones. However, the working of product markets in a federal democracy such as India is influenced not only by regulations enacted by the Central Government, but also by those enacted by individual state governments. Moreover, much of the authority on administration and enforcement of regulation also rests with state governments. Accordingly, it has been pointed out that regulatory and administrative bottlenecks at the state level may be blunting the impact of reforms undertaken at the central level.

Using the Annual Survey of Industries (ASI) data at the three-digit level for major Indian states over the period 1980–2004, the paper by Gupta, Hasan, and Kumar analyzes the effects of delicensing reforms on the performance of what in India is called registered manufacturing. (The portion of manufacturing in the so-called unorganized sector is not covered by the ASI data and is therefore not analyzed in the paper; however, this component was also unlikely to have been affected by the licensing controls when these were in effect.) The paper utilizes variations in industry and state characteristics in order to identify how factors such as labor regulations, product market regulations, availability of physical infrastructure, and financial sector development may have influenced the impact of delicensing on industrial performance.

The main findings of the paper are as follows:

1. The impact of delicensing has been highly uneven across industries. Industries that are labor intensive, use unskilled labor, depend on infrastructure, or are energy dependent have experienced smaller gains from reforms.
2. Regulation at the state level matters. States with less competitive product market regulations have experienced slower growth in the industrial sector post-delicensing, as compared to states with competitive product market regulations. States with relatively inflexible labor regulations experience slower growth of labor-intensive industries and slower employment growth.
3. Infrastructure availability and financial sector development are important determinants of the benefits that accrued to states from reforms.

> If supportive regulatory conditions prevailed and infrastructure availability allowed it, businesses responded by expanding their capacity and grew; thus hysteresis does not seem to matter.

The authors acknowledge that their approach is subject to a few caveats. Several other major reforms have been introduced that impact Indian manufacturing, including reductions in barriers to trade and the dismantling of the policy of reserving particular industries for production by small-scale enterprises. These are not systematically examined and might interact with the impact of delicensing. Second, the neglect of the unorganized sector noted above means that the interactions between the "registered" and the "unorganized" sectors in adjusting to policy change is not systematically explored. Finally, regulations can affect firms and industries in many different ways. For example, they may create incentives for firms to operate in the informal sector, stay relatively small, or adopt particular types of techniques. While the analysis of aggregate data can shed (indirect) light on some of these effects, a more complete analysis would require the use of a micro-based approach utilizing plant-level data.

The authors conclude that the agenda of reforms to promote manufacturing is not yet complete. Areas for additional action include further reform of labor market regulations; improvement of the business environment; provision of infrastructure and further development of the financial sector. In addition, in a federal democracy like India, reforms at the Center (especially those related to labor) need to be complemented by reforms at the state level.

Capital account liberalization remains a highly contentious issue. Proponents argue that rising cross-border flows of financial capital allow for a more efficient allocation of financial resources across countries and also permit countries to share their country-specific income risk more efficiently. Detractors have blamed capital account liberalization as being the root cause of the financial crises experienced by many emerging market countries. Their case has been strengthened by the lack of clear evidence of the presumed benefits of financial globalization. This debate has again become topical as many emerging market economies and even some low-income countries are coping with volatile capital inflows, with major economies like China and India contemplating further opening of their capital accounts.

A common argument in the literature in favor of openness from the viewpoint of the developing economies has been that access to foreign capital helps increase domestic investment beyond domestic saving. The recent literature has revived another older argument emphasizing the indirect benefits of openness to foreign capital, including the development of domestic financial markets, enhanced discipline on macroeconomic policies, and improvements in corporate governance.

In his paper, “Some New Perspectives on India’s Approach to Capital Account Liberalization,” Eswar S. Prasad argues that a major complication in considering capital account convertibility is that economies with weak initial conditions in certain dimensions experience worse outcomes from their integration into international financial markets in terms of both lower benefits and higher risks. For countries below these “threshold” conditions, the benefit–risk tradeoff becomes complicated and a one-shot approach to capital account liberalization may be risky and counter-productive. This perspective points to a difficult tension faced by low and middle-income countries that want to use financial openness as a catalyst for the indirect benefits mentioned above.

The author, nevertheless, maintains that the practical reality is that emerging market countries are being forced to adapt to rising financial globalization. In his view, capital controls are being rendered increasingly ineffective by the rising sophistication of international investors, the sheer quantity of money flowing across national borders, and the increasing number of channels (especially expanding trade flows) for the evasion of these controls. Hence, concludes the author, emerging market economies like China and India are perforce grappling with the new realities of financial globalization, wherein capital controls are losing their potency as a policy instrument (or at least as an instrument that creates more room for monetary and other macro policies). Against this background, the author provides a critical analysis of India’s approach to capital account liberalization through the lens of the promised indirect benefits from such liberalization. In recent years, the Reserve Bank of India (RBI) has taken what it calls a calibrated approach to capital account liberalization, with certain types of flows and particular classes of economic agents being prioritized in the process of liberalization. The result of these policies is that, in terms of overall *de facto* financial integration, India has come a long way, experiencing significant volumes of inflows and outflows. Although foreign investment flows crossed 6 percent of GDP in 2007–08, in the author’s view the flows are modest, placing India at the low end of the distribution of *de facto* financial integration measures in an international comparison across emerging market economies.

The RBI’s cautious and calibrated approach to capital account liberalization has resulted in a preponderance of FDI and portfolio liabilities in India’s stock of gross external liabilities. The author agrees that this is a favorable outcome in terms of improving the benefit–risk tradeoff of financial openness and has reduced India’s vulnerability to balance of payments crises. But he goes on to argue that the limited degree of openness has, nevertheless, hindered the indirect benefits that may accrue from financial integration, particularly in terms of broad financial sector development.

Against the backdrop of recent global financial turmoil, the author sees merit in a high level of caution in further opening the capital account. He states, however, that excessive caution may be holding back financial sector reforms and reducing the independence and effectiveness of monetary policy. He goes on to argue that increasing *de facto* openness of the capital account implies that maintaining capital controls perpetuates some distortions without the actual benefit in terms of reducing inflows. Flows of different forms are ultimately fungible and it is increasingly difficult, given the rising sophistication of investors and financial markets, to bottle up specific types of flows. In the author's view, rising *de facto* openness in tandem with *de jure* controls may lead to the worst combination of outcomes—new complications to domestic macroeconomic management from volatile capital flows with far fewer indirect benefits from financial openness.

The author takes the view that a more reasonable policy approach would be to accept rising financial openness as a reality and to manage, rather than resist (or even try to reverse), the process of fully liberalizing capital account transactions. Dealing with and benefiting from the reality of an open capital account will require improvements in other policies—especially in monetary, fiscal, and financial sector regulations. This approach could in fact substantially improve the indirect benefits to be gleaned from integration into international financial markets.

In terms of specific steps, the author suggests that this may be a good time to allow foreign investors to invest in government bonds as an instrument of improving the liquidity and depth of this market. A deep and well-functioning government bond market can serve as a benchmark for pricing corporate bonds, which could in turn allow that market to develop. By providing an additional source of debt financing, it would create some room for the government to reduce the financing burden it currently imposes on banks through the statutory liquidity ratio—the requirement that banks hold a certain portion of their deposits in government bonds.

The author also recommends an "opportunistic approach" to liberalization whereby outflows are liberalized during a period of surging inflows. He suggests that if undertaken in a controlled manner, it could generate a variety of collateral benefits—sterilization of inflows, securities market development, and international portfolio diversification for households. The RBI has recently adopted such an approach by raising ceilings on external commercial borrowings in order to compensate for capital outflows. According to the author, these are steps in the right direction. But one potential problem he sees is that when taken in isolation rather than as part of a broader and well-articulated capital account liberalization agenda, these measures are subject to reversal and unlikely to be very productive.

Despite this enthusiasm for capital account liberalization, the author goes on to suggest that none of this implies that the remaining capital controls should be dropped at one fell swoop. What it does imply is that there are some subtle risks and welfare consequences that can arise from holding monetary and exchange rate policies as well as financial sector reforms hostage to the notion that the capital account should be kept relatively restricted for as long as possible. It may seem reasonable to maintain whatever capital controls still exist in order to get at least some protection from the vagaries of international capital flows. However, in the author's view, not only this is an unrealistic proposition, it could detract from many of the potential indirect benefits of financial integration. He sees steady progress toward a more open capital account as the most pragmatic policy strategy for India.

India's rapidly evolving economic landscape during the past two decades has elicited broad discussion of how changing economic factors will influence the future of India's growth and prosperity. Often overlooked in the discussion are the effects of India's changing economic structure on relative price dynamics, which have consequential effects on the allocation of resources in the economy. A host of recent developments would likely induce a change in relative prices, including the shift in economic policies beginning in 1991, the acceleration in economic growth, a rapid increase in exports, and rising per capita incomes and productivity growth. Taken together, these factors amount to the "catch-up" process that typically leads to an increase in the relative price of nontradables in developing economies.

In their paper, Renu Kohli and Sudip Mohapatra trace relative price developments in a two-sector, two-good (tradable and nontradable) framework for the Indian economy over the period 1980–2006. In line with their *a priori* expectations, the ratio of nontradable to tradable prices, also called the internal real exchange rate, rises consistently over the past one-and-a-half decades. Their empirical analysis confirms that this rise, or real appreciation, is driven by both demand and supply factors. A later section uses the results of the study to illuminate the evolution of past macroeconomic policies. Finally, using India's recent robust economic performance as a guide, the paper concludes with a discussion on an appropriate macroeconomic policy mix for the future.

The authors construct the relative price of nontradables from the national accounts statistics using the degree of participation in trade as a criterion for classifying the economy into traded and nontraded sectors; the tradable–nontradable price series are derived as respective deflators for the two sectors. They find that the tradable and nontradable sectors are characterized by divergent inflation rates with the relative price of nontradables accelerating after 1991; on average, the difference exceeds 1 percentage point per year during 1991–2006. There are two competing explanations for such a divergent acceleration in prices: (*a*) the Balassa–Samuelson hypothesis posits that real exchange rates tend to appreciate as countries develop and (*b*) other demand-side explanations originate from changes in government spending and/or a shift in consumer preferences toward services (nontradable) as incomes rise. The preliminary analysis presented in the paper indicates a role for both factors in explaining the real exchange rate appreciation. A puzzle posed by the data, however, is the increase in the relative price of nontradables in conjunction with an expansion of the tradable sector, which suggests an offsetting role might have been played by economic reforms like import liberalization and exchange rate correction, leading to the emergence of new tradables through an increase in competitiveness.

The paper examines the determinants of this divergence in an integrated framework, exploring the role of both demand and supply side determinants. The relative price of nontradables is modeled as a function of the labor productivity growth gap between the tradable and nontradable sectors, real government expenditure as a share of gross domestic product, real per capita income, and a measure of import tariffs. The labor productivity growth gap and the import tariff rates capture the supply-side influences due to technological change (the Balassa–Samuelson effect) and the impact of trade liberalization, which accelerated after 1991. The fiscal and income growth variables summarize the demand side impact upon relative prices. The regression results reveal a significant influence of both demand and supply factors. A percentage point rise in the relative price of nontradables is associated with a 5 percent increase in the labor productivity growth gap, a 4 percent increase in per capita income growth, and a 3 percent increase in fiscal growth; the estimated impact of a fall in import prices upon the relative nontradables' inflation rate is 0.04. The results are robust to a number of sensitivity checks, including different estimation methods, stability, specification, omission, and inclusion of variables as well as alternate definitions of the variables.

A decomposition of the relative price change over the sample period indicates that demand factors accounted for almost three-fourths of the average relative price increase over the sample period. In contrast, the supply-side influence stemming from the labor productivity growth differential between the two sectors accounted for only 35 percent of the mean of the dependent variable. Noting the rapid decline in import tariffs after 1991, the authors argue that this result underscores the role of convergence in tradable prices and its contribution to the divergence in sectoral inflation rates in liberalizing economies.

Kohli and Mohapatra link their results to macroeconomic policy by tracing the past evolution of exchange rate and fiscal policies in India. They argue that the fiscal expansion of the 1980s ending in the 1991 crisis led to a rise in the inflation rate of the nontradable sector, while the exchange rate policy favored steady depreciation in order to retain competitiveness and boost growth. Noting India's recent and potential economic performance, its buoyant exports, and strong per capita income growth, they observe that the pressures upon real exchange rate appreciation, internal as well as external, are likely to continue—and indeed, accelerate—in the future. Under the circumstances, an appropriate macroeconomic policy mix would be to continue with the gradual increase in exchange rate flexibility so as to absorb the equilibrium shifts in the economy. This could be complemented with fiscal consolidation to offset competitiveness losses arising from the nominal and real exchange rate appreciation.

Finally, the paper raises a number of critical data issues, not the least of which is the absence of a services price index in India. The implicit price series developed in the paper strongly suggests an understatement of generalized inflation through the current inflation indicator, the wholesale price index (WPI), which can be misleading. It also identifies gaps in the data on sectoral employment shares, emphasizing the need for sufficiently disaggregated information to enable fruitful analysis and informed policymaking.

The Asian financial crisis of 1997–98 served as a startling revelation to emerging economies of the drawbacks of financial integration. Neither the International Monetary Fund nor reliance on more flexible exchange rate regimes succeeded in preventing—or indeed, adequately combating—such a systemic crisis. Moreover, even countries practicing sound macroeconomic policies realized they were not immune to such crises as they can be hit by contagion and financial panic from other countries, regardless of their proximity. As a result, many countries have decided that they need to protect themselves against a speculative currency attack, and further, that the key to self-protection is the accumulation of substantial holdings of liquid foreign exchange. Over the past decade, developing countries, and particularly those in East and South Asia, have greatly expanded their foreign currency reserves. By the middle of 2008, the reserves of China, South Korea, Russia, and

India alone amounted to over US$2.85 trillion. In the case of India, reserve accumulation has increased five-fold since 2001–02.

The security that results from high reserves does come at a price, however. The magnitude of reserves being held combined with the fact that most reserves are held as low-yield government bonds suggests that the opportunity cost of reserve holdings can be substantial. In his paper, Abhijit Sen Gupta employs a new empirical methodology to evaluate the factors influencing the demand for international reserves in emerging markets, and he estimates the costs incurred in the process for India in particular. Sen Gupta argues that the traditional analysis of the costs of reserve holdings, which considers a single adequacy measure (namely, import cover), does not reflect the multitude of factors influencing demand for international reserves in a financially integrated world. In addition to the desire to meet potential imbalances in current account financing, a central bank may also hold reserves to defuse a potential speculative run on its currency or to cover its short-term debt obligations.

The author first introduces a simple empirical model to highlight the principal determinants of reserve holding in emerging countries. Using the results of this model, one can create an "international norm" of reserve holding, and thereby calculate a measure of "excess reserves" which is the difference between actual reserve holdings and this international norm. Next, Sen Gupta provides a brief discussion of the history of reserve accumulation in India. As the bulk of India's reserves are held in the form of highly liquid securities or deposits with foreign central banks and international organizations, the real return on these assets in recent years has been largely negative. In the final section, Sen Gupta estimates the cost of holding reserves in India by considering three alternative uses of the resources currently held in excess of the international norm described earlier.

The empirical section of the paper employs a sample of 167 countries over the period 1980–2005 and a regression framework that identifies the principal determinants of cross-country variation in the level of international reserves. In this context, reserves are defined as total reserves minus the country's holdings of gold. The dependent variable is this measure of reserves scaled by Gross Domestic Product (GDP). The results of this regression accord well with the *a priori* expectations. The log of per capita GDP and a proxy for trade openness (measured as the ratio of imports to GDP) both record positive and significant coefficients for reserve holding, implying that richer countries and more open countries tend to have higher reserves. In addition, the regression results reveal that countries with less flexible exchange rate regimes and more capital account openness tend to accumulate greater reserves.

Next, the author uses the above framework for the period 1998–2005 to predict the demand for international reserves for various emerging countries. The difference between actual reserves and the reserve level predicted by the equation is interpreted as a measure of excess reserves. As illustrations of his results, Sen Gupta finds that by 2005, Indonesia, Philippines, and Argentina had reserves close to the amount predicted by the model, while Brazil's reserve accumulation fill significantly short of the predicted value. In contrast, China, India, Korea, Russia, and Malaysia all exhibit significantly more reserves than what could be interpreted as an "international norm."

In his discussion of India's experience in reserve accumulation, Sen Gupta identifies several distinct episodes of significant reserve buildup in India: April 1993 to July 1995, November 2001 to May 2004, and November 2006 to February 2008. These three episodes account for more than US$ 220 billion worth of India's current stock of reserve accumulation of US$ 300 billion. In each of these episodes, the author discusses the role that both the government and the Reserve Bank of India (RBI) played in the decision to accumulate reserves.

Sen Gupta estimates that by the end of 2007, India had more than US$ 58 billion of excess reserves. In order to impute the costs of holding these excess reserves, he considers three alternative uses of the resources: financing physical investment, reducing the private sector's external commercial borrowing, and lowering public sector debt. The cost is substantial across all specifications, both in terms of actual income foregone and as a percentage of GDP. The author estimates the annual cost of keeping excess reserves in the form of low-yielding bonds rather than employing the resources to increase the physical capital of the economy to be approximately 1.6 percent of GDP. Alternatively, if the resources were instead used to reduce private sector external commercial borrowing or public sector debt, India could gain more than 0.23 percent of GDP.

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Private Schooling in India: A New Educational Landscape*†

Introduction

Although the growth of private schooling in India is quite visible, even in rural areas, the contours of this change remain poorly understood because of data limitations. Official statistics often tend to underestimate private school enrollment (Kingdon, 2007). Moreover, there is at best limited understanding of the effectiveness of private education in India. If parents know what is best for their children and if they are voting with their feet, we might assume that private schools must be of better quality than existing public schools. Two considerations suggest a need for deeper reflection, however: (*a*) There is a long history of school quality research in different contexts, particularly in the United States, which suggests that much of the apparent differences in schools are due to parental choices that propel children from certain backgrounds into certain types of schools (Hanushek, 1997) and

* Views presented in this paper are authors' personal views and do not reflect institutional opinions.

† The results reported in this paper are based primarily on India Human Development Survey, 2005. This survey was jointly organized by researchers at the University of Maryland and the National Council of Applied Economic Research (NCAER). The data collection was funded by grants R01HD041455 and R01HD046166 from the National Institutes of Health to the University of Maryland. Part of the sample represents a resurvey of households initially surveyed by NCAER in 1993–94. More information about the survey is available at www.ihds.umd.edu.

(*b*) the panorama of Indian private schools is dotted with small, unrecognized, and unregulated schools, frequently with poorly trained teachers. Anybody who has observed some of these schools would not automatically assume that private schools are better than government schools. Hence, it is important to empirically examine the impact of private school enrollment on educational outcomes.

So far, lack of appropriate data has made it difficult to explore this issue. However, a new survey (Desai et al., 2009), the India Human Development Survey (IHDS) 2005, jointly organized by researchers from the University of Maryland and the National Council of Applied Economic Research (NCAER), makes it possible to explore some of the linkages between private school growth and school quality. Using data from IHDS, this paper will provide a description of public and private schools in India as well as some of the considerations that guide parents in selecting private schools. In addition to providing descriptive information, it will examine whether private school enrollment is associated with higher student performance and whether this relationship, if any, is concentrated in certain sections of the population.

The second section describes the findings from the literature comparing public and private schools with a focus on findings from international studies, results from Indian studies, and some of the policy considerations. The third section describes the IHDS 2005 on which this paper is based and the methodology is described in the fourth section. The following three sections describe the nature of school systems in India, provide some descriptive statistics on the characteristics of private and public schools, and also examine the social and economic backgrounds of students who attend public and private schools. The eighth section examines the impact of private school enrollment on child outcomes and the section following it focuses on the characteristics of the children who benefit most from private school enrollment. The final section of this paper draws out the implications of our results for policy considerations.

Literature on Public and Private Schools

Throughout the 20th century, as the role of the State grew in industrial societies and as many third world countries obtained independence, it has come to be universally accepted that education is one of the core functions of any mature civil society and has resulted in massive expansion of publicly provided education (Meyer et al., 1977). However, a growing dissatisfaction with the quality of public education has led to an increased focus on private education resulting in a spirited debate. In this section, we review the following dimensions of the public–private education debate: (*a*) international school effects debate; (*b*) research on the quality of public and private schools in India, and (*c*) policy alternatives under consideration.

School Effects Debate in an International Context

The school effects debate in the United States began with the Coleman report of 1966. This report is most remembered for what it did *not* find, rather than what it did find (Coleman et al., 1966). It failed to find a relationship between school-level inputs such as expenditures and teacher quality and children's performance. It concluded that children's educational trajectories are determined by their home environments and parental education rather than school-level inputs. A cottage industry has developed in the United States that has tried to address this counterintuitive finding (Hanushek, 1997).[1] Emerging literature on developing countries is also a patchwork of results with weak to negligible relationship between school inputs and child outcomes (Banerjee et al., 2007; Hanushek, 1995). One of the most interesting contributions to this debate has concluded, however, that school effects are far more important to children in low-income countries (Heyneman and Loxley, 1983). Parental characteristics in these countries play a far less important role than school characteristics (Fuller, 1987).

A second strand of this discourse centers on the role of private schools. Coleman and his colleagues went on to explore the determinants of children's schooling attainment and observed that enrollment in Catholic schools leads to better performance and a lower chance of dropping out for American children than enrollment in public schools (Coleman et al., 1982). In this precursor to the modern public/private school debate, the improvement in student performance was attributed to the "social capital" arising out of Catholic schools which creates a supportive environment that supersedes the influence of the family and encourages better performance on the part of all students, but particularly disadvantaged students (Hoffer et al., 1985). This line of research has given rise to another cottage industry trying to compare achievements in Catholic schools, other private schools, and

1. One influential aspect of the Coleman report was the argument that peer influences play an important role in children's educational outcomes; consequently, black children in integrated schools do better than black children in segregated schools, with little decline in the performance of white students. This finding had far reaching impact in creating an impetus for court-ordered busing of children to create racially integrated schools.

public schools in the United States. There is considerable debate on whether higher performance of children in Catholic schools is a function of school environment or of the characteristics of parents who opt for Catholic schools (Marks, 2002).

The public/private school considerations in a developing country context rarely focus on the "social capital" inherent in private schools but instead arise out of frustration with the quality of public schooling and concentrate on efficiency issues (Glewwe and Patrinos, 1999). Some of the early studies in this area found that in many developing countries, children from private schools perform better on various measures of cognitive skills than those from public schools (Jimenez and Lockheed, 1995; Jimenez et al., 1991).

Unfortunately, the reasons for greater effectiveness of private schools are poorly understood. In particular, it is difficult to draw the conclusion that private schooling per se caused the observed improvement in educational outcomes (if any) and not the characteristics of the parents who chose to send their children to private schools, or some other processes associated with private school enrollment (Hanushek, 1997). In particular, two dimensions of private school enrollment pose a challenge to conclusions that children in private schools learn more than those in public schools:

1. Parents who send their children to private schools tend to come from the upper socioeconomic strata. While studies attempt to control for parental socioeconomic status, these factors are imperfectly measured and hence, at least part of the relationship between private schools and children's educational outcomes may be spurious.
2. Parents who send their children to private schools may place a greater value on education and hence may encourage children to work hard at school and complete their homework. Thus, it may be parental influence rather than school quality that results in improved learning.

One way of eliminating this selection bias is to randomly assign children to public and private schools and compare their learning outcomes. However, even well-designed experiments do not always yield clear-cut estimates of school effects. Voucher experiments in Colombia and Chile provide interesting examples.

Colombia began experimenting with school vouchers in 1991 and provided vouchers to students entering Grade 6 by randomly assigned lottery. This allows for a comparison of lottery winners and losers and the comparison indicates that the winners have lower dropout rate and somewhat higher tests scores than losers (Angrist et al., 2002). However, while random assignment controls for the endogeneity of school choice, it is difficult to use this experiment to conclude that private schooling increases educational attainment. Since students were at a risk of losing vouchers for poor performance, participation in voucher program may increase student motivation to work hard. The effect of better school inputs may be inseparable from the effect of higher student motivation (Bettinger, 2005).

Chile undertook one of the largest experiments in public funding of private schools beginning in the 1980s. Government provided vouchers to students to attend private schools that were completely privately run and managed. Consequently, about 53 percent of the students study in municipal schools while 34 percent study in subsidized private schools with the remainder in unsubsidized private schools. A review of test scores of children in Grade 4 from ten studies shows that private school students have a slight advantage in test scores in five studies, four show little difference between the two, and in one study the municipal schools students perform slightly better than the private school students (Bellei, 2008). This review goes on to note that private school admissions are selective and a poorly performing student can be easily expelled, so the slight advantage in scores for private school students could easily be due to selectivity.

Research on Public and Private Schools in India

In comparison with the extensive literature in other countries, research on public and private schools in India is still in infancy. However, studies in India have noted that government schools are more expensive than private schools with lower teacher accountability. Kingdon (2008) reports from a micro study in Uttar Pradesh that recurrent per pupil expenditure in pri-vate schools was only 41 percent of the expenditure in public schools; most of this difference occurs because teacher salaries are much lower in private schools, compared to government schools. Another study in Delhi found that on average, the full-time teachers teaching Grade 4 in government schools earned Rs 10,071 per month compared to Rs 3,627 in private recognized schools, and Rs 1,360 in private unrecognized schools (Tooley and Dixon, 2005).

Another aspect of public schooling that attracts considerable attention relates to the lack of accountability and frequent teacher absences (Chaudhury et al., 2006; Muralidharan and Kremer, 2006). Studies in India have found considerable absenteeism among school teachers in rural areas (ranging from 11 to 25 percent) and found that private school teachers are 2–4 percentage points more likely to be present in school than government school teachers (Muralidharan and Kremer, 2006).

While research on student performance in government and private schools remains limited, the available information records higher performance on the part of students from private schools than from government schools. For example, a nationwide survey of rural children's reading and arithmetic skills conducted by Pratham found that 60 percent of the rural children enrolled in Grade 5 in government schools can read a simple paragraph compared to 70 percent for those in private schools (Pratham, 2005). Similar results are shown by a study in Delhi slums (Tooley and Dixon, 2005). However these studies do not fully control for the socioeconomic differences in children in government and private schools.

Private Schooling and Public Policy Debates

Increasing dissatisfaction with the quality of public schooling has given rise to calls for increasing the involvement of the private sector in education and even public–private partnership in the form of state provision of vouchers for private schools in India (Kelkar, 2006; Muralidharan, 2006; Panagariya, 2008) and elsewhere (Chakrabarti and Petersen, 2008; Tooley, 2007).

Advocacy for public–private partnership in early education depends on some crucial assumptions:

1. it assumes that private education can be more efficient and cost-effective than publicly provided education without diluting the quality of education;
2. social class inequalities in access to private education are undesirable and can be addressed through government financing of privately delivered education, and
3. increased public funding of private education will not have a deleterious effect on public education.

Unfortunately, the advocacy for private education has fast outpaced the available research base in this area and none of these assumptions can be easily substantiated. Since parents who are able and willing to send their children to private schools tend to be highly educated themselves and value educational attainment, it is difficult to say that it is private school enrollment per se that causes the observed differences in skills between children in private and government schools. When the effect of government funded but privately managed charter schools in the United States are compared to government schools, results do not show substantial improvement in student performance (Fuller, 2003). Moreover, growth of private schooling may be associated with flight of middle-class parents from public schools, the very parents who are best able to increase school and teacher accountability, and improve overall educational climate in public schools. Research on school and neighborhood effects suggests that the social and economic composition of student population in schools has an impact on school functioning (Jencks and Mayer, 1990) and accountability as well as attitudes and aspirations of peers (Goddard 2003; Pong, 1998; Roscigno, 2000). Thus, migration of middle-class parents may accelerate a downward spiral of public education.

This brief review suggests that while dissatisfaction with performance of public schools in providing education is an important driving force behind the advocacy for private schools, research in this area must carefully evaluate the evidence before engaging in policy prescriptions. While private schools have mushroomed in many parts of India, including rural India, whether they can be effectively utilized to provide a viable alternative to public education remains open to question and forms the topic of this paper. The literature reviewed here is useful in shaping the questions, but answers will depend on educational conditions on the ground in India.

India Human Development Survey 2005

The India Human Development Survey of 2005 was jointly organized by researchers from University of Maryland and NCAER. This survey was funded by a grant from the U.S. National Institute of Health and builds on a prior survey by NCAER. This is a nationally representative survey of 41,554 households located in both urban and rural areas of 33 states and union territories of India with the exception of Lakshadweep and Andaman and Nicobar. The sample extends to 384 districts out of 593 districts identified in 2001 census and covers 1503 villages and 971 urban blocks located in 276 towns and cities.

A major innovation of this survey was to conduct short assessments of reading, writing, and arithmetic skills for children aged 8–11 years. Conducting educational assessment in developing countries particularly India is difficult for a variety of reasons: children's abilities vary tremendously and an instrument must capture children at both ends of the distribution; tests must be translated into many different languages with similar difficulty levels; the instrument must be simple and intuitive so that interviewers can administer it easily and it would not frighten children who are not used to standardized tests. Luckily, we were able to work with Pratham, a non-governmental organization that has worked in the field of elementary education for many years. They had developed simple assessment tools to measure the effectiveness of their training programs and had administered these tools to over 250,000 children in their nationwide survey reported in *The Annual Status of Education Report 2005* (Pratham, 2005). These tests were included in the IHDS and allowed us to measure whether a child is not able to read at all, or is able to read letters, words, sentences, paragraphs, or stories. Simple addition, subtraction, multiplication, and division problems were also developed. The English version of the test is reproduced in appendix 1.

Interviewers were trained extensively by Pratham volunteers using specially developed films so that they could differentiate between a child's shyness and inability to read. They were also taught how to develop rapport with children. Tests were developed in twelve Indian languages as well as in English, and children were asked to take the test in whichever language they were most comfortable in.

In all the IHDS sample consists of 17,117 children aged 8–11 years. Reading and arithmetic tests were administered to 72 percent of the children aged 8–11 years. Children may not be tested for two reasons: (*a*) interviewers were explicitly instructed to obtain parental consent as well as assent from children for testing and were asked not to pressurize children who were reluctant and (*b*) since the household survey was the main focus of this study, the administration of the reading and arithmetic skills was left to the end. We suspect that household fatigue as well as interviewer fatigue may have played a role in missing skill testing. Appendix table A-1 in appendix 2 shows the proportion of children tested by a variety of household and background factors. The results suggest that children who are currently not enrolled are the least likely to be tested. Beyond this, while there is a mild difference in test completion rate between different social and economic groups, this difference is not large. There is little difference in test completion for children in private and government schools. While instruments for test completion are difficult to find, a Heckman selectivity correction relying on probit-linear regression combination was not statistically significant nor did it change any other coefficients substantially.

The test data we have available to us are quite unique, particularly since they are combined with a wealth of household and contextual characteristics. Children are classified according to their ability to read in one of the five categories:

1. Cannot read at all.
2. Can read letters but not form words.

3. Can put letters together to read words but not read whole sentences.
4. Can read a short paragraph for 2–3 sentences but not fluent enough to read a whole page.
5. Can read a one-page short story.

In all, 12,394 children aged 8–11 years were administered the reading test. Excluding cases with missing data on independent variables as well as non-enrolled students, the analytic sample for reading skills consists of 11,702 children.

Children's mathematical skills are classified in four categories:

1. Cannot read numbers above 10.
2. Can read numbers between 10 and 99 but not able to do more complex number manipulation.
3. Can subtract a two-digit number from another.
4. Can divide a number between 100 and 999 by another number between 1 and 9.

Note that we focus on 2-digit numbers to avoid calculations on fingertips and to get a better estimate of true understanding of subtraction and division. Also, given the Indian system of expecting children to memorize multiplication tables from 1 to 20, we chose to test children on division rather than multiplication skills. In all, 12,345 children aged 8–11 years were administered the arithmetic test. Excluding cases with missing data on independent variables as well as non-enrolled students, the analytic sample for reading skills consists of 11,655 children.

In addition to the household module, the survey also included a primary school module where the interviewers were asked to conduct a school facilities survey for one public and one private primary school in each village and urban block. When more than one facility was available in each block/village, interviewers were asked to select the facility that was predominantly used by the residents. The school facilities survey provides an interesting description of the schooling climate in India. However, given the differential use of private and public schooling in different parts of India, the results from this survey should be treated as being indicative of the schooling climate around different parts of India rather than providing a representative sample of primary schools.[2] However, this survey provides us with some

2. With appropriate weighting, these data can provide a representative sample of public and private schools. However, the descriptive results in paper are unweighted.

interesting exclusions restrictions to handle the endogeneity of choice of private schools.

Methodology

The primary goal of this paper is to examine the relationship between enrollment in private schools and academic skills for children aged 8–11 years. In view of some of the methodological considerations outlined earlier, we rely on a variety of techniques to obtain a sense of the magnitude of this effect. Specifically, we examine the impact of private school enrollment on children's verbal and mathematical skills using ordinary least squares regression, Heckman control function method based on exclusion restrictions (Heckman and Navarro-Lozano, 2004), and family fixed-effects models. Triangulation based on these three methods allows us to develop a range of estimates for the impact of private school enrollment on children's skills.

The Heckman control function method assumes that the underlying model is:

$$Y_i = \beta X_i + \delta Z_i + \varepsilon_i$$

Where Y_i is the child's score on reading and arithmetic tests, Z_i reflects private school enrollment, and X_i, includes controls for a variety of background characteristics including state of residence, urban/rural residence, caste/tribe/religious background of the parents, child's age, sex, highest level of education obtained by parents in the household, household size, log of annual household income, and household's score on an index of possession of a variety of consumer durables. The switching regression is identified by W_i, the instruments that affect private school enrollment. These include presence of a private school in the village, whether English is taught early on, presence of a cook in government school, and household's social networks. These variables are described in greater detail in a later section.

Further, Z_i in the equation above is supposed to stem from an unobservable latent variable:

$$Z_i = \gamma W_i + \mu_i$$

The decision to send a child to private school or not is made according to the rule:

$$Z_i = \begin{cases} 1, & if\, Z_i > 0 \\ 0, & if\, Z_i \leq 0 \end{cases}$$

These equations are estimated in STATA using the TREATREG routine with full maximum likelihood. Instruments used in identifying the selection equation are discussed along with the characteristics of private and government schools in India below. Due to the reliance on probit-linear combination, the dependent variables—reading and arithmetic skills—are assumed to be continuous variables for this analysis.

Since results from this method are highly sensitive to the choice of exclusion restrictions (Stolzenberg and Relles, 1997), we supplement this analysis with a highly restrictive family fixed-effects model. Impact of private schooling on children is riddled with concerns about the fact that families which choose private schools are different from those that choose government schools and any observed relationship between private schooling and child outcomes could be due to these unobserved factors. One way of addressing this is to compare the achievements of children within the same family based on whether they go to private school or not, that is, adding a dummy variable per household. We supplement the analysis using the Heckman control function method with the family fixed-effects models to give us another estimate of school effect.

Growth of Private School Enrollment in India

The Indian educational panorama consists of a variety of schools. While schools run by Central, state, and local governments comprise a clear "government" sector, the private sector consists of three types of schools:

1. Schools that receive government grant-in-aid but are privately run.
2. Schools that receive little government funding but are recognized based on certain criterion outlined by the government and must follow certain regulations.
3. Schools that are unrecognized and might not meet the criteria (such as infrastructure or teacher salaries) needed for recognition. Private schools that receive grants-in-aid, normally called aided schools, resembled private schools in early decades following Independence. They received money from the government but teachers were directly hired and paid by the schools. Since the 1970s, these teachers receive their salary directly from the state and are recruited by a government appointed commission but their routine operations are governed by the private management (Kingdon, 2008). Hence in cost and teacher

> qualification, they are similar to government schools but retain a private character in management and day-to-day operations. Private recognized schools must meet certain criteria regarding infrastructure, teacher qualifications, and salaries to receive recognition, however, some schools manage to slip by without fully complying with the regulations. The private recognized schools tend to be larger, often run by non-profit management, and be located in urban areas. In contrast, the unrecognized schools tend to retain a home grown flavor and are frequently run in a more ad-hoc fashion, sometimes in the back of a teacher's home.

Private school enrollment in India has been rising rapidly with 20–24 percent of the rural students being reportedly enrolled in private schools (Pratham, 2005). Primary education has been a priority for the Indian government for many decades. Successive Five Year Plans have emphasized the importance of investing in primary schooling with a plethora of government programs (Govinda, 2002). Hence, the rapid rise in private school enrollment comes somewhat as a surprise. Even now, official statistics do not fully capture the growth of private school enrollment. Official data from the Seventh All India Survey of Education show that the share of private schools in primary enrollment is about 6 percent in rural areas and about 29 percent in urban areas. However, there are good reasons to believe that this is a substantial underestimate (Kingdon, 2007).

Official statistics do not usually collect data on unrecognized schools and consequently tend to underestimate the size of the private sector (Kingdon 2007). The 1993–94 household survey by NCAER (Shariff, 1999) found that about 10 percent of the primary school students in rural India were in private school while the comparable figures from the Sixth All India Survey by National Council for Educational Research and Training (NCERT) conducted in 1993 recorded only about 3 percent in private unaided schools. The 2002 Seventh All India Educational Survey conducted by the NCERT found 5.8 percent enrollment in private (unaided) schools in rural areas and 28.8 percent in urban areas. If aided private schools are included, this number swells to 9 and 45 percent in rural and urban areas respectively. However, household based surveys, which include both recognized and unrecognized schools, document a higher prevalence. Consequently, the Annual Status of Education Report (ASER) survey conducted by Pratham in 2005 (Pratham, 2005) and confined to rural areas, found that private school enrollment for rural children was nearly 20 percent.

The India Human Development Survey 2005 documents similar enrollments. Table 1 shows that at the all India level, about 68 percent of children are enrolled in government schools with 42 percent and 76 percent of the urban and rural students respectively in government schools. Private enrollment—combining enrollment in aided and unaided private schools, madrasas, and convents—forms 58 percent and 24 percent of the urban and rural enrollments respectively, among children of age 6–14 years. We combine aided and unaided schools into a single category—"private schools"—because parents may often not know the exact management of the schools their children attend, resulting in considerable measurement error. Moreover, private aided schools are similar to private recognized but not aided schools in many ways since teacher recruitment and performance are monitored by school management using locally appropriate standards and increasing numbers of teachers are paid by the management rather than by the government (Chopra and Jeffrey, 2005).

As Figure 1 indicates, private school enrollment rises in higher standards but even for primary schools, the proportion in private schools is substantial.

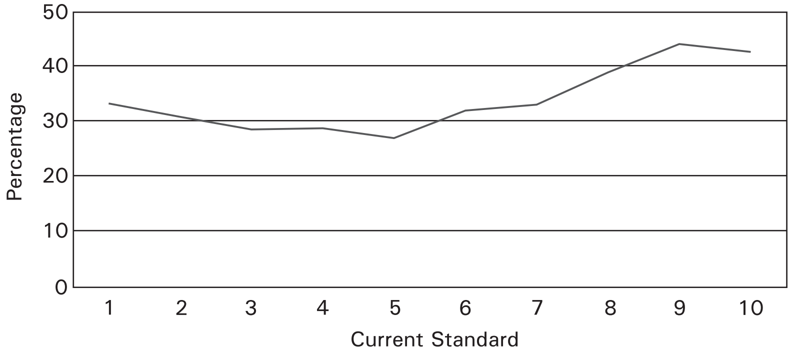
This can be costly, of course. Figure 2 shows the average educational costs for private and public schools by current standard. The average primary student in a private school pays Rs 600 in fees and another Rs 600 in expenses for book, uniforms, and transportation (compared to Rs 20 and Rs 200 for government schools). Furthermore, while only 17 percent of the children in government schools get private tutoring, nearly 27 percent in private schools do so and when they do get private tutoring, median cost for private school students is Rs 600 instead of Rs 500 for the private school students.

TABLE 1. Distribution of Type of Schools Attended for Enrolled Children (Aged 6–14 Years)

School Type	*Rural*	*Urban*	*All*
Government	76	42	68
Education Guarantee Scheme (EGS)	1	1	1
Government	75	41	67
Private	24	58	32
Private Aided	4	8	5
Private	17	45	24
Convent	1	3	2
Madrasa	1	1	1
Other	1	2	1
Sample Size	24,949	11,776	36,725

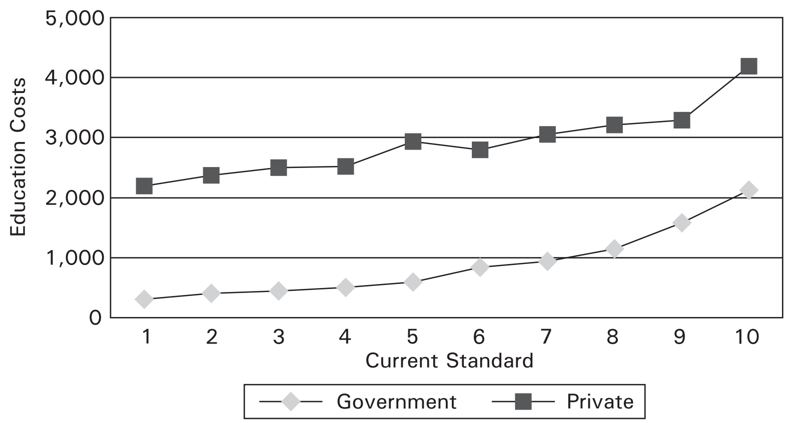
Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

FIGURE 1. Enrollment in Private Schools by Current Standard



Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

FIGURE 2. Total Educational Costs by Standard for Public and Private Schools Students (Aged 6–14 Years)



Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

Note that these costs are per student per year, borne by the family and do not include government expenditure.

Characteristics of Public and Private Schools in India

As we designed and fielded the IHDS, we had the opportunity to talk to many parents. We heard two main themes in their explanations for sending their children to private schools: (*a*) "Government schools are not good around here; the teachers are often absent and do not work hard even when present," and (*b*) "We want our children to learn English, and the private schools are English medium or teach English earlier than the government schools."

The parents' observations have good empirical support. As table 2 indicates, the school facilities survey in the IHDS found that about 12.4 percent teachers in government schools were not present on the day of the survey. While these estimates are below the 25 percent absenteeism found in more detailed studies using multiple unannounced visits, the data nevertheless reflect some of the same public/private differences (Chaudhury et al. 2006; Muralidharan and Kremer, 2006). While private school teachers are only 2 percentage points less likely to be absent overall, a within-village fixed-effects model shows that private school teachers are 1.39 times as likely to be present on the day of the visit as government school teachers. The within-village results differ because private schools may be located more often in villages with low attendance rates by public school teachers. This correlation may result either from private schools prospering in areas with weak public schools, or because the rise of private schools results in deterioration of public schools by removing civic pressure on the government schools system.

TABLE 2. Characteristics of Private and Public Schools in India

	Government schools	*Private schools*
Percentage of teachers present in a school	87.6	89.4
Percentage of teachers trained	85.9	43.8
Percentage of teachers with college degree	43.7	64.4
Percentage of students present in school	86.9	91.9
Some subjects taught in English+	26.8	51.1
English instruction begins in 1st standard	53.2	88.2
No. of classes meeting outside	0.7	0.3
No. of mixed grade classrooms	0.9	0.6
Any toilet facility	60.9	78.3
Chairs/desk for all students	29.2	63.5
Blackboard in all classrooms	95.4	98.1
Computer available for student use	5.9	29.2
School has fans	28.4	63.3
Kitchen for cooked meals	41.3	10.8
Cook employed by a school	74.9	11.1
Any teaching material on the wall	77.3	78.9
Children's work on the wall	67.6	73.9
No. of Schools Surveyed	2034	1748

Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

Notes: †Many schools teach some subjects in English and others in vernacular languages.

*IHDS selected one predominant private and one government school per village/urban block. The school sample is nationwide but not nationally representative.

Our data also show that private schools have better facilities such as desks, flush toilets, and fans. The differences in teacher characteristics between private and government schools are striking. Private school teachers are more likely to have a college degree but less likely to have received teacher training than government schools. Part of this difference may be that employment in government schools is conditional on a training certificate.

Government and private schools also differ substantially in the provision of a mid-day meal. After Tamil Nadu introduced a successful mid-day meals program in its schools, the National Program of Nutritional Support to Primary Education was launched across India in 1995. The mid-day meals program (MDM) aims to increase primary school attendance, as well as improve the nutritional status of school children. Generally, the program serves the 6–11-year age group. However, some upper-primary schools run the MDM program as well, and in recent union budgets, separate provision has been made for the upper-primary schools also. Under the MDM scheme, cooked meals are to be served during the lunch time in the school, with calorie value equivalent to 100 gm of wheat or rice per student per school day. In some places, a dry ration is provided to be carried home based on a certain minimum level of school attendance.

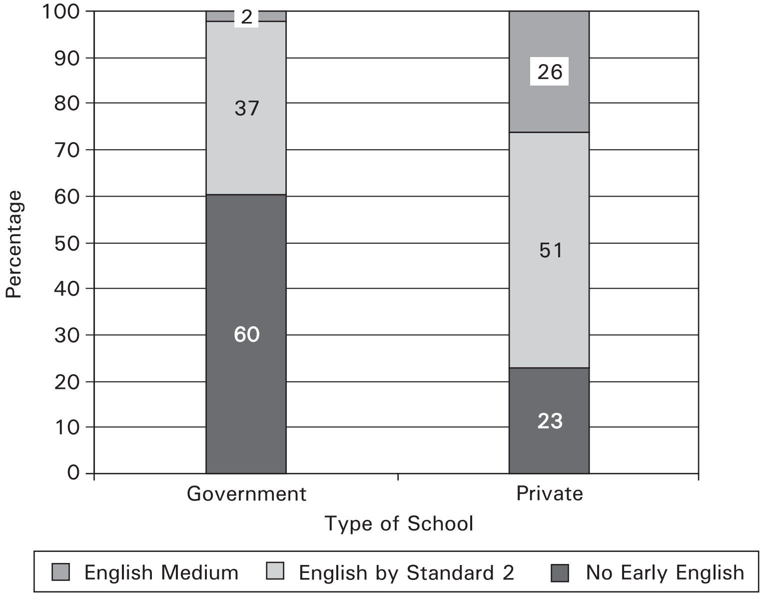
The IHDS data report 60 percent of children up to Grade 5 receive mid-day meals or free grains. Of these, 35 percent receive the full MDM program benefits; 8 percent get only *dalia* (porridge) for the meal, and 16 percent are given grains in place of the meal. These programs are mainly found in government schools. Among private schools, only 8 percent of primary students participate compared to 80 percent at government schools. It would be reasonable to expect that a fully functioning MDM program would increase the likelihood that a child attends government school and one of the indicators for a functioning MDM program is the presence of a cook in the school (Drèze and Goyal, 2003).

Similarly, IHDS data presented in figure 3 show that private schools are more likely to teach English early.[3] While only 2 percent of children in government schools are taught in English exclusively, nearly 26 percent of children in private schools are. When the initial medium of instruction is a vernacular language, English is introduced in earlier standards in private schools.

The school facilities, teacher absenteeism, and English medium results suggest that parents send their children to private schools for a good reason.

3. Table 2 is based on school data and not nationally representative of the experiences of students. Figure 3 is based on student data which are nationally representative.

FIGURE 3. English Instruction by Type of School, Children Aged 6–14 Years



Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

Obviously, private school students are a selected population coming from higher socioeconomic backgrounds. It will be important to control for this selectivity insofar as possible when examining the impact of private schools on student performance.

Characteristics of Private School Students

Table 3 provides descriptive statistics for our sample, private school enrollment as well as children's ability to read a simple paragraph and do basic two-digit subtractions. In recent decades, there has been a sharp increase in school enrollment, about 92 percent of the children aged 8–11 years in IHDS are in school; of these, about 31 percent of the children aged 8–11 years are enrolled in private schools. In keeping with generally preferential treatment of boys in Indian families, boys are somewhat more likely to be enrolled in private schools than girls. Private school enrollment seems clearly associated with higher income and education of the household. Interestingly, students in metro cities are about as likely to enroll in private schools as students

TABLE 3. Sample Distribution, Private Schooling, and Skill Levels by Background Characteristics

	Proportion of sample	*Prop. in private school*	*Prop. able to read a para*	*Prop. able to subtract*
Gender				
Male	0.53	0.33	0.57	0.51
Female	0.47	0.29	0.54	0.46
Place of residence				
Metropolitan	0.05	0.58	0.69	0.72
Other urban	0.19	0.58	0.69	0.62
Developed village	0.34	0.29	0.55	0.48
Less developed village	0.42	0.17	0.48	0.41
Household income quintile				
Poorest	0.18	0.16	0.45	0.38
Second	0.22	0.17	0.47	0.40
Third	0.22	0.26	0.51	0.45
Fourth	0.20	0.39	0.62	0.54
Affluent	0.18	0.59	0.73	0.69
Standard of living quintile				
Poorest	0.20	0.1	0.34	0.29
Second	0.22	0.16	0.47	0.37
Third	0.24	0.27	0.54	0.49
Fourth	0.20	0.44	0.69	0.60
Affluent	0.15	0.69	0.81	0.78
Socio religious group				
Forward caste	0.19	0.43	0.71	0.64
Other backward classes (OBC)	0.36	0.29	0.57	0.50
Dalit (Hindu, Sikh, Buddhist)	0.24	0.21	0.45	0.39
Adivasi (any religion)	0.06	0.15	0.48	0.38
Muslim	0.13	0.38	0.46	0.42
Minority religions	0.02	0.74	0.80	0.79
Maximum adult education in (HH)				
Illiterate	0.24	0.16	0.37	0.31
1–4 std.	0.09	0.14	0.48	0.38
5–9 std.	0.35	0.26	0.55	0.47
10–11 std.	0.14	0.45	0.66	0.61
High secondary & some college	0.08	0.53	0.72	0.66
College graduate	0.09	0.63	0.80	0.75

Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

in smaller cities and, controlling for income and education of the adults in the household, enrollment in private schools is marginally lower in metropolitan cities than in other urban areas. This is probably due to the presence of higher quality Central Government schools in major metropolitan areas, particularly Delhi.

Caste and religion seem associated with private school enrollment. Forward castes and other minorities groups such as Christians, Sikhs, and Jains are far more likely to send their children to private schools than Dalits and Adivasis with Muslims and Other Backward Classes (OBCs) falling in the middle. Results from multivariate analyses (not reported here) indicate that even after controlling for parental income and education, Dalit children are substantially less likely to be enrolled in private schools.

State differences in private schools are interesting (table 4). Private school enrollment in one of the high education states, Himachal Pradesh, is low while it is high in Kerala, the other high education state. Uttar Pradesh has considerably higher private school enrollment than the neighboring Bihar. Some of these regional differences in private school enrollment may well be associated with socioeconomic background of its residents but may also reflect some differences in state policies. Christians are substantially more likely to be in convent schools and the Christian population is high in the North East and in Kerala. However, history also plays a substantial role.

TABLE 4. Private Schooling and Skill Levels by State

	Proportion in private school	*Proportion able to read a paragraph*	*Proportion able to subtract*
ALL INDIA	0.31	0.55	0.49
Jammu and Kashmir	0.46	0.41	0.61
Himachal Pradesh	0.18	0.84	0.69
Uttarakhand	0.34	0.63	0.47
Punjab	0.52	0.67	0.73
Haryana	0.44	0.66	0.63
Delhi	0.31	0.77	0.72
Uttar Pradesh	0.44	0.40	0.34
Bihar	0.18	0.47	0.48
Jharkhand	0.37	0.61	0.61
Rajasthan	0.32	0.57	0.44
Chhattisgarh	0.19	0.62	0.37
Madhya Pradesh	0.29	0.47	0.33
North East	0.54	0.60	0.78
Assam	0.09	0.75	0.46
West Bengal	0.12	0.52	0.58
Orissa	0.08	0.59	0.51
Gujarat	0.20	0.65	0.43
Maharashtra/Goa	0.29	0.66	0.54
Andhra Pradesh	0.29	0.50	0.51
Karnataka	0.27	0.53	0.55
Kerala	0.61	0.82	0.60
Tamil Nadu	0.42	0.80	0.72

Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

Exclusion Restrictions for Private School Enrollment

The brief description of students in private schools as well as the literature cited earlier clearly suggest that private school enrollment is a choice variable and while we expect to control for observable family background factors such as education, income, and household size, these controls may be inadequate due to omitted variables as well as measurement error in some of the included variables. In order to estimate the Heckman control function discussed earlier, instead of relying simply on distributional assumptions, we rely on theoretically motivated exclusion variables that are expected to be associated with the decision to enroll in private school as well as private school admission but are not expected to be independently associated with educational outcomes.

Availability of Private Schools

Private school enrollment is dependent on a complex interplay of supply and demand. Social composition of an area, history, and state policies all play an important role in shaping the availability of private schools. Hence, availability of private schools is an important instrument for private school enrollment which has been used in the literature (Jimenez et al., 1991). We assume that in all urban areas private schools are available.

Desirability of Public Schools

Given the IHDS's focus on school surveys, we also included a set of variables describing the characteristics of government schools in the village/urban block as factors which may motivate parents to favor or not favor government schools. These include English medium instruction for some academic subjects, early introduction to English language, and presence of a cook in the government school as a marker for the draw of the mid-day meal program. Since school surveys for some localities were not conducted due to interviews taking place during weekends or holidays, a variable denoting missing school survey is included in the analysis.

Parental Ability in Gaining Entrance in Private Schools

Private school enrollment is not simply a function of parental preferences. In urban areas, admission into quality private schools can be a highly competitive process in which parents with broader social networks gain an edge over less connected parents. Consequently, we also control for two markers of family social networks, whether the household members know anyone working in the medical profession and whether they know anyone working for the government. These variables are described in table 5.[4]

While switching regressions estimated with maximum likelihood are considered both unbiased and efficient, they are highly dependent on the validity of the exclusion criteria as well as their strength as predictors of private school. Table 6 shows the first stage regression with the exclusion variables listed above as predictors. The results show that with the exception of

TABLE 5. Sample Distribution, Private Schooling, and Skill Levels by Instruments for Private Enrollment

	Proportion of sample	*Proportion in private school*	*Proportion able to read a para*	*Proportion able to subtract*
Know any medical personnel				
No	0.67	0.27	0.52	0.45
Yes	0.33	0.39	0.61	0.56
Know any govt. workers				
No	0.68	0.26	0.51	0.45
Yes	0.32	0.41	0.64	0.58
Private primary school in village/ town (all towns = yes)				
No	0.50	0.15	0.51	0.43
Yes	0.50	0.47	0.6	0.55
Local govt. school has a cook				
No	0.37	0.40	0.57	0.53
Yes	0.63	0.26	0.54	0.46
Local govt. school teaches English in KG/Std 1				
No	0.58	0.34	0.52	0.46
Yes	0.42	0.26	0.6	0.53
English as a medium of instruction in local govt. school				
No	0.83	0.31	0.54	0.47
Yes	0.17	0.28	0.63	0.56
School survey missing for village/ block				
No	0.84	0.27	0.54	0.48
Yes	0.16	0.50	0.60	0.52

Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

4. This analysis has been carried out with and without the two variables measuring social networks due to our concern that the network measures may not be truly exogenous. The coefficient for private schools in the regression with smaller set of instruments was similar in magnitude but had a greater standard error. The school variables are excellent instruments for rural India; for urban areas, since parents have choices beyond the local school, having other instruments make the results more robust.

TABLE 6. Impact of Excluded Variables on Enrollment in Private Schools—Results from the First Stage of Switching Regression Model

	Coef.	Z value
Know anyone in medical profession	0.24**	5.6
Know anyone in government	0.27**	6.61
Private schools available in a village	0.92**	21.69
Cook in a local govt. school	−0.08*	−1.88
Early English in a local govt. school	−0.08*	−1.94
Institutions in English in local govt. school	0.07	1.56
Missing school schedule	0.34**	5.29
Constant	−1.18	−19.65
No. of cases	11,667	
Chi Square (7 df)	704	

Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.
Note: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

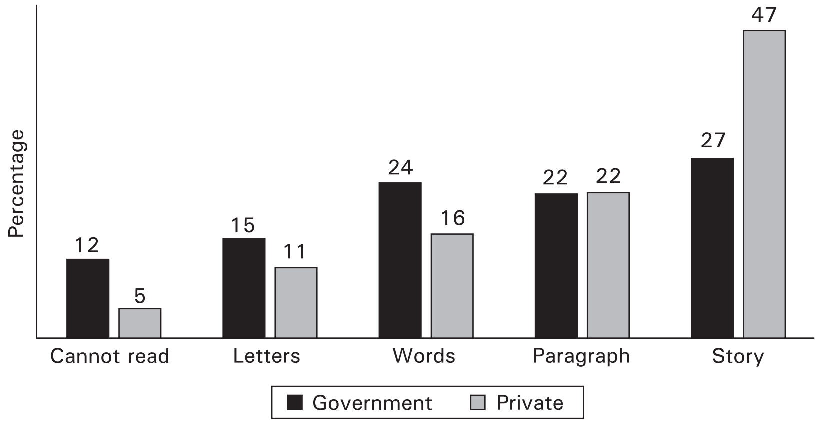
English medium instruction, each of the other variables is associated with private school enrollment in the direction expected and these relationships are statistically significant. Overall, the model is highly significant with a Chi Square of 704 and 7 degrees of freedom.

Private School Enrollment and Child Outcomes

As the brief overview of literature presented above suggests, it is important to be cautious about drawing inferences based on any perceived relationship between private school enrollment and children's skill acquisition. Hence, in this section we first describe the basic relationship between private school enrollment and children's performance on reading and arithmetic tests while controlling for observable characteristics of their households. Then we address the issue of endogeneity using a switching regression model in which school choice is captured by a set of theoretically motivated exclusion restrictions. Finally, we examine the impact of private school enrollment on child outcomes within a highly restrictive framework, family fixed-effects model.

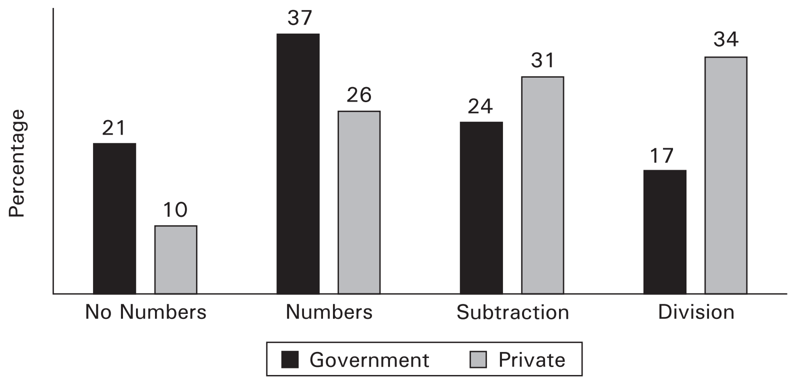
Figures 4 and 5 indicate basic differences in reading and arithmetic skills among children enrolled in government and private schools. Results indicate that private school students have higher achievement on these tests. These differences are further analyzed by adding controls for parental socioeconomic background, place of residence, and children's sex, age, and current standard. In addition to private school enrollment, these regressions control for highest education level attained by any of the household adults,

FIGURE 4. Distribution of Reading Skills by School Type



Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

FIGURE 5. Distribution of Arithmetic Skills by School Type



Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

log of family income, a 30-item standard of living index consisting of ownership of various consumer durables (TV, refrigerator, telephone, car, cot, etc.) and quality of housing (toilet, piped water, etc.), household size, number of children under age 15, place of residence, state of residence, child's sex, and age. Caste, ethnicity, and religion are particularly important to control for since they are linked to private school enrollment, particularly enrollment in madrasas or convents, as well as having an independent impact on educational outcomes (Desai et al., Forthcoming). Controls for state of residence are also included in each regression although not presented in the tables.

TABLE 7. Impact of Private School Enrollment on Reading and Arithmetic Skills

	Reading skills			*Arithmetic skills*		
	1	*2*	*3*	*1*	*2*	*3*
	Basic OLS	*Switching regression*	*Family fixed effect*	*Basic OLS*	*Switching regression*	*Family fixed effect*
Residence (metro omitted)						
Other urban	0.163***	0.161***		0.112**	0.108**	
Developed village	0.179***	0.171**		0.092*	0.078	
Less developed village	0.176**	0.167**		0.101**	0.082	
Socio religious group (forward caste omitted)						
Other Backward Classes (OBC)	–0.051	–0.051		–0.054*	–0.055*	
Dalit	–0.222***	–0.222***		–0.222***	–0.222***	
Adivasi	–0.104*	–0.104*		–0.124***	–0.125***	
Muslim	–0.231***	–0.231***		–0.241***	–0.242***	
Other minority religions	–0.101	–0.102		–0.0602	–0.062	
Maximum household education (none omitted)						
1–4 std.	0.147**	0.147**		0.037	0.038	
5–9 std.	0.186***	0.187***		0.110***	0.111***	
10–11 std.	0.338***	0.338***		0.252***	0.253***	
High secondary & some college	0.387***	0.389***		0.302***	0.305***	
College graduate	0.417***	0.419***		0.388***	0.390***	
Log of household annual income	0.001	0.001		0.006	0.006	
Score on Std. of living scale	0.034***	0.035***		0.031***	0.031***	
No. of persons in the household	–0.0237***	–0.024***		–0.019***	–0.019***	
No. of children < 15 in the household	–0.00504	–0.005		0.004	0.003	

Female child	−0.100***	−0.100***	−0.07	−0.157***	−0.156***	−0.179***
Current standard	0.341***	0.341***	0.229***	0.247***	0.247***	0.183***
Age of the child	0.025	0.025	0.164***	0.037***	0.037***	0.123***
In private school	0.392***	0.362**	0.307***	0.280***	0.221**	0.224***
Constant	0.497**	0.513**	1.482***	0.148	0.179	0.879***
R-squared	0.337		0.286	0.355		0.287
Chi Square (42 df)		3,954			4,782	
Observations	11,667	11,667	11,667	11,619	11,619	11,619

Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.
Note: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.
Regressions also include controls for states.

In Model 1, the basic OLS model, students' reading and arithmetic skills are regressed on a set of independent variables including enrollment in private school (table 7). As might be expected, parental education, urban residence, household income, and index measuring standards of living are all positively associated with student performance on these skill tests. However, while standard of living—a marker of long-term economic status—is consistently statistically significant, log of household income is not. This may be because income contains considerable year-to-year fluctuation while standard of living indicates permanent income, a variable with longer term impact on well-being (Filmer and Pritchett, 2001). While it is reasonable to see skills increase with age and current standard, the coefficient on sex is surprising. Holding age and current standard constant, girls have lower performance on both reading and arithmetic tests, possibly due to greater demands of household chores compete with time spent doing homework. In international studies, girls generally perform slightly above boys in verbal tests and slightly below boys in mathematical tests.

Enrollment in a private school is positively related with higher performance on both verbal and mathematical skills. While the coefficient for verbal skills is slightly larger, it is important to remember that the skill levels range from 0 to 4 for verbal skill and from 0 to 3 for mathematical skills.

The second model corrects for the endogeneity of school choice by using a Heckman type correction, in which the binary choice of attending private school or not is modeled with the set of exclusions restrictions described above. The results from this endogenous switching regime are presented in Model 2. The first stage probit model (presented in table 6) suggests that our instruments are highly correlated with private school enrollment. Each is statistically significant and in the expected direction–with the exception of English medium instruction. The second stage regression includes the effect of private school enrollment on reading and arithmetic skills, correcting for the biases introduced due to endogeneity of school choice. As might be expected, the coefficients for private school are smaller in size than those from the naïve OLS regression models; however, the difference is not substantial. Nor is the *lambda* statistically significant. The Wald test for independence of regressions is not statistically significant suggesting that the possibility that selection equation and achievement equation are unrelated cannot be ruled out. This suggests that while omission of the endogenous nature of school choice introduces some bias in the regression estimate, the size of this bias is not very large. The regression coefficient for private school from the uncorrected model for reading skill is 0.39 while in the model correcting for endogeneity it is 0.36. The difference for arithmetic skills is similar in magnitude, 0.28 vs 0.22. Since the standard deviation is 1.35 for reading skills and 1.03 for mathematical skills, the improvement associated with private schools is about one-fourth to one-third of a standard deviation.

Results from any models relying on instrumental variables are only as good as the instruments themselves. Hence, we compare these results with those from a strongly restrictive model—family-level fixed-effects model. Here we assume that all family influences such as desire for education and parental encouragement are shared by all children in the family. Children differ mainly in their personal characteristics such as gender, age, standard, and private school enrollment. These family-level fixed-effects models continue to suggest that private school enrollment is consistently related to higher performance and the magnitude of these coefficients is similar to those obtained from the switching regression.

These results suggest three things:

1. Private school enrollment is associated with higher child outcomes, even after controlling for a variety of family factors.
2. Size of this effect is statistically significant but moderate with average improvement being about one-fourth of a standard deviation.
3. The coefficients from these three models are not vastly different from each other.

Some caveats in interpreting these results are in order. One of the greatest difficulties in interpreting the association between private school enrollment and children's educational outcomes is affected by biases at various levels.

Within Family Choices

Parents when faced with spending scarce resources on children's education may choose to send an academically gifted child to a private school. Hence, in within-family fixed-effects models, any association between private schools and child scores may be due to children's ability rather than their school. The only way of addressing this would be via longitudinal data in which one would try to examine the differential growth in educational achievement between children in private and government schools, holding their initial talent constant. This may be particularly important because studies have also found that at times educational innovations or programs have a large initial impact, with declines in magnitude over time (Banerjee et al., 2007).

Cross-sectional analyses like ours are unable to do this.

Differential Value Placed on Education among Families

Some families value education more than others and may be more likely to invest in it by sending children to private schools and ensuring that they do their homework. While we have tried to control for these differences using switching regression, some of the variables in the model such as having greater access to social networks may not be fully exogenous. In particular, households with greater social connections may have a greater ability to get their children into private schools (as we argue), and at the same time, may have greater returns to education in the form of better access to jobs.

Differential Demand for Education across Communities

Some of our exclusion restrictions rely on village level access to private schools and characteristics of public schools. It is possible that communities may differ in their demand for schools and certain types of education such as early instruction in English. Hence, it may be higher demand for high quality education that may lead to better outcomes rather than access to private schools. While this seems a more remote possibility—it is difficult for parents and communities to change government school curriculum and ensure early English instruction—it is not impossible.

However, we have used a variety of techniques and excluded variables with the expectation that while each may retain some sources of bias, together they provide us with a rough indication of whether private school enrollment might be associated with higher performance or not. Our results suggest remarkable similarity of effects across the three models. It is possible that some of these effects are overestimated; particularly, the within-family fixed effect may decline if children's ability is taken into account. However, if the results we present suggest an upper bound for the impact of private school education, the estimated effects are no more than one-third to one-fourth of a standard deviation. As we discuss later, in comparison to inter-state differences in educational outcomes, these are modest effects.

Which Children Benefit the Most from Private School Enrollment?

The debate on the validity of evidence about the impact of private schooling, or lack thereof, has occupied the center stage in such a way that there has been little room for studying differences in potential benefits of private schooling. In this paper we focus on the interaction between parental economic status and school type to explore the mechanism through which private schools may influence child outcomes. Research in the United States suggests (Hoffer et al., 1985) that benefits of private schools accrue disproportionately to disadvantaged students. In order to examine this, we interact private school enrollment with household standard of living in Model 2 from table 7, that is, the Heckman switching regression. In this analysis private school enrollment is interacted with the 30-item standard of living index,[5] while controlling for the selection into private schools using the instruments discussed earlier.[6]

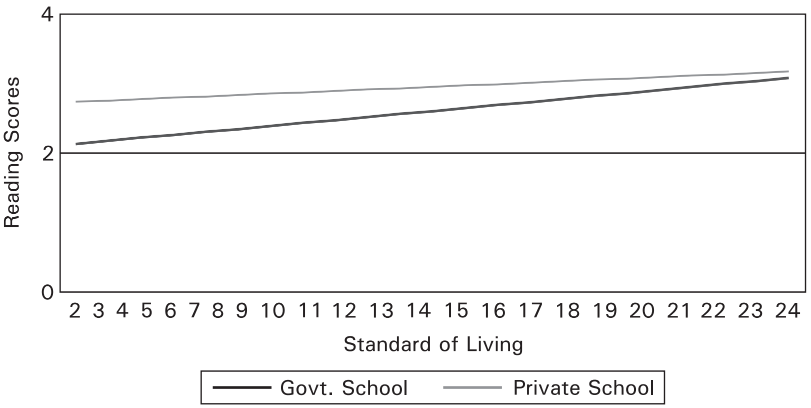
This interaction term is highly significant and negative in sign and the coefficients are presented in appendix 3. Results from this analysis are graphically presented in figures 6 and 7 which suggest that benefits to private school enrollment for children from lower economic strata are far greater than those for children from upper economic strata and at upper income levels, the difference between private and government school narrows considerably. The lack of difference between private and government schools at upper income levels is not surprising; parent with the means to send their children to private school would only select government school if it is of high quality. A good example may be university professors whose children attend Central Government schools located on campus and that are run with a great deal of intellectual input from the campus community. However, the benefits of private schooling to poorer children are more intriguing and deserve greater attention to the mechanisms through which these benefits accrue.

While the US research has tried to understand the mechanisms through which experiences of students in private and government schools may differ, in the developing country context, little attention has been directed to this issue. In the following analysis we attempt to provide some qualitative information on experiences of children in government and private schools. We note that this part of the analysis is suggestive rather than conclusive since it is difficult to determine the causal direction of the association. Nonetheless, this may well be the only data where even associations can be explored.

5. While not reported here, we obtain similar results for interaction between household education and private schooling and between place of residence and private schooling with children from lower education households and those from least developed villages benefiting the most from private school enrollment.

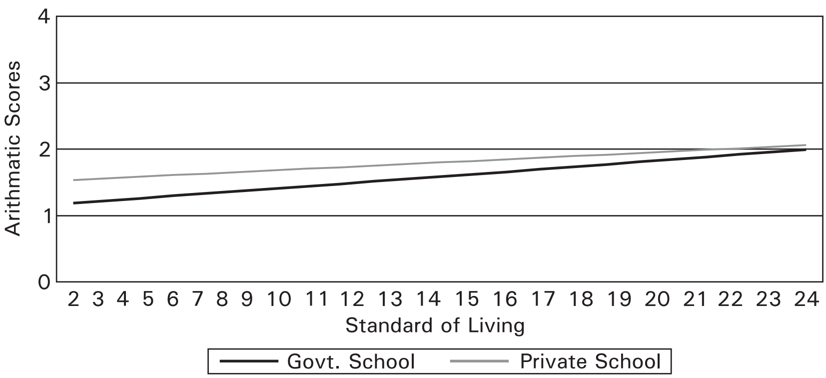
6. The same analysis was conducted with the naïve regression model without taking into account endogeneity of private school enrollment and results were similar. This is not surprising given the similarity of results from models 1 and 2 in table 7.

FIGURE 6. Predicted Reading Scores by Standard of Living for Government and Private Schools



Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

FIGURE 7. Predicted Arithmetic Scores by Standard of Living for Government and Private Schools



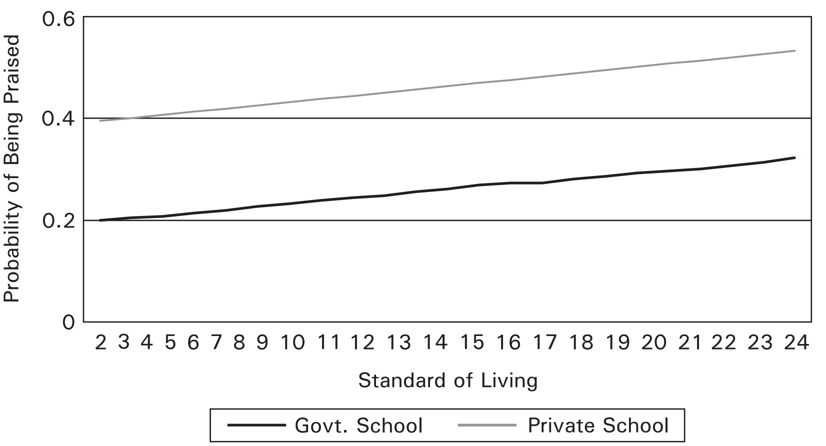
Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

The IHDS interviewed parents about the schooling experiences of up to two children in a household. Two variables in this section are interesting: (*a*) whether the parent reported that the child was praised in the month preceding the survey and (*b*) whether the parent reported that the child was physically beaten or pinched in the month preceding the survey. On both of these variables, private school students fare better than government school students. About 25 percent of the government school students were praised compared to 42 percent in private schools and about 29 percent of the government school students were beaten compared to 25 percent in private schools. However, it is the interaction of school type with family's standard of living that is of greatest interest.

Figure 8 shows the predicted probability of a child being praised by school type and parental economic status. This probability is calculated from a probit model which controls for the selection factors as well as the family background factors in table 7 with the coefficients presented in appendix 3. The results indicate that children from higher economic strata are more likely to be praised and the slope of this line does not differ considerably between government and private schools. Positive reinforcement is really important in any setting but particularly in Indian classrooms where constant comparisons and attendant humiliation are fairly common.[7] Greater positive reinforcement in private schools may be a reflection of better learning environment in these schools although social class clearly seems to play a role in both settings.

Figure 9, however, shows a very different picture when it comes to the probability that the child was beaten or pinched. There is little difference in the likelihood of physical punishment by parental economic status for children in private school; however, there is a strong negative relationship between economic status and punishment in government schools. In government

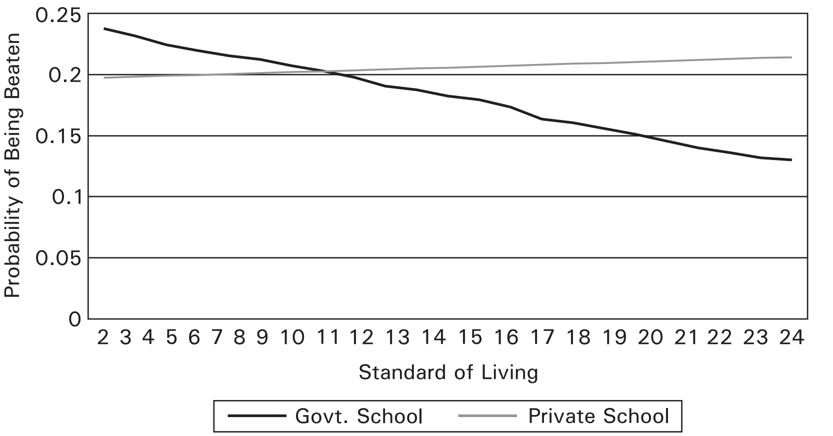
FIGURE 8. Probability of a Child Being Praised in the Last Month by Standard of Living



Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

7. Many schools rank students in a class explicitly in comparison to each other and ranking is clearly known to students and their families.

FIGURE 9. Probability of a Child Being Beaten in the Last Month by Standard of Living



Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

schools, children from poorer homes are far more likely to be punished than those from richer homes.

Many educational researchers have remarked upon the pervasiveness of physical punishment in Indian schools (Probe, 1999); indeed, our estimates suggest that nearly a quarter of the children were physically punished in the prior month. We suspect that this humiliation does not create an environment conducive to learning and if children (and their families) perceive this punishment to be unfairly meted out, it may lead to even greater alienation among students from poorer households. In contrast to government schools, in private schools parents may be able to demand fair treatment, and although physical punishment remains rampant even in private schools, it does not seem to be associated with children's social class. It may be tempting to argue that the teachers who teach in private schools are more egalitarian than those in government schools, but the evidence from the likelihood of the child being praised contradicts this argument. When it comes to positive attention, richer students receive more attention in both settings although the intercept is higher for private schools. However, the link between parental social class and negative attention is nonexistent in private schools.

These results suggest a need to pay greater attention to qualitative dimensions of classroom environment. While teacher presence and accountability may be one of the avenues through which private schools outperform government schools, hidden aspects of classroom environment such as positive reinforcement and reduced discrimination against disadvantaged children may be equally important.

Lessons for Public Policy

As we document modest but statistically significant improvements in reading and arithmetic skills of students in private schools and further note that these benefits are particularly concentrated among disadvantaged students, it may be tempting to argue that perhaps private schooling is the *amrit* or the elixir that will cure Indian education. If the reader were to come to this conclusion he or she would be in good company given the rising chorus of advocacy for private schools around the world (Chakrabarti and Petersen, 2008; Dixon and Tooley, 2005; Glewwe and Patrinos, 1999; Kochar, 2001). However, a number of considerations suggest caution before leaping to this conclusion. These fall in two categories—(*a*) empirical results based on our data and (*b*) theoretical issues raised in the literature.

Empirically, we find that while private school students perform somewhat better than their government school peers, these effects are modest compared to other structural effects. Table 8 provides an overview of the inter-state variation in reading skills across India based on the Model 2 from table 7 with state of residence and private school interaction term added.[8] Column 1 shows unadjusted differences across states; column 2 shows the predicted scores for students in government schools, holding their family characteristics constant at all India means; column 3 shows the predicted scores for students in private schools, and the final column shows the difference between predicted scores in private and government schools. The states are sorted from lowest difference to highest difference.[9]

The results show substantial inter-state variation in the scores of both government and private school students. Controlling for parental characteristics, government school students in states as diverse as Kerala, Himachal Pradesh, Chhattisgarh, and West Bengal perform at a higher level than private school students in many other states. Within states, the performance of private school students is not consistently higher than government school students and in some states, government school students do better than private school students. Most importantly, private school advantage seems

8. For brevity we do not present results for arithmetic skills but they present a similar pattern.

9. Note that while the all India sample is fairly large, about 11,700 children aged 8–11, the sample sizes at state level are considerably smaller and these results should be treated with caution.

TABLE 8. Predicted Reading Scores for Children in Private and Government Schools by State

	Unadjusted reading score	Adjusted		Different Private–Govt.
		Govt.	Private	
	(1)	(2)	(3)	(4)
North East	2.57	2.78	2.49	−0.29
Maharashtra/Goa	2.83	2.77	2.55	−0.21
Tamil Nadu	3.17	2.03	1.84	−0.20
Delhi	3.09	2.79	2.69	−0.09
Haryana	2.88	2.73	2.65	−0.08
West Bengal	2.45	2.83	2.91	0.09
Gujarat	2.79	2.62	2.76	0.14
Kerala	3.29	3.70	3.87	0.17
Chhattisgarh	2.81	2.91	3.10	0.19
Orissa	2.65	2.67	2.95	0.28
Karnataka	2.50	2.35	2.64	0.29
Himachal Pradesh	3.43	3.13	3.48	0.35
Rajasthan	2.52	2.43	2.89	0.46
Andhra Pradesh	2.40	2.21	2.68	0.47
Punjab	2.94	2.46	3.00	0.54
Jharkhand	2.58	2.73	3.27	0.55
Assam	2.84	2.97	3.52	0.56
Madhya Pradesh	2.31	2.36	2.99	0.63
Uttar Pradesh	2.02	2.03	2.72	0.69
Uttarakhand	2.74	2.53	3.24	0.72
Bihar	2.31	2.72	3.48	0.76
Jammu and Kashmir	2.37	2.03	2.85	0.82

Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

to be located in states like Bihar, Uttar Pradesh, Uttarakhand, and Madhya Pradesh—states known for poorly functioning public institutions as well as being some of the poorer states in India. These results are consistent with the findings for Uttar Pradesh from other studies that find large differences in student outcomes for children from "best" schools in poorly performing districts and "worst" schools in better performing districts (Das et al., 2006).

These results suggest that before a blanket embrace of private schooling, it may be worthwhile figuring out why some government schools function well and others do not. Blaming teacher absence may seem intuitive but the complete story may be more complex. While our school data become somewhat unreliable when we start comparing across states due to limited sample size, we find that public school teacher absence is higher in states like Kerala (17 percent) than in states like Uttarakhand and Punjab (4 percent and 9 percent respectively), however gains to private schooling are only modest in Kerala but considerably larger in Uttarakhand and Punjab.

Theoretical considerations also suggest caution before a massive embrace of school voucher program. If classroom environment is affected by the demands paying parents—most of whom are middle class—place on teachers, a voucher program that leads to an influx of poorer parents may dilute this effect. Kerala is an interesting example, 61 percent of the students in our sample in Kerala are in private schools but as table 8 indicates students in Kerala appear to have only a modest gain associated with private school enrollment although it is possible that even here poorer students may benefit more.[10] Students in Haryana and Tamil Nadu, the other states with large private school enrollment, show a loss in skills for students in private schools compared to their government school peers. These observations are comparable to those from the voucher program in Chile where some studies evaluating Chile's massive voucher program record modest gains and others record a loss for students in private schools (Bellei, 2008).

These observations suggest that it may be worthwhile examining the differences in classroom environment between government and private schools and the processes through which these occur before shifting our attention to private schooling as the panacea for the ills of public education. The differential slope of parental social class on physical punishment between government and private schools provide an interesting illustration. If children from poor households in private schools benefit because their parents are able to ensure that they are not physically punished, would this benefit be diluted if parents were not paying the tuition but were relying on school vouchers? Are there other ways of ensuring that government school teachers do not resort to discriminatory behavior? To date, the discourse on benefits to private schooling in developing country context has focused on teacher absence and lack of accountability and to some extent, lower costs of private schooling. While these are important, perhaps a better understanding of how parental social class operates in government schools and shapes student learning may be a useful contribution to this research.

We sound these cautionary notes because an enthusiastic embrace of private school through large voucher program has a potential for disrupting existing structure of public education. Transfer of better educated or better motivated families into private school system may negatively affect the quality of public education—a deterioration that may be difficult to reverse. Hence, a thoughtful evaluation of private and public education coupled with experimental programs in a few geographically diverse districts may be a more reasonable strategy at this juncture in Indian development.

10. Kerala has a substantial proportion of students in government-aided schools–one version of voucher schools. These are included with private schools in this analysis.

APPENDICES

Appendix 1

TABLE A-1. Learning to Read Language (Level 1)

(a) Alphabets

k P r
S t
D h n
M b

(b) Words

Cat Ball
Mat
water Boy
Road
Put My
Come Make

(c) Story

When Rita was going home it started raining. Her friend Minu saw her. Minu said to Rita, Rita it is raining hard. Come with me to my house. When it stops raining you can go home. Rita went to Minu's house.

(d) Paragraph

Animals live in the forest. Lion is the king of the forest. But when the lion comes, they all run away.

Paragraph

Jaipur is a large city. It has a famous palace. Ajmer is another city near Jaipur. People go for vacation there.

TABLE A-2. गणित (Mathematics)

1		2		3
36	72	56 –38	74 –56	7) 468 (
64	48	46 –18	75 –37	5) 275 (
33	76	63 –47	94 –65	8) 496 (
45	82	84 –68	84 –46	3) 174 (
56	76			
पाँच पूछो। (4/5) संख्या 5 में से 4 पहचान होनी चाहिए। (Ask five, four to be recognized out of five.)		दो करो। (2/2) 2 में से दोनों सही होने चाहिए। (Attempt any two, both should be correct.)		एक करो। (1) किया हुआ भाग का सवाल सही होना चाहिए। (Attempt any one, it must be correct.)

Appendix 2

TABLE A-1: Proportion of 8–11 Year Olds Tested

All India	**0.72**
Place of Residence	
Metro city	0.69
Other urban	0.76
More developed village	0.71
Less developed village	0.72
Socio Religious Group	
Forward Caste Hindu	0.78
Other Backward Classes	0.73
Dalits	0.74
Adivasis	0.66
Muslim	0.66
Christian	0.68
Maximum Adult Education in HH	
0 years	0.65
1–4 std.	0.70
5–9 std.	0.74
10–11 std.	0.77
Higher secondary/some college	0.78
College graduate	0.77
Household Income Quintile	
Poorest	0.71
Second	0.72
Third	0.73
Fourth	0.71
Affluent	0.75
Standard of Living Quintiles	
Poorest	0.67
Second	0.71
Third	0.75
Fourth	0.74
Affluent	0.76
Child Gender	
Male	0.73
Female	0.72
Type of School	
Not enrolled	0.39
Government school	0.78
Private school	0.78

Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

Appendix 3

TABLE A-1. Interaction Effect of Standard of Living and Private School Enrollment on Children's Reading and Arithmetic Skills, Likelihood of Being Praised and Being Beaten

	Reading	*Arithmetic*	*Praised*	*Beaten*
Standard of living	0.043***	0.035***	0.022***	–0.013**
Private school enrollment	0.654***	0.364***	0.628***	–0.123
Private* standard of living	–0.023***	–0.012***	–0.006	0.016**

Source: Authors' calculations based on India Human Development Survey (IHDS) 2005.

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Regression includes all variables in table 7, Model 2.

Comments and Discussion

Kaushik Basu: As the Indian economy picked up steam in the early 1990s and, somewhat unexpectedly, the services sector became the engine of growth, the subject of education and the acquisition of human capital, always important, acquired a salience not seen before. Since, evidently, a large part of this services sector advantage is a lagged effect of the country's large investment in higher education and especially in engineering in the first few decades after the country's Independence, there is a lot of soul searching on whether India is continuing to invest in education adequately at all levels—school, college, and university. The debate is spurred on by the nagging feeling that the answer is no, India is not doing as well as it should in the spread of quality education and the acquisition of human capital suited to the needs of a vibrant 21st century economy. The debate has ranged from the need to overhaul its structure of university education to the significance of raising basic literacy and reaching minimal school education to the entire population.

The paper by Sonalde Desai, Amaresh Dubey, Reeve Vanneman, and Rukmini Banerji is a remarkably balanced contribution to the charged field of school education and, in particular, the strengths and weaknesses of government run schools in contrast to private schools. In an area where the position that so many commentators take is based on ideological priors, this paper stands out by being firmly rooted in evidence and statistics. Not surprisingly the findings that emerge are measured and even those measured findings are stated with all the caveats spelled out clearly, as good research demands. For these very reasons, the results seem persuasive and dependable.

At the risk of an overly simplistic summary, the main findings of the paper may be stated as follows. Overall, private schools provide not hugely but somewhat better quality education than state-run schools and the advantage accrues in greater measure to the economically disadvantaged children. Teachers in private schools are paid less but they are more diligent in doing their work in the sense of having a lower absenteeism rate than their counterparts in government schools. In studying the relation between school ownership and the quality of education the authors make a lot of effort in trying to isolate the direction of causality—from ownership to quality but nevertheless they caution the reader that for the final word on causality the jury must still be considered to be out.

Critique

Compounding the risk of a short colloquial summary of the main findings of the paper by Desai et al., let me begin by being equally pithy in stating my own main critique. If we are to take lessons from studies such as this to the domain of actual policy-making as the authors are clearly keen on doing, it is important to go a step or two beyond the ownership structure of the schools to matters of micro-organization in understanding the correlates of school quality and what exactly parents seek in choosing a school for their children. The paper under discussion describes some broad-brush regularities in the data well, but stops short of what is critical in crafting policy. Hence, the paper reads a bit like a preamble to a serious study. That does not take away from its merit, but at the same time it leaves the reader with the feeling that the paper delivers less than what it sets out to do, less than what it could have. The rest of my note may be viewed as an elaboration of this cryptic comment.

It is useful to begin from a somewhat different track—by analyzing in the abstract what the respective strengths and weaknesses may be for government and private schools in delivering quality education. The literature in economics is replete with ideas on why the state sector tends to be inefficient. The main reason is that the agent delivering the product cannot, typically, earn a profit on what he or she delivers, and so, the person's incentive for doing a good job is stunted. This is probably at the core of why the state-owned sector tends to be less efficient and more bureaucratic. In addition, in a large sector like school education in India, it is likely that politicians will have an interest in getting electoral mileage out of the sector. Providing quality education may increase the popularity of a government, but the link between better organization of schools and the delivery of good quality education and widespread perception of this may have a considerable time lag. On the other hand, how teachers are treated—their salary, the propensity to look the other way when they do not deliver—would be immediately felt by the teachers and could have an important effect in propping up or dismantling governments. The evidence from India suggests that this second effect is dominant. Indian teacher absenteeism in government-run schools is embarrassingly high.

This problem is emblematic of much what is wrong with the bureaucracy. Several studies show that, when it comes to playing truant from school, Indian teachers are very good match for their students (PROBE, 1999; Rana et al., 2002). A multi-country study by Kremer et al. (2005), in which researchers made surprise visits to government-run primary schools, shows that in terms of teacher truancy, India performs very poorly. At any time, 25 percent of teachers are found missing from government-run schools in India. Among the countries studied the only one to have a higher figure is Uganda with 27 percent. Further, Kremer et al. (2005) found that only 45 percent of the teachers in India were actually teaching at the time of a surprise visit.

As Desai et al. (2009) point out, private school teachers have a better record of attendance. Do government teachers have a lower salary to compensate for the fact that they can "take off" more easily? On the contrary, they earn considerably more than their counterparts in private schools. As Tooley and Dixon's (2005) study of schools in Delhi show, teachers in government schools earn about three times as much as those in private recognized schools and around seven times as much as teachers in private unrecognized schools. Hence, the performance and pay of teachers in government-run schools do not seem to be driven by the forces of demand and supply. Evidently, this is a sector that enjoys political protection in keeping with the reasoning earlier.

Before moving on, a caveat needs to be spelled out. It is not always realized that in India, the private school–public school distinction must not be thought of solely in terms of a school's profit earning capacity. This is because in India, private schools are set up by opening a trust or a charitable foundation and under the law the "owners" of these schools cannot earn profits. All profits must be reinvested in the school. Hence, the profit motive cannot work in the same way as in a privately-owned corporation. Instead, the incentive comes from the ability to pay oneself a higher salary and collect higher benefits when the school earns a higher profit. The legality of these practices is somewhat questionable. The main profit advantage of privateness in the education sector is whatever can come from these borderline practices.

Returning to the discussion on lack of incentives in state-run schools, I observe that not all advantages are stacked in favor of the private sector. This is because education is a "product" that is particularly prone to asymmetric information. By its very nature this is a product where the buyer is much less able to judge the quality of what he or she is buying than the seller. So the market for education is likely to suffer from the classic lemons problem which can result in a serious malfunctioning of the free market.

In addition, a person who sells education is immediately creating competition for himself or herself by the act of selling the product. If there is one literate person in the village and he teaches another person and helps that person to become literate, then he will have to contend with the fact that what was earlier a monopoly will now be a duopoly (two teachers in the village). This will be one more reason why education may not be entirely in safe hands in the free market sector. It is not surprising that government has played a huge role in the provision of education the world over.

The fact that *a priori* reasoning demonstrates there are advantages and disadvantages on both sides makes the empirical investigation in a paper such as the one being discussed here interesting. The verdict could have gone either way; the study by Desai et al. shows that it goes in favor of the private sector. But maybe because there are disadvantages on both sides, the victory turns out to be slender.

There are important qualifiers. First, some states, especially the better managed ones are better in both private and public sector schools. And in fact government-run schools in some states are better than private schools in other states. Take reading performance of children. In Kerala, where we know that education is in general well-provided, performance in government schools is better than in government schools in any other state. But not just that. The children of government schools outperform the children of private schools in every state in India except Kerala. Another state where education in general has been a great success is Himachal Pradesh. The reading performance of children in Himachal Pradesh is beaten by the children of private schools of only five other states. In other words, for children in most states moving them from government schools to private schools would help but the help would be greater if they were to be moved to government schools in Kerala or Himachal Pradesh.

This has an important lesson. Government cannot be left off the hook for providing education on the ground that the private sector can do it better. There are states where the government does deliver, and in fact, delivers better than the private sector in many states. Therefore, while we should try to get private schools to supplement the effort of the state, the responsibility for creating an educated citizenry has to be shouldered by the state. In case teachers play truant and do not do their work seriously, pressure has to be brought on government to design teacher incentives and punishments more effectively.

The paper also mentions, echoing the celebrated Coleman Report (Coleman et al., 1966) in the US, how one reason why school structure does not have too sharp an effect on the quality of education could be that a child's performance depends more on home "atmosphere" than school. Unfortunately, this important lead is not taken any further by Desai et al. There are two different ways in which I have found corroboration for this. In an informal study that I did some time ago, I found strong evidence of the role of home atmosphere (Basu, 2008). This was based on some data that

I acquired from an NGO-run teaching institute for slum children in Kolkata called Anandan. At Anandan slum children are taught basic numeracy, logic, English; they are made to be aware of world affairs. The idea is to take the poorest children and spark their curiosity and intellectual interests. Anandan collects basic information about the children's background: their household income; whether their households have radios, bicycles, watches; the number of siblings they have; and, of course, basic information about each child such as age, sex, and mother tongue. In addition, it also has with them answers from questions directly administered to the children, about social conditions in the household, such as, whether the parents beat each other, whether the parents talk to each other and whether so how much, and whether the parents talk to the children.

Furthermore, the school had given 60 children, of ages from 9 years to 16 years, some basic IQ, arithmetic, and general knowledge questions. The questions they were asked may be found in Basu (2008). The data were not collected with special statistical care and was not meant for formal statistical enquiry. They were for the school's internal use. But the data nevertheless conveys a sense of what is important as a determinant of a child's aptitude. What turns out to be most important for a child's aptitude is not income or the possession of radios, watches, and bicycles, but whether the child lives with her own family (that is a big plus) and whether the parents talk to each other (that is again a big plus). The OLS results and the summary statistics are reported in Basu (2008).

The second lead, that much of what one learns comes from beyond school, comes from the idea of proximate literacy. There is now a substantial literature that suggests that how one performs in life can depend on having access to a literate person at home or, in the parlance of this literature, being a "proximate literate" (Basu and Foster, 1998; Gibson, 2001; Maddox, 2007; Subramanian, 2008). If one lives in a household with just one more literate person in the household that makes a huge difference. Gibson's study, based on Papua New Guinea, suggests that one can get three-fourths of the benefit of being literate oneself by having an access at home to a literate person. Basu, et al.'s (2002) study based on evidence from Bangladesh corroborates large benefits to proximate literacy.[1] Something similar to the Coleman observation that Desai et al. talk about in the context of the United States may

1. Some aspects of our findings are contested in an interesting paper by Iversen and Palmer-Jones (2008). For instance, household literacy may not be all good for females. This raises interesting questions about the directions of externality. The existence of externality, however, seems to be beyond question.

well apply to poorer nations even though the mechanics of learning at home may be different.

Schools as Fraternities

This still leaves an open question, which can be turned into a creative critique of the paper by Desai et al. If it is the case that (*a*) a lot of one's educational skills depend on the home ethos or, more accurately, on what a student learns at school, but the student's receptivity depends critically on the atmosphere at home and (*b*) of what depends exclusively on the atmosphere at school, the marginal advantage of going to a private school is not that large, then how come private schools are so much in demand in India and how is it the case that so many private schools, registered and unregistered, flourish?

This suggests that maybe the indicators that Desai and her co-authors study—such as the ability to read and write, and do mathematics—are not what parents are after when they try to decide what kind of school to send their children to. That is, may be, the children are sent to school to learn precisely what is suggested in the Desai et al. paper but the choice of school is guided by other considerations. Suppose that one important consideration in choosing a school is to form associations and networks that can help later in life. I am suggesting the kind of consideration that often prompts students in American campuses to join fraternities and sororities. Now suppose that some children are considered to be more coveted to associate with. It could be the children of some caste group or class or social background. This in turn can be derived from something more fundamental. We know that in getting good jobs it matters a lot what kind of network one belongs to. Hence, if the children of aristocracy or some caste group are likely to be better linked to the world of quality jobs, it may make sense to be willing to pay to get one's children into the network of this group.

Once this objective is recognized, it is easy to understand how a private school can become coveted purely by biasing admissions in favor of the category of students whose association is sought after. The school can then charge higher admission fees from all children. What the children or their parents will be paying for is partly the quality of education, but more importantly, for the quality of associates that students are likely to find in this school.

If the model I am suggesting is valid, then the somewhat lukewarm findings by Desai, Dubey, Vanneman, and Banerji on the quality advantages of private schools are easily explained. I am not suggesting that it is association with a certain class of children that parents are after, but simply that what the parents are after could be different from what is treated as axiomatic in the paper under discussion, namely, that the choice of school is guided by the objective of bettering ones reading and arithmetic skills. In fact, one important contribution of their paper is that it leads to this important question: What is it that parents, especially in poorer regions, seek for their children in choosing schools?

Abhijit Banerjee: Kaushik Basu and I made a deal. There are two roles that a discussant plays. One is to make nit-picky comments about the econometrics and the other is to provide wisdom. I think he is naturally chosen to do the wisdom bit. So I will take on the econometrics. But before that, a little bit of perspective.

If I think of what India Policy Forum should be doing, at some level, there should be ten papers like this one for every one paper of all the other kinds. I think the question here is entirely first order for the future of India. Twenty years later no one will care about what we did with our excess reserves today (indeed, since I spoke about this, the reserves have been substantially depleted) but everyone will know if growth stops because we did not generate enough human capital to sustain growth.

This is my prejudice: Let me express it bluntly. I think human capital is vital for us to be able to sustain the specific pattern of growth that has been ours for the last twenty years, and we know very well that our supply chain for skill is pretty broken and we do not actually understand how to fix it.

I think one of the very important contributions of Pratham's work is to tell us just how broken it is. I think it is spectacularly broken: These are some of those numbers that are frightening, any way you think about it. They concentrate on the early years of schooling. We do not actually know as much about the later years of schooling, but I would imagine that they do not look much better. So, I think this is an extremely important question.

The paper mentions both the reasons why you would want to think about it. One is to determine the government's regulatory stance on this, which is entirely absent at this point—while there is an official view of what are called recognized schools, unrecognized schools, which is where most poor children end up, seem to be delivering private education essentially with impunity right now. Whether that is how things ought to be, and if not that, how best to regulate them, are problems we need to be grapple with.

Second, and related, is the whole issue of whether or not we want to move to something like a voucher model where the government moves away from actually providing toward funding. This is a question that often comes up in policy conversations but the evidence base, as emphasized in the paper, is remarkably thin.

What we do know from the work of many people, including Lant Pritchett and Rinku Murgai (2007) in this journal, is that public school teachers are much better paid. As a result, one might expect them to be better educated. The data from the India Human Development Survey (IHDS) suggests, interestingly, that this is not the case, though they may be better trained. On the other hand, there is now a fair amount of documentation of what, for want of a less polite description, is called the problem of incentives in the public sector.

We also know that even poor parents are now keen to send their children to private schools, and that private school participation is growing apace. However it does not follow that private schools are better: It is true that people are voting with their money but we do not know what they are voting for. Zhang (2008) shows that parents in China queue up to get their children into more expensive schools, but when you look at the impact effect of going to those more expensive schools, it is negative for a large part of the distribution. Everybody, except the very top students, loses out in terms of test scores by jumping the queue and getting into these schools. In contrast, Andhrabi et al. (2007) conclude based on data from Pakistan that even illiterate parents can distinguish between the best and worst schools. However, they do have trouble with schools of intermediate quality.

We therefore need an independent answer to the question: Are the parents making the right choice? The reason why it has always been a challenge to answer this question is that there is an identification problem. The paper is very conscious of this: It basically comes down to the question, "Are children who get sent to private schools different from those who are not?" This is a problem at every level—within a family, within a neighborhood, within a district, and within a state. That is to say, you always worry about the fact that the district that ended up with better quality public schools might be a district where education is valued for reasons that are unobserved or unmeasured in the data. Likewise, you worry that the child who gets sent to the public school rather than the private school by a family that can afford both, might have certain characteristics that are driving the choice. As a result, there is the eternal search for an instrument. What you want is something that influences the private school participation but not performance.

This can be a frustrating effort. While I do not want to be too critical of the paper, there are obvious reasons why the presence of a private school in the village does not qualify. If you want to use the presence of a private school as an instrument, you will have to be willing to say that I as a businessman setting up a private school will be happy to set it up at a random place. Literally. As soon as you say that, you know that that sentence is false. A mad man will set up schools in random places if his goal is to make money, and presumably, we think that schools are not run by mad men.

Likewise for Early English in government schools. The variation in this cannot come from a state-level policy decision because all regressions control for state effects. If it is a policy decision that is allowed to vary within the state, then one would imagine that the Early English schools would be special schools within the school system. Where do you choose to set up these special schools? I would not imagine that they are unresponsive to demand, for example, and demand is correlated to people's priorities. So, I cannot imagine that the school that is within the state government system and has early English is going to be randomly placed within the state. So, again there is the same challenge.

Another interesting idea they have is to make use of the fact that different people belong to different social networks and social networks provide access to a different menu of schools. But even the authors do not believe that social networks are excludable. It is not hard to imagine that if you have connections that help you get your children into school, having that connection would also affect the value you place on schooling, and hence the effort you would put into making sure that your children do well. For example, the same connection could get your child a job later.

The presence of a cook in a government school is the most interesting candidate for an instrument. In principle, the rule that the government uses to allocate cooks might have specific features that could be exploited to generate a compelling instrument. However, the authors do not have that information and therefore end up comparing villages with and without a cook, which is not very satisfactory—it could be, for example, that it is harder to find a cook in villages where job opportunities are better.

However, even if the exclusion restrictions fail, the reduced form in this case is of some independent interest. It tells us that the villages where there is a cook in the local government school systematically and substantially under-perform as compared to other villages—there is a 20 percent reduction in the set of children who can do the required level of arithmetic. In other words, if we were to assume that the cook was randomly assigned, we would conclude that the school meal program is hurting children's education because parents are basing their school choice decision on the presence of the cook. I am not sure I believe that cooks were randomly assigned, so I am not too worried about this, but it is certainly an intriguing possibility.

The paper also provides an alternative set of estimates based on family-fixed effects. I like this approach less: It seems to me that the fact that the same family sent one of its children to private school and another to government school is telling something about the children, or at least about the family's perception of the children, and something about the family's willingness to make other kinds of investment in these children. Which child is getting private tuition? Which one gets more time to do her homework? One could imagine models of the family which predict that this is also the child they are sending to private school and perhaps models where we see the opposite (because of inequality aversion, say). So, it seems like we do not exactly know what is being picked up here.

It is true that despite these potential endogeneities, the IV and family-fixed effect models generate results that are similar to the OLS. While it could all be accidental (the standard errors are sufficiently large that a formal over-identification test would not be very meaningful), it is striking nevertheless because there is no reason why the selection of schools *to not get a cook* should be similar to the selection of children within a family who get private schooling. It is true that none of this helps us with the concern that what we observe here is the effect of private schooling plus other complementary inputs that families provide to the children who they send for private schooling, but it does make these results harder to dismiss.

To get anything much more definitive, we will probably need to rely on randomized experiments. There is a paper by Angrist et al. (2002) that takes advantage of a program in Colombia that allocated school vouchers by lottery to estimate the benefits of private schooling for high school-age girls in urban settings and finds moderate-sized effects. This is useful, but given the many differences in the contexts (we are talking about co-educational primary schools in rural India, a much poorer part of the world) it is hard to imagine putting too much weight on these results. There is however an ongoing study by Kremer and Muralidharan in Andhra Pradesh that I expect to make a dent in this problem.

The paper also gives us some interesting clues about the reasons why private schools work better. They start from the observation that the gains from going to private school, measured by the IV approach are bigger for children from poorer families. This is striking given that we do not control for the quality of the private schools: one might have been tempted to assume that government schools vary less in quality than private schools and therefore while everyone goes to roughly the same kind of government schools, the children of the non-poor go to much better private schools than the poor. This would have made the private school effect bigger for the rich.

The paper then makes an attempt to see why we might see these differences. While it is beyond its scope to settle the issue, it makes two very useful observations. One is that a child is much more likely (nearly twice as much) to have been praised in the previous month in a private school than in a government school. It is possible that the effect of the praise on the confidence and performance of children is much larger for children from economically more deprived backgrounds because they have less confidence to start with and moreover, are less likely to have parents who can judge the quality of their work. Second, poorer children are much more likely to have been beaten in a government school in the last month than richer children but there is no such difference in private schools. This might also encourage them to perform better.

This exercise echoes something that a number of other studies of Indian government schools have found: It is not at all uncommon for children to go through several years in a government school without having learnt to read letters or do the most basic arithmetic despite getting promoted to higher grades every year. On the other hand, when there is an attempt to actually teach the children these basic skills, they learn fast, even when the teachers teaching them have only a week's training and a high school education (Banerjee et al., 2007; Banerjee et al., 2008). If the government school teachers actually wanted to teach these children, it is hard to imagine that they could not do better.

The authors also emphasize the fact their OLS result should be seen as an upper bound on the effect of private schools since typically those people who end up in private schools tend to be the more motivated and the more socially advantaged even after we control for all observable differences. While I am sympathetic to this view, it is worth noting that this might not be the case if the primary source of variation in private school participation comes from the presence of a cook in the school—it may well be that the demand for a cook comes precisely from parents who care more about eating in schools than teaching in school. It could also be the case that private schools set up precisely in places where the government teacher never shows up, and these are typically places where the demand for quality is also low. However, the evidence in Andhrabi et al. (2007) suggests that this is not the case at least in Pakistan; if anything, the opposite: Private schools tend to be concentrated in less remote areas.

It is very important to emphasize that this entire discussion of OLS bias assumes that we are only talking about the effects of small changes in access to private schools. The full equilibrium effects of shutting down the government system and going to a voucher-based approach could be very different both because then there would be a demand effect (there will need to be more private schools at the same level of quality) and also a supply effect (many more qualified people would be looking for jobs in private schools since the government will no longer hire them). The two effects in opposite directions and the direction of the net effect are not possible to predict. But it is at least conceivable that the full equilibrium effect could be much larger than the partial equilibrium version.

The ongoing study by Kremer and Muralidharan makes an attempt to empirically make some progress on this issue. They do a two-stage randomization. They randomly choose villages where some people will get vouchers. Within a village, they randomly choose people and give them vouchers. So, what that does is, first if you compare the villages that have vouchers with those that do not, that gives you the effect of being in the voucher treatment, and then you get a separate estimate by looking within the village. The difference between these two estimates is exactly a measure of the supply elasticity of private schools, which is what we need when we think of increasing participation on a large scale. There is still the worry that villages are small, so the supply effect may be relatively weak, and there is certainly no attempt to think about what happens if government schools stop hiring and hence there are more teachers available, but it is clearly a very important start.

With all these caveats, if we accept that the OLS estimate is an upper bound on the effect of private schools, I think we ought to be quite concerned. We know that the public school system suffers from quite serious incentive problems. Teachers do not show up to work and even when they do they do not teach. Yet the gains from moving to a system that ought to have much better incentives are no more than one-third of a standard deviation. To put some scale on this number, the gains from private schooling are significantly smaller than the effects of the two Pratham-run supplemental teaching programs we have evaluated (the Balsakhi program and the Read India program). Those programs were both implemented by non-professionals—mostly high school students or the equivalent with a week of training.

A different scaling emphasized by the authors makes the same point. The government schools in Chhattisgarh are better than private schools in Gujarat. The private-school effect is dwarfed by cross-state differences. Both of these facts point to the same conclusions. Incentives are important but there is something else that is missing. It may be that the skills of the private school teachers who are willing to work at the current, abysmally low, salary levels leave much to be desired. It is possible some of these can be rectified by more targeted and better designed training programs and better pedagogy.

It is also possible that they need to be paid more. Putting pressure on the schools to deliver more by setting clearer standards and testing children may also help though testing at young ages is always a vexed issue. The general point is that we cannot rely on privatization alone to save us.

General Discussion

Esther Duflo noted that the effects private schools are shown to have on achievements in the paper are quite large. When test scores in private schools are 0.3 standard deviations higher in private schools on the average than in public schools, we are talking about large differences. Duflo also stated that contrary to the author's remark in the presentation, randomized experiments do establish causality between the policy and outcome.

Surjit Bhalla said he would like to know if the authors' surveys showed that families overwhelmingly sent male children to private schools while sending female children to public schools. He also expressed the opinion that even if private schools did not offer superior education, vouchers had a role to play. They gave individuals the freedom to choose and such choice was an essential feature of a democracy.

Geeta Kingdon noted that the authors' implicit conclusion during the presentation that public–private partnerships produced no better outcome than public schools because the learning outcomes in government-aided private schools were no better than in government schools, was incorrect. For the first 15 or 20 years of Independence, the aided school system had functioned like a privately managed system. But around 1970 onwards, highly centralizing pieces of legislation turned this system *de facto* into government school system. Since then, teachers of aided schools are recruited and paid directly by the government at the same salary rate as in government schools. These schools receive block grants just as government schools do, that is, there are no performance-based incentives built into the system of public grants to private schools. Today's public–private partnership reform recommendations, or voucher school recommendations, are not of that nature. They are advocating giving the educational resource to the child or to the school in ways that are very different. They intend to give public resources in ways that incentivize private schools via, for example, per student grants (rather than block grants) directly to students (rather than to schools), thus promoting competition between schools to attract students.

Dilip Mookherjee noted that the authors' regressions did not include any controls for school inputs despite substantial differences in inputs as shown in table 2. To what extent can the differences in outcomes be related to differences in inputs employed? Mookherjee also hypothesized that the wealth effects, not included by the authors in their analysis, could be important. The poorer the parent, the more selective he or she is likely to be with respect to the child's ability when considering sending the latter to a private school. And if there is complementarity between school resources and child's ability, you will find poor children to be benefiting more from private schools just as the authors find.

Devesh Kapur raised the point that sometimes the identity of the school attended by children is less than well defined. They enroll in the area public school, get their mid-day meal, and promptly walk across to a private teacher who gives private tuitions for Rs 5, 10, or 15. So, here we have an altogether different kind of public–private partnership! Public schools are also happy with the arrangement since they collect revenues from the government based on enrollments.

Rukmini Banerji concurred with Kapur noting that the classification of children between private and public schools can often turn fuzzy. She had found that in schools in Bihar, 30 percent of the children were not present on even one of the four visits made. Did that mean they were enrolled but did not actually exist, or enrolled but not in attendance, or enrolled but attending a private school?

Rukmini Banerji added that a closely related phenomenon was private tuition, massively present in the ASER data in states such as West Bengal that oppose vouchers and private schools. In these states, 60–70 percent of all children attend coaching institutes from a very young age. The ASER project did not ask who the providers of tuition were, but in all likelihood, they are the school teachers. Thus, education is coming from multiple sources.

Rukmini Banerji further stated that the implications of absence in private and public schools are very different. In public schools, children are promoted automatically up to 5th grade as long as the child attends 75 percent of the classes. In turn, attendance can be manipulated. In private schools, children can fail and be held back. Student absenteeism remains a hugely understudied phenomenon.

Barry Bosworth stated that this is a nice paper but the results are predictable. We have by now seen, maybe, a thousand of these empirical studies. Most would agree that students in private schools perform better than students in public schools but the whole problem is the selection bias. Bosworth said that it was more or less agreed that addressing the selection bias required randomized experiment. When the experiments had been done in the United States with random assignments, the private school effect did not turn out to be big. The present study is probably not going to convert many to the idea of a wholesale switch to private schools. We need to wait for the paper by Michael Kremer using random assignment, which would be far more convincing.

In response, Sonalde Desai noted that the challenges for pretty much anybody working in this area is to satisfy multiple audiences and serve multiple purposes. While randomized experiments may give you a definite answer on the role of a specific variable in a specific situation, they may not help the policy-maker a whole lot. One of the problems with experimental research is that it is going to focus on a specific question in a specific area under a specific set of conditions. But some of the most interesting issues on schooling in India relate to the differences across states and social groups. Experiences of Scheduled Tribes are very different from those of upper caste students and Scheduled Tribes in Assam have very different experiences from those in Maharashtra. So, as social scientists, if we put all our eggs in the experimental basket, we would fail to adequately inform policy. Desai added, that she, nevertheless, recognized that her analysis would not change the minds of the skeptics.

Turning to other comments, Desai said she found the point made by Kaushik Basu interesting. She agreed that the benefits from being part of an elite group of students would have an important effect on the decision to attend private school. The opposition to vouchers may partially be coming from this fact since a wide access to such schools would dilute the effect. Research along these lines may help us understand why there has been exponential growth of private schools in Uttar Pradesh but not in Madhya Pradesh and Bihar.

Regarding the pitch in favor of universal vouchers by Bhalla, Desai said this required careful thinking since institutions were very difficult to build and very easy to dismantle. Notwithstanding our complaints, Indian school system functions reasonably well when compared to many other countries. Before engineering a massive switch in the structure through vouchers, we need more compelling evidence in favor of private schools than presented here.

Abhijit Banerjee quipped that he was glad to have allocated the wisdom constituency to Kaushik because his comment on causality was characteristic of mystical Indian wisdom and entirely beyond himself (Banerjee). He also said that data on physical punishment are very difficult to interpret. Expressing disagreement with Bhalla on the issue that people should have the right to send children to the school of their choosing, Banerjee said that regulating education system is a common practice. For instance, we decide who can provide education so as to minimize fraud. Besides, people voting with their feet is not equivalent to them being necessarily better off.

Kaushik Basu returned to the causality issue. He noted that randomized experiments about which Barry talked are extremely important. When such experiment can be done—often this is not the case—you can go to the heart of the matter. But there is a risk of overselling. And here is the example that helps sharpen the reservations. Suppose a properly done randomized experiment shows that 80 percent of the children in Delhi benefit by going to private schools. Now consider a specific parent: should he send his child to a private school or not? The answer to that question based on the randomized experiment is not so clear. The specific child is not a random draw from Delhi population: the parent knows a whole lot about his characteristics and those characteristics may pull the other way. Randomized experiment studies usually do not give us any insights into what is really the link between the cause and effect. That remains mystical.

The session concluded with Sonalde Desai adding that when randomized experiments are done, knowledge of that fact, via the Hawthorne effect, may impact the subject's behavior and produce spurious outcomes. So, even the experiments may produce unreliable outcomes.

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Big Reforms but Small Payoffs: Explaining the Weak Record of Growth in Indian Manufacturing*

Introduction

The promotion of the manufacturing sector and its exports has been a key pillar of the growth strategy employed by successful developing countries, especially labor-abundant ones. In this context, India's recent growth experience is puzzling on two accounts. First, while India's economy has grown rapidly over the last two decades, the growth momentum has not been based on manufacturing. Rather the main contributor to growth has been the services sector. Second, the relatively lackluster performance of Indian manufacturing cannot be ascribed to a lack of policy initiatives to jumpstart the sector. India introduced substantial product market reforms in its manufacturing sector starting in the mid-1980s, but the sector never took off as it did in other high-growth countries. Moreover, insofar as subsectors within manufacturing have performed well, these have been the relatively capital- or skill-intensive industries, not the labor-intensive ones as would be expected for a labor-abundant country like India (Kochar et al., 2006).

One of the main components of reforms in India was the liberalization of the industrial licensing regime, or "delicensing." Under the Industries Development and Regulation Act of 1951 every investor over a very small size

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needed to obtain a license before establishing an industrial plant, adding a new product line to an existing plant, substantially expanding output, or changing a plant's location. Over time, many economists and policymakers began to view the licensing regime as generating inefficiencies and rigidities that were holding back Indian industry. The process of delicensing started in 1985 with the dismantling of industrial licensing requirements for a group of manufacturing industries. Delicensing reforms accelerated in 1991, and by the late 1990s virtually all industries had been delicensed. Large payoffs were expected in the form of higher growth and employment generation with this policy reform.

However, the payoffs till date have been limited. It can be argued that a lag between the announcement and implementation of the policy, and also a lag between implementation and the payoffs may be responsible. However, it has been as many as twenty years since the first batch of industries was delicensed and almost a decade since the last batch of industries was delicensed; the view that payoffs would occur with a lag is difficult to maintain.[1]

What then could be the reasons for the rather lackluster performance of the industrial sector? The following factors are usually offered: (*a*) strict labor laws have hindered growth, especially of labor-intensive industries (Krueger, 2007; Panagariya, 2006; Panagariya, 2008); (*b*) infrastructure bottlenecks have prevented industries from taking advantage of the reforms, and (*c*) credit constraints due to weaknesses in the financial sector may be holding back small- and medium-sized firms from expanding (Banerjee and Duflo, 2008; McKinsey Global Institute, 2006; Nagaraj, 2002). More recently, two other factors have also been raised. First, it has been pointed out that the evolution of Indian industry may be influenced by path dependence or hysteresis so that despite the reforms of the mid-1980s and early 1990s, the relative profitability of capital and skill-intensive activities remains higher than that of labor-intensive activities (Kochhar et al., 2006). Second, the major reform initiatives undertaken so far—focused mainly on product market reforms—have been national ones. However, the working of product markets in a federal democracy such as India is influenced not only by regulations enacted by the Central Government but also those enacted by individual state governments. Moreover, much of the authority on administration and enforcement of regulation also rests with state governments. Accordingly, it

1. There have been two other major reforms in the Indian industrial sector—trade reforms and the abolition of policies which reserved certain sectors for small-scale industries. We plan to examine these in our future works.

has been pointed out that regulatory and administrative bottlenecks at the state level may be blunting the impact of reforms undertaken at the Central level (OECD, 2007).

Even though the foregoing factors have been debated actively in academic and policy circles, the empirical evidence to support or negate these arguments is limited. Two prominent exceptions include Besley and Burgess (2004) and Aghion et al. (2006). These papers have primarily looked at the effect that labor regulations have had on industrial growth in India using state-level amendments to the Industrial Disputes Act (IDA) to classify states as pro-worker, neutral, or pro-employer. While the first finds that industrial performance has been weaker in Indian states with pro-worker labor laws, the second finds states with pro-worker labor laws to have experienced limited benefits from delicensing reforms.

But these findings have been contested. First, it has been argued that the entire burden of regulatory weaknesses that might be constraining Indian manufacturing is placed on labor. In particular, neither of the papers accounts for other regulatory weaknesses. Second, the coding of state-level amendments to the IDA as pro-worker, neutral, or pro-employer has been criticized (see, especially, Bhattacharjea, 2006).

In this paper, we attempt to address both of the criticisms. Thus, while this paper analyzes the impact of delicensing on industrial performance, as in Aghion et al., we pay attention to the role of factors other than just labor regulations in influencing industrial performance. In particular, we look at how weaknesses in infrastructure and cumbersome product market regulations at the state level may be affecting India's manufacturing sector.

Additionally, we deal with the criticism surrounding Besley and Burgess' coding of state-level labor regulations, and thus the robustness of their result that pro-worker labor regulations have undermined industrial performance, in two ways. First, we consider an alternative approach for classifying states' stance on labor regulations drawing upon the works of Bhattacharjea (2008) and OECD (2007) in addition to that of Besley and Burgess. Second, we consider an altogether different approach for identifying the impact of labor regulations on industrial performance. Instead of relying solely on cross-state heterogeneity in labor regulations, we rely on heterogeneity in industry-specific characteristics as well. In particular, to the extent that rigidities introduced by labor regulations are likely to have their greatest bite on labor-intensive industries, the performance of labor-intensive industries can be expected to be weaker than others, especially in states with pro-worker or inflexible labor regulations.

In this way, our empirical work attempts to answer the following questions in a manner that builds upon the recent literature: Does the impact of policy reform vary across industries? Does the impact depend on the state-specific regulatory framework governing not only labor issues but also product market regulations? Does infrastructure play a role in determining the payoffs from reforms? Could hysteresis be one reason behind the modest payoffs from reforms? We use state-level data on registered manufacturing published by the Annual Survey of Industry (ASI) at the three-digit level from 1980 to 2004 to answer these questions. This data is used along with a host of other data pertaining to industry and state-level characteristics of various kinds. The main findings of the paper are as follows:

1. The impact of delicensing has been highly uneven across industries. Industries that are labor intensive and/or depend on infrastructure (or are energy dependent) have experienced smaller gains from reforms.
2. Regulation at the state level matters. States with less competitive product market regulations have experienced slower growth in the industrial sector post-delicensing, as compared to states with competitive product market regulations. States with relatively inflexible labor regulations have experienced slower growth of labor-intensive industries and slower employment growth.
3. Infrastructure availability and financial sector development are important determinants of the benefits that accrued to states from reforms. Where supportive regulatory conditions prevailed and infrastructure was available, businesses responded by expanding their capacity and grew, and to that extent hysteresis does not seem to matter.

It is useful to note some features of our work that can help put our findings in a broader context. First, our analysis is limited to India's registered manufacturing, or in other words, the formal manufacturing sector. As is the case in other developing countries, India's manufacturing sector is characterized by a duality.[2] While registered manufacturing accounts for

2. The registered or formal manufacturing sector includes all manufacturing establishments that employ either ten or more workers using power or twenty or more workers without using power and which are registered under the Factories Act, 1948. Data pertaining to the registered manufacturing sector are collected annually through the ASI. All remaining manufacturing establishments belong to the unregistered or informal manufacturing sector. A key source of data on unregistered establishments, also known as unorganized sector establishments, is the National Sample Survey Organisation's (NSSO) survey of the unorganized sector carried out approximately every five years.

a very large share of total manufacturing value added in India, its share of employment is quite low. For example, registered manufacturing accounted for almost two-thirds of total manufacturing value added in India and only around 20 percent of employment in 2000–01.[3] Given that so much of manufacturing employment is in the unorganized sector, an understanding of how economic reforms have affected the sector is clearly a matter of considerable importance. A lack of comparable annual data on the unorganized sector makes it difficult to study it along with the registered sector, however, we follow previous literature by focusing on the registered sector. We do not consider this to be a serious limitation of our work. On average, firms in the formal sector can be expected to be more productive, pay higher wages, and provide better working conditions than firms in the informal sector. Indeed, from the perspective of economic development, one would want to see the formal sector expanding at the expense of the informal sector. If output and/or employment in the formal sector are growing slowly, we would like to know why and what can be done about it. Thus from several points of view, including the welfare of workers, the performance of the formal sector is important to monitor and analyze.[4]

Second, the unit of analysis in this paper is industry-level data (by state). It can be argued that analysis would be more appropriate at the firm-level or the factory-level data. However, there are some important drawbacks in using available micro data such as the firm-level Prowess database published by the

3. See Bosworth et al. (2007), for issues related to employment data in India.

4. A caveat to this reasoning is as follows. It has been pointed out by several analysts that the survey frame of the ASI has been deteriorating steadily over the last 10 to 15 years (see, for example, Manna 2008). A specific manifestation of this deterioration is that the ASI may not be picking up information from a number of smaller establishments as well as it used to. If the smaller establishments tend to be labor-intensive, or are to be found in states that are coded by us as having inflexible labor market regulations, it is possible that our results based on ASI data may be biased. Thus, for example, when we find employment growth to be lower post-delicensing in labor-intensive industries, this result may reflect the fact that employment in labor-intensive industries is increasingly being generated by smaller establishments that are missing from the ASI frame. Results from our research using data from unregistered manufacturing from 1994, 2000, and 2005 suggest that any deterioration in the ASI frame on account of under-coverage of establishments is not systematic in a way that biases the results we get in this paper. For example, treating all unregistered manufacturing establishments with ten or more workers as establishments that should have been covered by the ASI, we find no statistically significant differences in trend growth of employment, output, or value-added across labor- and non-labor-intensive industries. Similarly, we find no statistically significant differences in trend growth across states based on their labor market regulations. These results hold even when we limit our attention to unregistered manufacturing establishments with 20 or more workers.

Center for Monitoring Indian Economy (CMIE) and the ASI unit (factory)-level data. The Prowess data is available only since the early 1990s for listed firms, with poorer coverage in the earlier years of the data. In addition, it lacks information on employment and the state in which the firm operates, thus rendering it virtually useless for our exercise. As for ASI factory-level data, data are not available as a continuous time-series covering the period of interest. Moreover, extensive discussions with researchers working with this data convinced us that building a panel dataset is exceedingly difficult. In view of these limitations we settled for the ASI industry-level data for our analysis.[5]

Third, we do not consider reforms other than delicensing in the paper. Several other major reforms have been introduced insofar as Indian manufacturing is concerned, including reductions in barriers to trade and the dismantling of the policy of reserving particular industries for production by the small-scale sector. On a similar note, an important element of the post-reform economic landscape in India has been the opening up of the economy to foreign direct investment (FDI). It is indeed an important development and is likely to have affected industrial performance. However, studying its impact separately is beyond the scope of this paper.

Finally, regulations can affect firms and industries in many different ways. For example, they may create incentives for firms to operate in the informal sector, stay relatively small, or adopt particular types of techniques. While the analysis of aggregate data can shed (indirect) light on some of these effects, a more complete analysis would require the use of a micro-based approach utilizing plant-level data, ideally from both the formal and informal sectors. This type of analysis is clearly beyond the scope of this paper though we plan to tackle this in future works.[6]

The rest of the paper is organized as follows. In the second section, we highlight the performance of the industrial sector in India, including the heterogeneity in the industrial performance across industrial sectors and the

5. The terms plants and factories are often used interchangeably in the literature and refer to the actual premises where manufacturing activity is carried out. A firm on the other hand takes into account ownership. A firm may have several factories operating under its ownership. Industry is defined here as the aggregate of plants/factories producing similar goods (using NIC classification).

6. As may be inferred from the discussion above, such analysis will have to be limited to only a few years spaced roughly five years apart (on account of the fact that plant level data on informal sector firms cannot be obtained on an annual basis). Further, such analysis would not be able to take account of plant fixed effects (on account of the fact that plant identities cannot be known).

regional variation in industrial growth. In the next section, we discuss the econometric methodology and the sources of data used in the paper. In the fourth section, we present and discuss our results. The final section concludes the paper.

Performance of the Indian (Registered) Manufacturing Sector

The Indian growth process in the past 15 years (and some would argue in the entire post-Independence period) has been rather lopsided. Indian growth has been more about services rather than industries. There have been modest payoffs to reforms in the industrial sector. This is despite the fact that the liberalization efforts were focused mostly on improving the regulatory environment faced by the industrial sector and reducing trade protection. Within industry, labor-intensive sectors have gained much less from reforms than the capital-intensive sectors. Growth has also been uneven at the regional level. Certain states with higher per capita income and higher initial share of industry have done better than the rest. Let us first look at this heterogeneity in Indian industrial sector.

Indian Growth Momentum is about Services

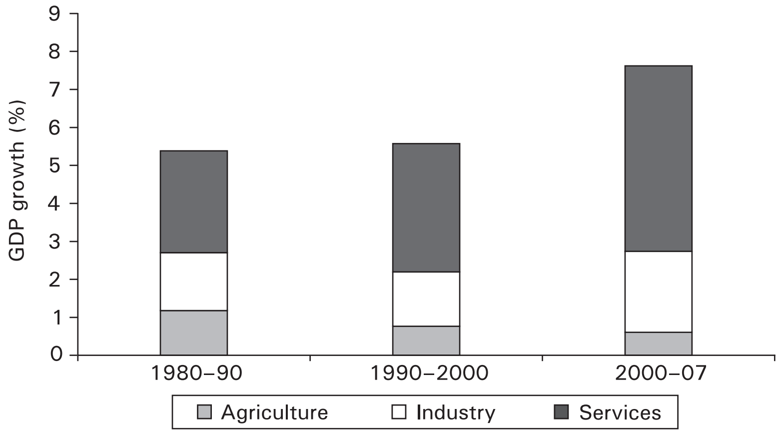
As has been documented in Gordon and Gupta (2004), the services sector has been the largest contributor to economic growth in India, and with services sector growth accelerating further in the post-liberalization period, its share in Gross Domestic Product (GDP) and contribution to growth has been increasing. As figure 1 shows, it has contributed almost two-thirds of GDP growth in India in recent years and currently constitutes close to 55 percent of GDP.

Modest and Unstable Pick-up in Industrial Performance Post-delicensing

The growth of manufacturing value added has not necessarily accelerated in the post-delicensing period.[7] The aggregate value added in registered manufacturing has increased from about Rs 2.8 billion in 1980 to Rs 16.4 billion in 2004 (as measured in 1993–94 prices), which translates into 5.6 percent

7. The performance in the post-delicensing period has also not been consistent. It has been marked by a sharp deceleration from 1996 to 2001 when the average annual growth rate dipped to 3 percent, from 11 percent a year in 1991–96, and a recovery in the ensuing period when the industrial growth recovered to an average 10 percent a year over the period 2001–06 as per the Central Survey Organisation (CSO) data.

FIGURE 1. Sectoral Contribution to Growth—Selected Periods



Source: CSO national accounts data at 1999–2000 prices. Sectoral shares used in the calculation of contribution of the three sectors to overall GDP growth are based on the average shares in the three periods respectively. GDP statistics for the fiscal year 2007–08 are based on advanced estimates and are subject to revision.

Note: Data in this figure pertain to industry as opposed to manufacturing [and includes manufacturing (registered and unregistered), construction, and utilities] and is drawn from the National Accounts Statistics (NAS). In the regression analysis in the rest of the paper, we use the industry-level data for only registered manufacturing, drawn from the Annual Survey of Industries. Thus the data in figure 1 for industry are not directly comparable with the data used in figure 2 onwards. In fact, the data for registered manufacturing in NAS is derived from the data for registered manufacturing in the ASI, but it does not match exactly with the latter. This is because while the estimates in NAS in the base year 1999–2000 are drawn from the data in ASI in that year, the base year numbers are extrapolated for subsequent years using the growth rates observed in the series for Index for Industrial Production (IIP) and the wholesale price index (WPI) at the NAS compilation category.

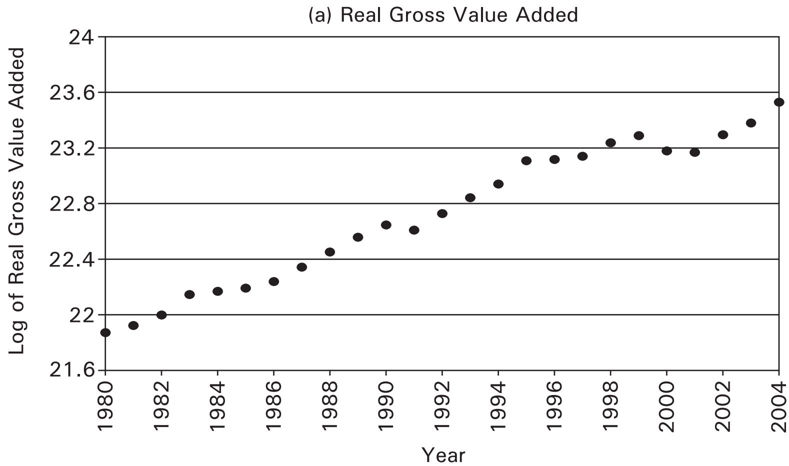
a year average growth rate in the sample period, with value added growing by an additional 15 percent between 1993 and 2004 (that is, a little more than 1 percent a year). This modest pick-up in value added has not been accompanied by additional growth in employment or in the number of factories.[8, 9] As figure 2(a) shows, employment, of blue-collared workers as well as total employment stagnated in the mid-1990s and subsequently declined until about early 2000s, and experienced a modest pick-up in recent years. When we

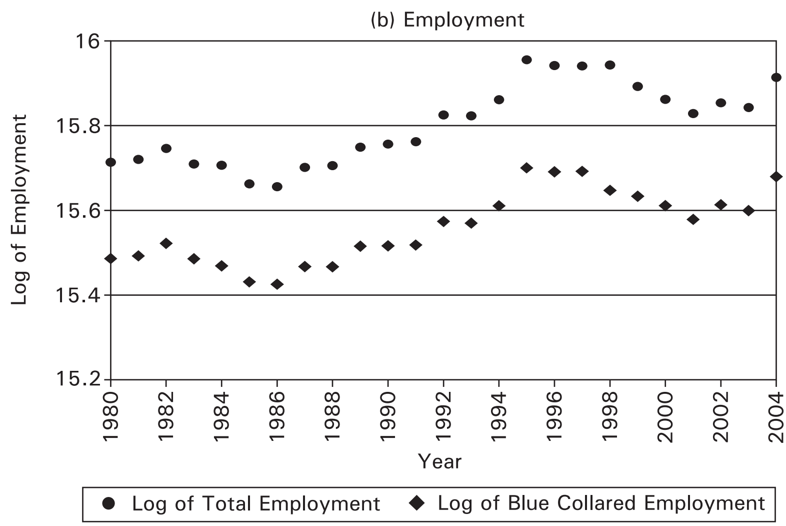
8. As highlighted in Gupta et al. (2008), performance varies across different sectors: the industries which depend more on infrastructure on average experienced lower growth in value added post-delicensing, as compared to the industries which are less reliant on infrastructure. Similarly, the industries more dependent on the financial sector or the labor-intensive industries have fared much worse than the industries that do not rely as much on the financial sector and capital-intensive industries.

9. As per the Factories Act, 1948, a factory refers to any premises where 10 or more workers are working when the manufacturing process is carried on with the aid of power or where 20 or more workers are working and the manufacturing process is carried on without the use of power.

compare this performance with the pace of growth in the manufacturing sector of many East Asian countries including China, we realize that, especially in terms of value added, the performance of Indian manufacturing has not been close to that of East Asian countries. For example, manufacturing value added in South Korea grew at an average annual real growth rate of approximately 17 percent between 1960 and1980, and China's manufacturing sector grew at an average rate of 12 percent per year between 1990 and 2005.

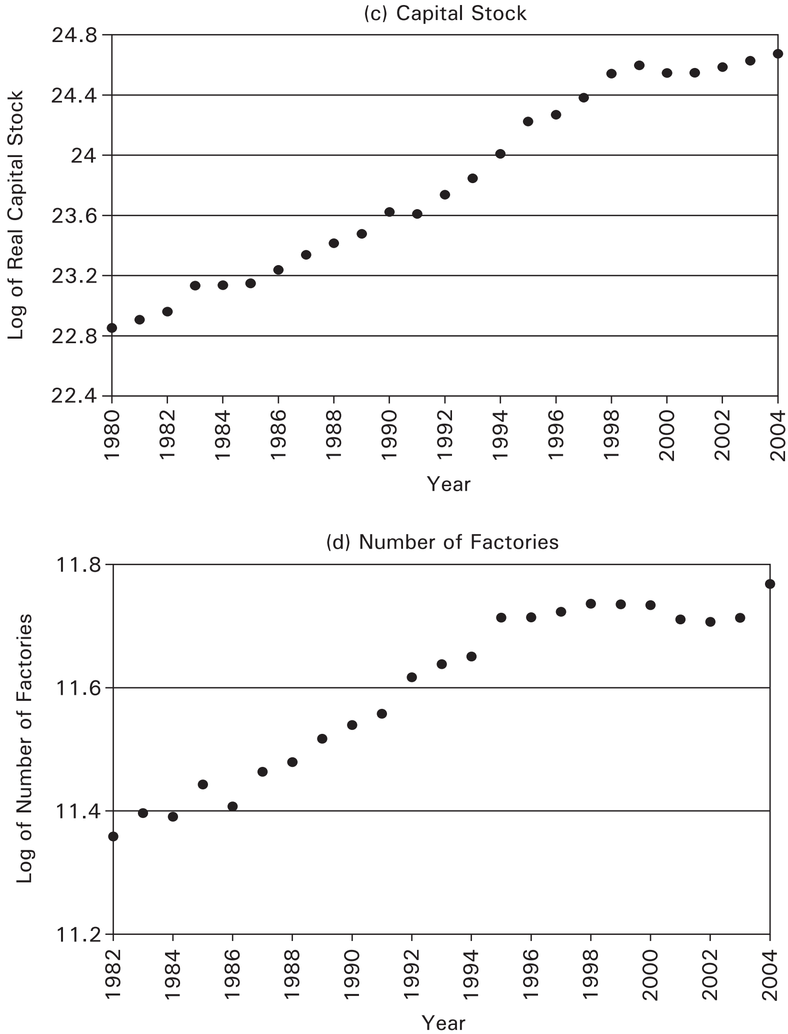
FIGURE 2. Performance of Indian Manufacturing (Registered)





(*Figure 2 continued*)

(*Figure 2 continued*)



Source: Annual Survey of Industries from 1980–81 to 2004–05.

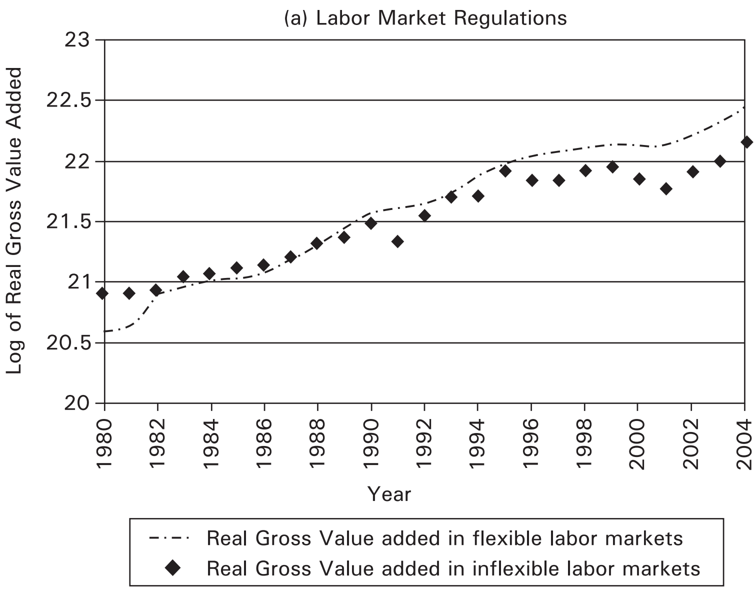
Note: The aggregate numbers at the all-India level used above are only for the manufacturing sector and leave out six industries due to lack of complete time series. Please see appendix 5 for details.

In addition, we note in figure 3 that the performance has been uneven across states and industries. As can be seen from the figure, there has been a divergence in the performance of the labor-intensive and capital-intensive industries in India. The labor-intensive industries have grown relatively slowly post-delicensing. Different panels in figure 3 depict the industrial sector growth across different industries and across states characterized by different regulatory framework and different infrastructural developments. First, in figure 3(a), we see that the industrial performance is similar across states with different labor market regulations. In figure 3(b), we see that industrial output grew faster in states with competitive product market regulations post-delicensing. Industrial performance is also seen to be better in states with more developed infrastructure or more developed financial sector in figures 3(c) and 3(d). As can be seen in 3(e), the growth seems to be broadly similar in labor-intensive and capital-intensive industries before the liberalization, but has accelerated in the capital-intensive industries, post-delicensing. Finally, the last two figures 3(f) and 3(g) show that the performance of labor-intensive industries is, in particular, better in the states with labor regulations that are considered to be flexible (pro-employer).

Data and Methodology

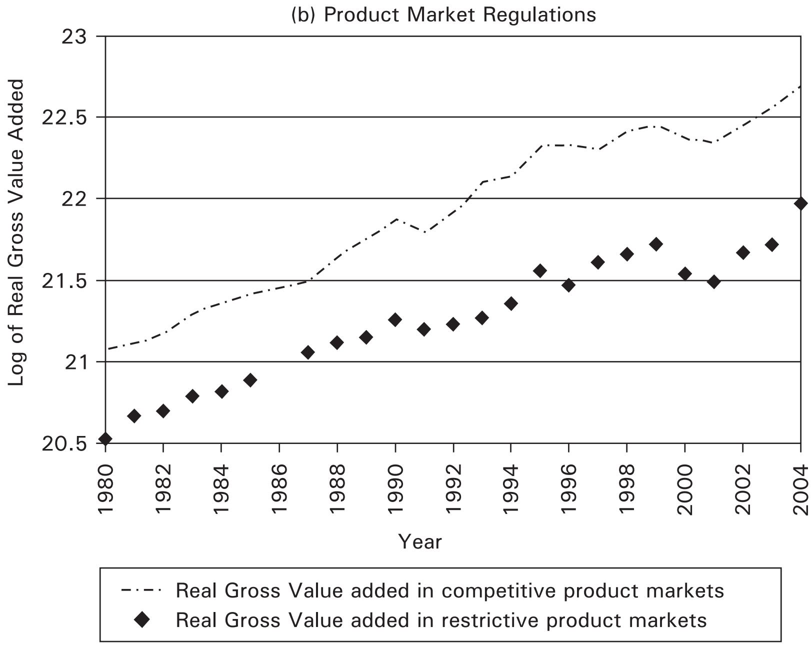
Our analysis is based on the ASI data for 42 three-digit manufacturing industries for the period 1980–2004 for 15 major states of India. As mentioned earlier, we capture only registered manufacturing in our analysis using

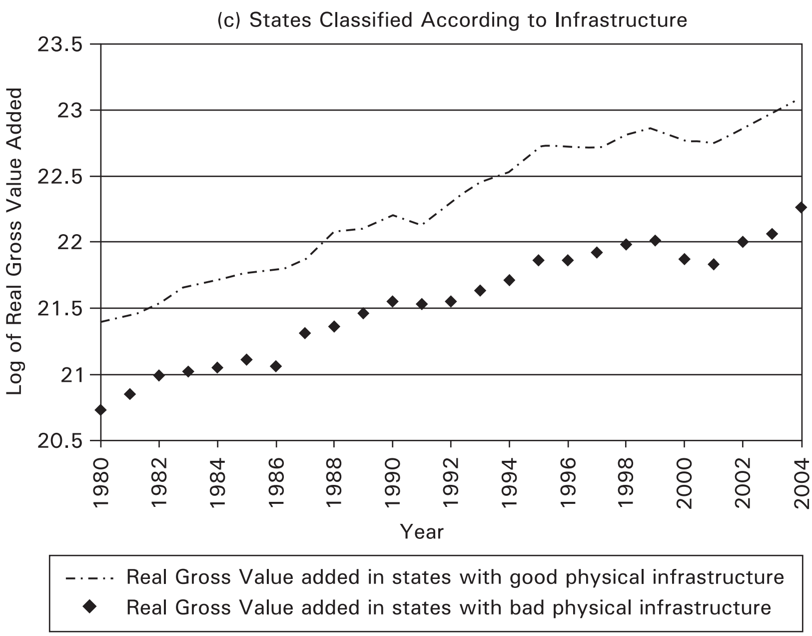
FIGURE 3. Regulations, Infrastructure, and Indian Industry



(*Figure 3 continued*)

(*Figure 3 continued*)

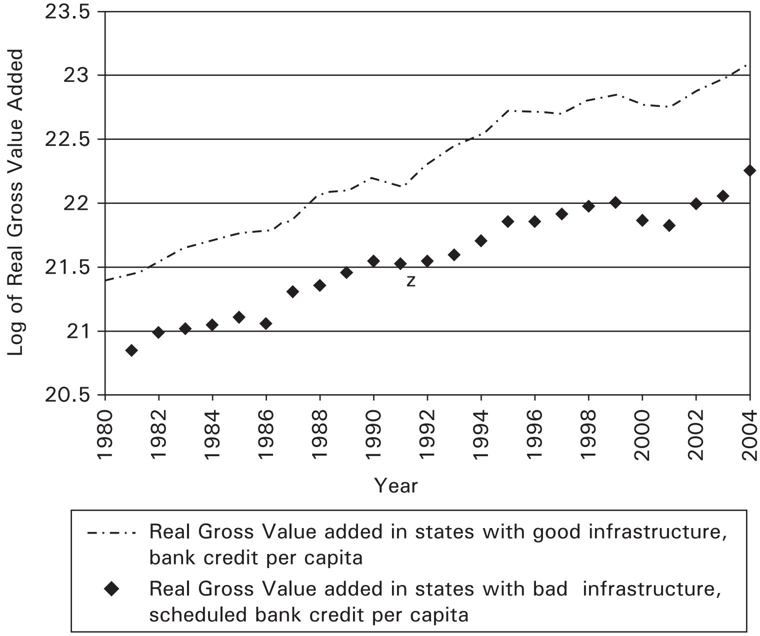




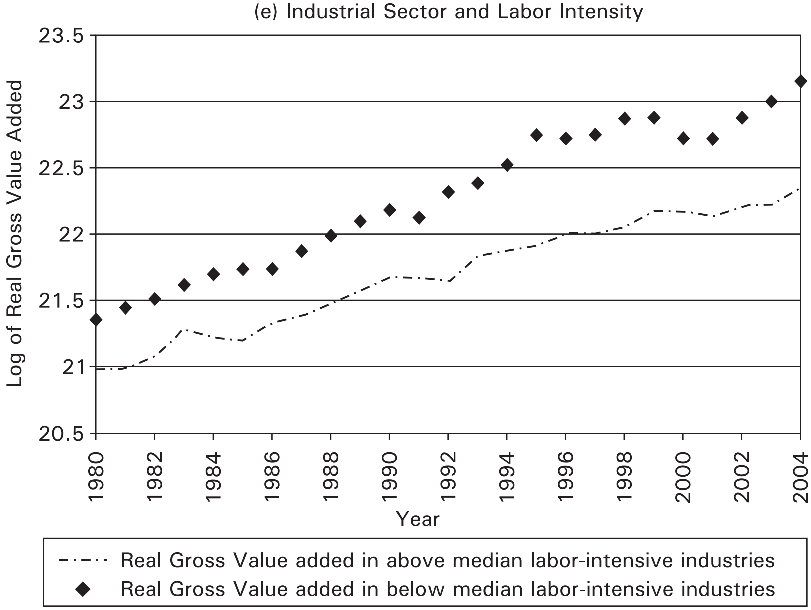
(*Figure 3 continued*)

(*Figure 3 continued*)

(d) States Classified According to Financial Sector Development



(e) Industrial Sector and Labor Intensity



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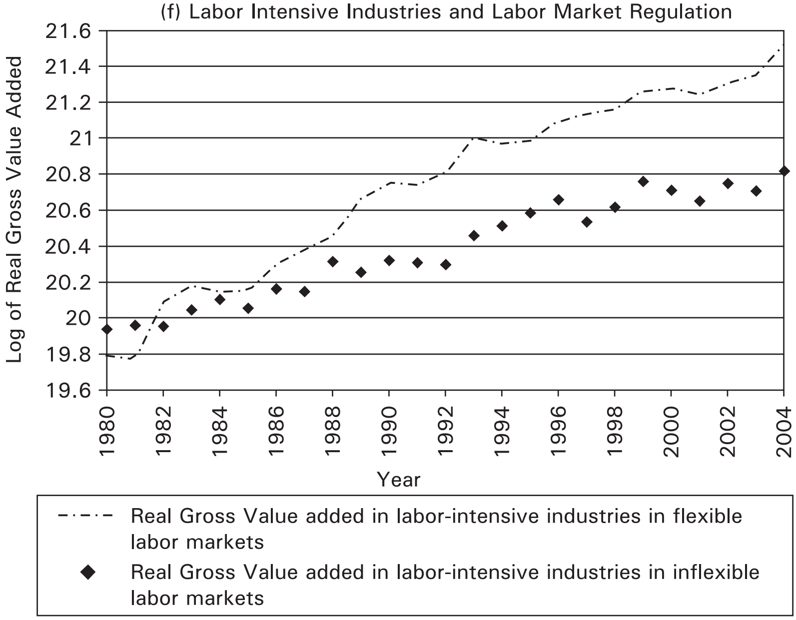
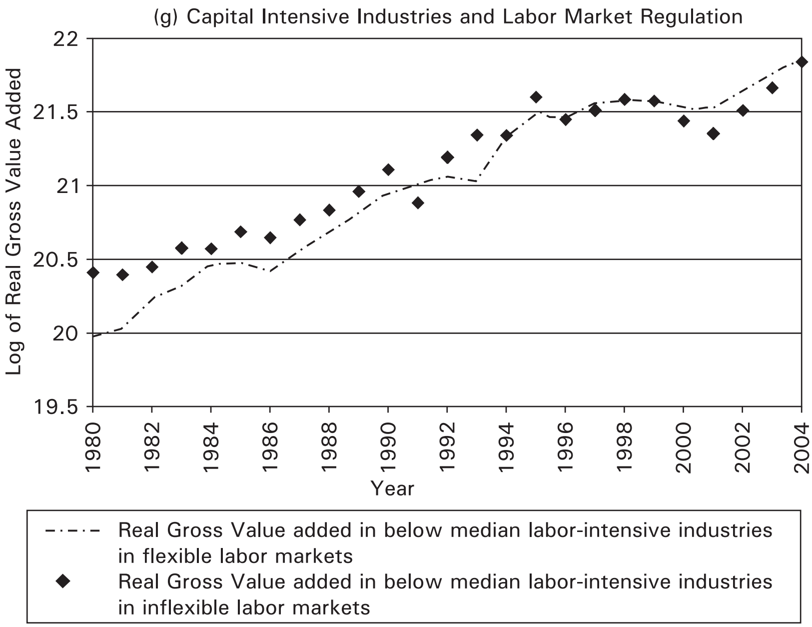




Source: ASI data (from 1980–81 to 2004–05) for registered manufacturing at three-digit level of classification.

this data. We utilize variation in industry and state characteristics in order to identify how factors such as labor regulations, product market regulations, availability of physical infrastructure, and financial sector development may have influenced the impact of delicensing on industrial performance. Our measures of industrial performance include gross value added, gross value of output, employment, and number of factories. Definitions of these variables are provided in appendix 1. Next, we discuss methodological issues in more detail, including how we measure delicensing and pertinent industry and state-specific characteristics for our econometric analysis.

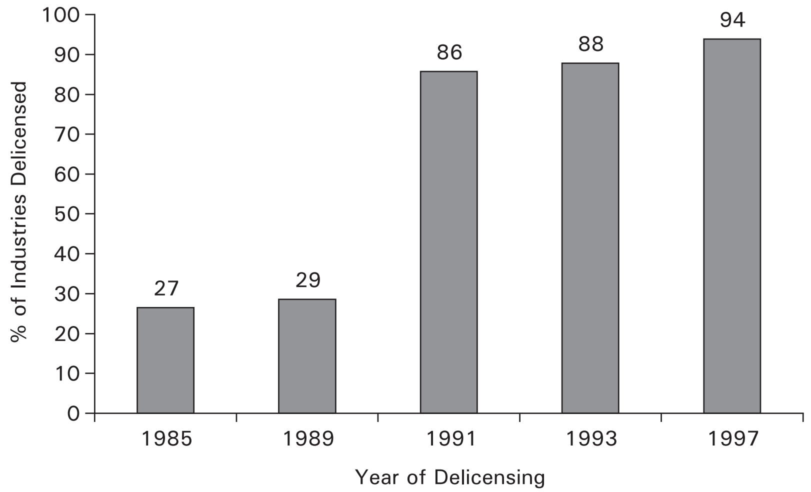
Delicensing, Industry Characteristics, and State Characteristics

DELICENSING: From the early 1950s up until the early 1980s the evolution of India's manufacturing sector was guided by industrial and trade policies that protected domestic industry and gave the State a central role in investment decisions. While a strict regime of import and export controls defined trade policy, industrial policy worked through an elaborate system of industrial licensing. Under the Industries Development and Regulatory Act of 1951, every investor over a very small size needed to obtain a license before establishing an industrial plant, adding a new product line to an existing plant, substantially expanding output, or changing a plant's location.

Industrial stagnation since the mid-1960s—increasingly blamed on the policy framework—led to some tentative steps aimed at liberalizing these regimes in the late 1970s and early 1980s (Ahluwalia, 1987, 1991). Relaxations of the industrial licensing system were introduced and import licensing requirements were eased. Serious liberalization efforts began in 1985 with delicensing—the exemption from the requirement of obtaining an industrial license—of 25 broad categories of industries, which map into 13 industries in our three-digit-level data. The next major reform of the licensing regime came in 1991 when industrial licensing was abolished except in the case of a small number of industries (see figure 4 and appendix 2 for the time path of delicensing).

Thus delicensing is one of the most comprehensive reform programs undertaken by the Government of India and this is the reform variable that we work with. Information about it is also readily available (Aghion et al., 2006; Gupta et al., 2008). Additionally, there is a good reason to believe that the specific timing of delicensing of particular industries was unanticipated by firms. Further, it is unlikely that the industries that were delicensed were chosen on the basis of expected future performance (Aghion et al., 2006). In other words, delicensing represented an unanticipated reform and also a

FIGURE 4. Cumulative Share of Industries Delicensed



Source: Based on Aghion et al. (2006) and extended by the authors.

reform measure that is unlikely to be subject to endogeneity concerns. To the extent that implementation of delicensing may have lagged its announcement, we lag the date of delicensing by a year.[10]

INDUSTRY CHARACTERISTICS: For technological reasons, industries need different inputs in different combinations, with specific industries often relying more heavily on certain inputs. For example, some industries may rely more on labor, some on skilled labor, and some may make more extensive use of physical infrastructure such as roads, electricity, ports, and so on. As a result, the size and growth of industries can be expected to depend on the cost and availability of inputs that are used most intensively in their production. Here, we look at industries which are labor intensive, unskilled-labor intensive, spend more heavily on energy and other infrastructure, or export a larger share of their total output, and examine whether the payoffs from reforms differ across these industries. If industries requiring a certain input have gained less from reforms, it could be because of the limited availability of that input and/or its price being too high.[11]

10. As mentioned earlier, studying the impact of other important policy reforms such as trade reforms or delisting of industries from the ambit of the small-scale industry reservation policy is beyond the scope of this paper. We, however, plan to analyze the impact of these policy reforms in our future work.

11. We are presuming, of course, that the production of these goods is not constrained by inadequate demand, but due to supply-side constraints imposed on their growth.

For example, if industries dependent on infrastructure have not grown much post-reforms, it may well be on account of the unavailability of adequate infrastructure. A similar finding for labor-intensive industries would be hard to reconcile in the same way, however. Given the large size of India's labor force and the level of wages, a more natural explanation for the relatively weak performance of labor-intensive industries could lie in appealing to issues such as the quality of labor and/or regulations on employment that make the effective price of hiring labor too high.

We construct indicators of industries' reliance on labor and infrastructure inputs using data from several different databases for Indian industries and Indian firms, as well as using data for the US. The idea behind using the latter is that input needs are sufficiently technical in nature and specific to an industry (or a small group of industries), and not to countries. Also, the *relative* need of industries of various inputs is unlikely to change over time. Thus, for example, while all industries may be becoming more capital-intensive over time, the set of industries that can be characterized as relatively labor-intensive at any given point of time will be more or less unchanged across countries.[12]

In order to get around the concern that these input-related industry characteristics would reflect the equilibrium conditions between the demand and supply of the respective inputs, we use data from an earlier year rather than contemporaneous data. Furthermore, to smooth out the noise in the data we use five-year averages of the relevant variables to calculate the industry-specific indicators. We also confirmed, where possible, that the relative industry rankings across various characteristics do not change over time. This robustness check gives credence to the belief that there are perhaps external technological reasons for why an industry uses more labor per unit of capital or depends more on infrastructure than others. We also find that these characteristics are highly correlated when calculated using different databases, and that the various characteristics are not highly correlated with

12. For all industrial characteristics (except skill intensity) we have used different databases for India. Since this could be subject to the criticism that it is not truly exogenous, we use the Indian data for an earlier year. We also check the robustness of the results to using the US data, and we find the industries are highly correlated using the US and the Indian data. For skilled-labor intensity, we had to rely exclusively on the US data since these data are not available for India. We conduct two more robustness tests to make sure that the results are robust to the way these industries have been classified. First, instead of using an index value we use a dummy variable for above and below median labor-intensive industries (since the actual values might differ across countries, but in a relative sense the intensities should be similar). Second, we just look at the top and the bottom tercile (since the measurement error is likely to be the largest in the middle rank) of industries.

each other. Thus, there is independent variation in these characteristics (see appendix 3 for details).

STATE CHARACTERISTICS: Have all states benefited equally from the delicensing reforms? If not, what factors can explain why some states were better positioned to gain from the reforms than others?

Given its importance in production and the fact that it varies across states, physical infrastructure is certainly one such factor. Appendix 4 describes the data we use to capture infrastructure differences across Indian states. Another factor that many observers point to concerns the regulatory environment faced by manufacturing firms. Importantly, the regulatory environment can vary by state. This is because India's Constitution distinguishes areas of regulatory responsibility in terms of whether authority rests with the Central Government, the state government, or both. For example, bankruptcy procedures and "exit policy" are under the exclusive purview of the Central Government; inspections and compliance with regulation come under the purview of the state government; labor regulation and "entry" are areas of joint responsibility (Conway and Herd, 2008).

We consider two types of regulations that can vary across states in this paper: labor market regulations and product market regulations.

While India's labor regulations have been criticized on many counts including, for example, the sheer size and scope of regulations, their complexity, and inconsistencies across individual pieces of regulation, a few specific pieces of legislation are the controversial ones. The key ones involve Chapter VB of the IDA and Section 9A of the IDA and the Industrial Employment (Standing Orders) Act. The first of these makes it necessary for firms employing more than 100 workers to obtain the permission from state governments in order to retrench or lay off workers—permission which some analysts argue is rarely forthcoming and thereby ends up raising the effective cost of labor usage in production.[13] As for the second and third, these pertain to the terms and conditions of work. While they seek to make labor contracts complete, fair, and legally binding, they can constrain firms

13. Until 1976, the provisions of the IDA on retrenchments or layoffs were fairly noncontroversial. The IDA allowed firms to lay off or retrench workers as per economic circumstances as long as certain requirements such as the provision of sufficient notice, severance payments, and the order of retrenchment among workers (last in first out) were met. An amendment in 1976 (the introduction of Chapter VB), however, made it compulsory for employers with more than 300 workers to seek the prior approval of the appropriate government before workers could be dismissed. A further amendment in 1982 widened the scope of this regulation by making it applicable to employers with 100 workers or more.

from making quick adjustments to changing conditions, especially in view of weaknesses in collective bargaining mechanisms.[14]

It is important to note that not all analysts agree that India's labor laws have made for a rigid labor market. In particular, a counter-argument to the views above is that the rigidity inducing regulations have been either ignored (Nagaraj, 2002) or circumvented through the increased usage of temporary or contract labor (Datta, 2003; Ramaswamy, 2003).[15] Ultimately, whether India's labor laws have created significant rigidities in labor markets or not is an empirical issue.

Unfortunately, quantifying differences in labor market regulations across states—a critical step in evaluating whether labor regulations have been a dampener on industrial performance—has proved to be contentious. For example, Besley and Burgess (2004) exploit state-level amendments to IDA—arguably the most important set of labor regulations governing Indian industry—and code legislative changes across major states as pro-worker, neutral, or pro-employer. While, in principle, the approach of Besley and Burgess has considerable merit, it is not without controversy. Bhattacharjea (2006), in particular, has argued that deciding whether an individual amendment to the IDA is pro-employer or pro-worker in an objective manner is quite difficult. Even if individual amendments can be so coded, the actual workings of the regulations can hinge on judicial interpretations of the amendments. Moreover, if noncompliance with the regulations is widespread, then even an accurate coding of amendments that takes into account the appropriate judicial interpretation loses its meaning.

We take the following approach in this paper. We start with the various attempts by different researchers at quantifying differences in labor regulations across India's major states. In addition to Besley and Burgess (2004), this includes OECD (2007) and Bhattacharjea (2008). A useful feature of the OECD measure of labor market regulations across states is that it incorporates state-specific information on the enforcement machinery. For example, information is provided on whether actions have been taken to reduce the transaction costs associated with the inspection regime. We calculate the labor market regulation variable by using a simple majority rule across different indicators.[16] Based on this rule we code the states as pro-labor,

14. See Anant (2000) for a discussion on this.

15. For a detailed review of Indian labor regulations and the debate surrounding the issue of rigidity, see Anant et al. (2006).

16. This is based on an approach used in Gupta et al. (2007) to find the currency crisis dates for different countries that differ across various studies in the literature. Rather than relying on a particular study or approach, they use the majority rule to find the currency crisis dates.

pro-business, or neutral if the majority of the studies in the literature that have calculated these codes do so. The advantage of calculating our variable in this way is that if a particular methodology or data source used by a researcher is subject to measurement error, then it will be weeded out in the rule. So unless several different sources systematically make a mistake in coding the states, we would not pick it up in our coding. Full details, including our final composite coding of states' labor market regulations (referred to as LMR in the tables on our regression results below) is given in appendix 5.

Notwithstanding the delicensing reforms, product markets in India remain highly regulated relative to other countries. It is widely believed that a number of the regulations in place limit competition in product markets. According to the World Bank's *Doing Business* survey, for example, starting a business in India is found to take a large amount of time due to the nature of regulations and administrative procedures involved (World Bank, 2008): 73 days compared to 24 days in Pakistan and only one day in New Zealand! Similarly, the time taken to close a business in India is one of the longest in the world.

As in the case of labor market regulations, some aspects of product market regulation are determined at the Central level while others, including the enforcement of product market regulations, are determined at the state level. Thus, product market regulations can be expected to vary across states. Conway and Herd (2008), described in OECD (2007), collected data from state government officials belonging to various regulatory departments, as well as from a law firm operating in all of India's major states, on the state-specific requirements for setting up a business. For example, they collected information on the administrative rules and procedures for obtaining clearances and approvals of various types. All the information collected is then coded and aggregated into state-level indicators of product market regulations. As described in more detail in appendix 5, we use the OECD indicators along with results from surveys of enterprise managers carried out as part of World Bank's investment climate studies in order to create a composite classification of states' product market regulations (PMR). In particular, India's major states are classified as having either competitive, neutral, or restrictive product market regulations. In addition to capturing the nature of product market regulations at the state level, the classification can be interpreted as capturing the willingness of states to implement delicensing reforms undertaken at the central level.

In appendix 5 we also show the correlations between various state-level characteristics. We observe that the labor market regulations at the state level are not correlated with other state-level indicators of regulation or infrastructure whereas the product market regulations, the infrastructure variables, financial development variables, and per capita income are correlated highly with each other. In our regressions, therefore, when we include more than one of the latter characteristics simultaneously, the coefficients of individual variables are less significant.

Econometric Framework

The basic specification we use to analyze industrial performance is similar to the one used by Aghion et al. (2006). However, we extend this basic specification using the approach of Rajan and Zingales (1998). That is, in addition to exploiting variation in state characteristics, we also exploit variation in industry characteristics. The most general specification used in our paper is given as follows:

$$\begin{aligned} y_{ist} = {} & \alpha_{is}\, d_{is} + \beta_{st}\, d_{st} + \theta_i \text{ trend}_i + \Upsilon \text{ (delicensing}_{it}) + \delta \text{ (industry} \\ & \text{characteristic}_i * \text{delicensing}_{it}) + \pi \text{ (state characteristic}_s \\ & * \text{delicensing}_{it}) + \tau \text{ (state characteristic}_s * \text{industry} \\ & \text{characteristic}_i * \text{delicensing}_{it}) + \mu \text{ other controls} + \varepsilon_{ist} \qquad (1) \end{aligned}$$

In Equation 1, y_{ist} is an industrial performance outcome (gross value added or employment) measured in logs. The first three right-hand side terms include fixed effects of various types and industry specific time trends. The d_{is}'s are industry–state fixed effects and d_{st}'s are state–year fixed effects. In lieu of industry–year fixed effects, which we cannot include in the regressions since the delicensing variable varies over industry and year, we include industry-specific time trends. The state–year fixed effects account for any omitted variables that might vary over states or over state and year, such as developmental spending. The state–industry fixed effects can account for variables that are specific to state and industry combinations, for example, if a state has a comparative advantage in certain industries because of geographical or historical reasons. Finally, industry-specific trends can account for different rates of technological change in different industries.

The next term in Equation 1 is the delicensing dummy which varies over time and industry. The dummy takes the value 1 for the year when the delicensing requirement for a particular industry was removed and remains 1 for the rest of the sample period. Since we are including state–industry and state–year fixed effects in the regressions, the only additional variables we can include are the ones that vary over state, industry, and year, or over industry and year.

The next term is an interaction of various industrial characteristics with the delicensing dummy. How do we interpret the coefficient of the interaction term involving the delicensing dummy and a particular industry characteristic? Consider the case where the particular industry characteristic is the labor intensity of industries and the coefficient for the interaction term is negative and significant. The coefficient then indicates that the industries that use labor more intensively have grown less post-delicensing as compared to the industries that use labor less intensively. This could be due to the fact that labor-intensive industries are constrained by the unavailability of certain inputs specific to these industries; alternatively, there may be regulatory barriers which inhibit their growth.

The next term in Equation 1 is an interaction between the delicensing dummy and either the state-level regulatory variables, or the state-level infrastructure related variables, or financial development. The coefficient π measures the impact of state regulations/infrastructure on the payoffs from reforms. State-level regulatory variables include state-specific measures of labor market regulations and product market regulations. The next term involving the delicensing dummy is an interaction of it with both industry characteristics and state characteristics. A particular combination for this interaction term that is of special interest to us involves the dummy for labor-intensive industries and a variable capturing labor market regulations at the state level. The results from this equation can shed further light on the effect of labor market regulations on industrial performance post-delicensing.

Finally, Equation 1 includes various control variables including initial per capita income of states interacted with delicensing, where initial per capita income can account for omitted variables that might vary across states and may affect the payoffs from reforms. Thus per capita income could proxy for geographical, cultural, and institutional factors. We also include a variable initial share of industry *i* in state *s,* interacted with delicensing. This variable accounts for initial comparative advantage that might affect regulation, for example, an initial comparative advantage of a state in labor-intensive industries might imply that the state develops pro-labor regulations and these sectors might be growing more slowly—thus erroneously attributing the slow growth of labor-intensive industries to labor market regulations. These other control variables can also help us test for regional convergence and hysteresis.

The variable ε_{ist} is an error term. To allow for heteroskedasticity and to deal with possible serial correlation in the error term, the standard errors are clustered by state–industry combinations.[17] We start our analysis in an

17. The results are robust to clustering by state and year of delicensing.

exploratory way and first establish the heterogeneity in industrial performance post-delicensing by estimating a more parsimonious specification given by Equation 2:

$$y_{ist} = \alpha_{is}\, d_{is} + \beta_{st}\, d_{st} + \theta_i \text{ trend}_i + \Upsilon \text{ (delicensing}_{it}) + \delta \text{ (industry characteristic} * \text{delicensing}_{it}) + \mu \text{ other controls} + \varepsilon_{ist} \quad (2)$$

Next we look at the effect of state-level regulations on the payoffs from reforms by estimating specifications based on Equation 3:

$$y_{ist} = \alpha_{is}\, d_{is} + \beta_{st}\, d_{st} + \theta_i \text{ trend}_i + \Upsilon \text{ (delicensing}_{it}) + \pi \text{ (state characteristic}_s * \text{delicensing}_{it}) + \mu \text{ other controls} + \varepsilon_{ist} \quad (3)$$

Then we estimate the full specification in Equation 1 to test whether the states with strict labor regulations affect labor-intensive industries in particular.

Empirical Results and Interpretation

Effect of Delicensing on Different Industries

Aghion et al. (2006) find that delicensing had an uneven effect on the industrial performance of different states. They looked at this issue from the perspective of differences in the policies related to the labor market at the state level. Here we first establish that post-delicensing performance varies across different industrial sectors as well.[18] We look at the labor-intensive industries, skilled-labor intensive industries, infrastructure dependence of industries (and separately the dependence on electricity and fuel, and distribution).

Did Labor-intensive Industries Benefit Less from Delicensing?

A common concern with the industrial performance in India has been that labor-intensive industries and the industries that can absorb the unskilled labor have not performed well post-reforms; consequently, employment generation has been sluggish as well. Hence, we first look at the labor-intensive industries.

18. In Gupta et al. (2008) we establish these patterns using the data aggregated at the all-India level.

In table 1 we include the initial size of each industry interacted with delicensing to account for convergence in real value added at the industry level. In columns II–IV we include a dummy for labor-intensive industries interacted with delicensing. In column III we also include intensity of industries for infrastructure, interacted with delicensing. In column IV we include the size of the establishment (average fixed capital required per factory) to account for the fact the labor-intensive industries might be capturing some other characteristic of industries such as size. Results show that the effect of delicensing does differ significantly for labor- and capital-intensive industries. There is weak evidence to show that in addition to labor-intensive industries, industries that used unskilled labor intensively grew less.[19]

Next, we test whether other kinds of industries also benefited less from reforms. The results of this exercise also ensure that the results on labor-intensive industries are not driven by the fact that these industries might be relying on some other factors of production affecting the gains from reforms.

TABLE 1. Did Labor-Intensive Industries Benefit Less from Delicensing?

	I	*II*	*III*	*IV*
	Dependent variable: Log real value added			
Delicense	–0.001	0.07	0.17**	0.26
	[0.02]	[1.27]	[2.52]	[0.59]
Share of industry *i* in value added in 1980* delicense	0.003	0	0.003	0.001
	[0.47]	[0.08]	[0.50]	[0.13]
Size (log of fixed capital)* delicense				–0.018
				[0.43]
Labor-intensive industry* delicense		–0.15**	–0.16**	–0.18**
		[2.24]	[2.32]	[1.97]
Infrastructure-intensive industry* delicense			–0.33***	
			[2.76]	
State–industry fixed effect	Yes	Yes	Yes	Yes
State–year fixed effect	Yes	Yes	Yes	Yes
Industry–year fixed effect	No	No	No	No
Industry trends	Yes	Yes	Yes	Yes
Observations	13257	13257	13257	13257
Number of state–industry	579	579	579	579
R-squared	0.87	0.87	0.87	0.87

Source: Computed by the authors.

Note: Robust t statistics are given in brackets. *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. Standard errors are clustered by state–industry pairs in all specifications.

19. Results on size and low skilled-labor intensity variables are stronger if we drop the industry Railway Locomotives, which seems to be an outlier.

We, in particular, consider the industries that spend more on energy, or energy and distribution (a broader measure of infrastructure). As seen from table 1, industries that use more energy or rely on distribution infrastructure grew less post-delicensing (relative to industries that spend less on energy and distribution and thus have less infrastructural needs).

Even after controlling for the infrastructure intensity of industries, labor-intensive industries have a negative coefficient. These results are robust to several different indices of infrastructure needs of the industries. Thus after controlling for many other characteristics, including the average size of enterprises in industries and the initial size of the industry, we still find that the labor-intensive industries have experienced smaller growth in value added post-delicensing.

Is There Divergence across Indian States in Industrial Production? And Does Hysteresis Matter?

Next we turn to performance of the industries at the state level. As has been well established elsewhere, the regional income disparities have been increasing in India—the richer states have been growing faster than the poorer states. Here we first see whether the same pattern of regional divergence exists in organized Indian industries as well. Continuing to look at the three-digit ASI industrial data, we estimate the regression equation given by Equation 4:

$$\begin{aligned} Y_{ist} = {} & \Sigma\alpha_{is}\, d_{is} + \Sigma\beta_{st}\, d_{st} + \Sigma\theta_{i}\ \text{Trend}_{i} + \Upsilon\ (\text{delicensing}_{it}) \\ & + \delta\ (\text{initial share of state } s \text{ in industry } I * \text{delicensing}_{it}) \\ & + \pi\ (\text{initial per capita income of state } s\text{/or initial per} \\ & \text{capita income originating in the industrial sector in} \\ & \text{state } s) * \text{delicensing}_{it} + \varepsilon_{ist} \end{aligned} \tag{4}$$

In Equation 4 we include states' share in each industry at the beginning of the period as a proxy for the inherent comparative advantage of the state in a particular industry given factor endowments and either per capita state domestic product or per capita income in the industrial sector, both interacted with delicensing.

We find that states with higher initial per capita income or higher per capita income originating in the industrial sector have experienced faster growth in industrial value added post-delicensing (table 2). Thus the divergence in industrial production has increased post-delicensing. One apparently anomalous result is that the states with higher shares of particular industries pre-delicensing experienced slower growth in those industries. At

TABLE 2. Divergence across States in Industrial Production

	I	II	III	IV	V
	Dependent variable: Log real value added				
Delicense	0.09*	−0.01	−0.016	0.11**	−0.01
	[1.86]	[0.23]	[0.35]	[2.32]	[0.11]
Share S, I in 1980* delicense	−0.015***	−0.016***	−0.016***	−0.004	−0.01
	[3.40]	[3.43]	[3.44]	[1.14]	[1.44]
Initial PCY in state *s** delicense		0.016**			0.02***
		[2.38]			[2.79]
Initial industrial output per capita in state *s** delicense			0.01**		
			[2.54]		
Initial output share* income level* delicense				−0.02***	−0.02***
(income level: 2 = lowest; 1 = medium, 0 = highest)				[4.02]	[4.07]
State–industry fixed effects	Yes	Yes	Yes	Yes	Yes
State–year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry–year fixed effects	No	No	No	No	No
Industry trends	Yes	Yes	Yes	Yes	Yes
Observations	13,257	13,257	13,257	13,257	13,257
R-squared	0.87	0.87	0.87	0.87	0.87

Source: Computed by the authors.

Note: Robust t statistics are given in brackets. *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. Standard errors are clustered by State–Industry pairs in all specifications.

first blush, this result seems to convey that the diversification in industrial structure across states has increased. But when we dig deeper, it turns out to be primarily because industrial production growth has been slower in the poorer states even in industries in which these states had a higher initial share (perhaps because of comparative advantage, for instance, Bihar in extractive industries; or because of the presence of public sector units). This is captured by the interaction term between the initial share of each state in particular industries and the income group that the state belongs to (we divide states into three groups based on their per capita income).

The variable income level takes three different values. It takes a value 2 if the state belongs to the lowest per capita income level, 1 if it has the medium per capita income level, and 0 if it belongs to the highest per capita income level. The coefficient of this variable is negative and significant, and when we include it, the coefficient for the initial share of states in industries becomes insignificant. This interpretation would then point to increasing divergence at the aggregate level as well as at the specific industries level. Post-delicensing, richer states have experienced higher industrial growth and the growth has been higher in richer states even in industries in which they had a small share in 1980.

Does Hysteresis (Path Dependence) Matter?

Although not systematically documented, one explanation for the slow response of Indian industries to reforms has been an appeal to hysteresis. The argument is as follows. Post-Independence, Indian states inherited an industrial structure that was primarily determined by the government, either through setting up of state enterprises or through encouragement of particular industries in particular states. The earlier set of interventions and policies ended with the policy reforms undertaken since the mid-1980s. Yet, the industry-specific capabilities that they created have persisted so that states have not been able to break away from earlier industrial patterns by either entering new industries or exiting old ones.

In our results in table 2, a positive and significant coefficient on the initial share of state *s* in industry *i* would have implied hysteresis. But this coefficient is either negative and significant, or insignificant. In either case, it does not seem to be the case that industrial growth is determined by inherited capabilities.

Does Infrastructure and Financial Development Matter for Benefits from Liberalization?

In table 3, we include indicators of infrastructure availability at the state level in the regression specification given by Equation 3, where other controls are the same as before, that is, per capita income and initial share of state *s* in industry *i*, both interacted with delicensing. We include several different indicators of infrastructure and use data from many different sources. These include indicators of physical infrastructure, overall infrastructure and human capital, and financial development. These measures are highly correlated with each other (table A-3 in appendix 5) as well as with per capita income. Hence, when we include more than one indicator of infrastructure these are individually not significant (due to lack of space we do not report all the results here). In order to avoid reverse causality we include the availability of infrastructure at the beginning of the period. Besides, at least for some of the indicators of financial development, we use variables such as number of scheduled bank branches per capita and credit by nationalized banks, the concern of reverse causality is less serious. In the Indian banking sector, which is largely publicly owned, these variables are determined more by the objectives of social equity rather than expected economic performance of states (Burgess and Pande, 2005).

In different columns in table 3, we include indicators of physical infrastructure, such as the composite indices for physical infrastructure

TABLE 3. Infrastructure and Payoffs from Delicensing

	I	*II*	*III*	*IV*	*V*	*VI*	*VII*
	Dependent variable: Log real value added						
Delicense	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01	−0.01
	[0.13]	[0.16]	[0.11]	[0.19]	[0.13]	[0.14]	[0.13]
Share S, I in 1980* delicense	−0.02***	−0.02***	−0.02***	−0.02***	−0.02***	−0.02***	−0.02***
	[3.50]	[3.44]	[3.58]	[3.52]	[3.66]	[3.55]	[3.70]
Initial PCY in state s* delicense	0.013*	−0.24*	−0.11*	−0.018	−0.18**	−0.02	−0.11**
	[1.95]	[1.95]	[1.96]	[0.81]	[2.00]	[1.10]	[2.08]
Physical infrastructure* delicense	0.12**						
	[2.25]						
Roads* delicense		0.32**					
		[2.09]					
Electricity* delicense			0.22**				
			[2.26]				
Literacy* delicense				0.006*			
				[1.66]			
Credit by scheduled banks* delicense					0.25**		
					[2.19]		
Branches* delicense						0.008**	
						[2.03]	
Credit by national banks* delicense							0.25**
							[2.40]
State–Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State–Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry–Year FE	No	No	No	No	No	No	No
Industry trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,257	13,257	13,257	13,257	13,257	13,257	13,257
Number of state–industry	579	579	579	579	579	579	579
R-squared	0.87	0.87	0.87	0.87	0.87	0.87	0.87

Source: Computed by the authors.

Note: Robust t statistics are given in brackets. *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. Standard errors are clustered by state–industry pairs in all specifications.

constructed by Kumar (2002), as well as indices for more specific aspects of infrastructure, including roads and electricity generation. We include literacy rate as an indicator of human capital. For indicators pertaining to the financial sector, we use the data put together by Purfield (2006), and include indicators of credit per capita by scheduled banks, number of branches per capita, and credit per capita by nationalized banks.

The results indicate that infrastructure does matter for the payoffs from reforms. Although since the alternative series are correlated highly, it is difficult for us to say what kind of infrastructure is more important for industrial growth. Moreover, there seems to be variation independent of per capita income because when we include the indicators of infrastructure with per capita income (both interacted with delicensing) the infrastructure variable remains significant, and with several of these infrastructural variables, the per capita income variable becomes either insignificant or negative and significant. This result could be interpreted to imply that infrastructure availability might be one factor behind increasing regional divergence.[20]

Does Regulatory Framework across States Matter for Growth?

In order to assess the impact of regulatory burden on growth we include indexes pertaining to labor market regulations (LMR) and product market regulations (PMR), either one-at-a-time or together in the regression specification given by Equation 3. As explained in appendix 5, both regulatory variables can take three values. In the case of labor regulations, the index takes a value of 1 if regulations are pro-employer, 0 if they are neutral, and –1 if they are pro-worker. Similarly, the product market regulation index takes a value of 1 if regulations are supportive of competition, 0 if they are neutral, and –1 if they impede competition.

The results described in table 4 show that states did not experience differential growth in production post-delicensing based on their labor regulations (we revisit this result shortly). States with a more liberal business environment, however, experienced faster growth post-delicensing. The product market regulation variable can also be interpreted as a measure of the willingness of states to carry out product market reforms initiated at the Center. Hence, states with a higher score on product market regulations may

20. As is evident from the regressions results, the R^2s are quite high and do not seem to vary across different specifications. The reason is of course that the fixed effects explain a great deal of variation in the data, and as compared to fixed effects, the individual regressors add little to R^2. As is customary, in order to gauge the appropriateness of individual regressors, we look at the significance of each individual variable rather than R^2.

TABLE 4. Does the Regulatory Framework across States Matter for Growth?

	I	*II*	*III*	*IV*	*V*	*VI*	*VII*
	Dependent variable: Log real value added						
Delicense	–0.01	–0.01	–0.01	–0.01	–0.01	–0.01	–0.01
	[0.23]	[0.16]	[0.15]	[0.14]	[0.13]	[0.13]	[0.15]
Share S, I in 1980* delicense	–0.02***	–0.02***	–0.02***	–0.02***	–0.02***	–0.02***	–0.02***
	[3.38]	[3.56]	[3.55]	[3.65]	[3.48]	[3.42]	[3.65]
Initial PCY, State s* delicense	0.02**	0.02**	0.02**	–0.11**	0.01*	0.01*	–0.15
	[2.23]	[2.38]	[2.35]	[2.06]	[1.88]	[1.92]	[1.49]
LMR* delicense	0.01		–0.03	0.02	–0.01	–0.01	0.04
	[0.09]		[0.33]	[0.26]	[0.10]	[0.18]	[0.50]
PMR* delicense		0.11*	0.12*			0.03	–0.06
		[1.69]	[1.85]			[0.31]	[0.50]
Bank credit* delicense				0.25**			0.33*
				[2.39]			[1.66]
Infrastructure*					0.12**	0.10	
Delicense					[2.30]	[1.31]	
State–Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State–Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry–Year FE	No	No	No	No	No	No	No
Industry trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,257	13,257	13,257	13,257	13,257	13,257	13,257
Number of state-industry	579	579	579	579	579	579	579
R-squared	0.87	0.87	0.87	0.87	0.87	0.87	0.87

Source: Computed by the authors.

Note: Robust t statistics are given in brackets. *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. Standard errors are clustered by state–industry pairs in all specifications.

well be the ones where delicensing, which was a reform measure passed by the Center, was implemented either more effectively or earlier as compared to other states. Interpreted this way, the results indicate that the benefits from liberalization accrued to the states if their willingness to reform matched those of the Center. In column III we include labor regulations and product market regulations simultaneously in the regression; indicators of infrastructure with regulatory variables are included in columns IV–VII. Results on labor regulations do not change, and since product market regulations and infrastructure are correlated strongly (table A-3 in appendix 5), when we include them together their individual coefficients are smaller and less significant.

Next, we explore the possibility that delicensing affected labor intensive and capital-intensive industries differently across states with different labor regulations. Thus we include the following two variables in our base specification: (*a*) a dummy for labor-intensive industries interacted with delicensing and (*b*) a three-way interaction among labor intensity of industries, labor market regulation, and delicensing.

Results indicate that while labor-intensive industries grew less post-delicensing and states with different labor regulations do not show any specific patterns post-delicensing, labor-intensive industries have performed particularly worse in states with pro-labor regulations. Thus it seems that the pro-labor regulations hurt where it matters the most—industries that employ more labor. In various columns in table 5, we check the robustness of this key result by changing the sample and by including other controls in the regressions. Thus in column II, we only look at the states where the labor market regulations are either considered to be pro-labor or pro-business, and drop the states with neutral labor regulations. In column III we drop tobacco, and petroleum industries, and in columns IV–VI we respectively include product market regulations, infrastructure, and financial sector variables, interacted with delicensing.[21]

The results are robust as the coefficient and significance of our key variable of interest does not change.

One concern remains and this is that our results might be driven by omitted variables. There can be two kinds of omitted variables—those related to states and those related to industries. For example, there could be another set of industries, correlated with labor intensity, which has performed poorly in states

21. Other robustness tests conducted but not shown here include clustering by state–delicense; and by including the full set of fixed effects: state–industry, industry–year, and state–year instead of other control variables that vary along these dimensions alone. Results are found to be robust.

TABLE 5. Labor Market Regulations and Labor-intensive Industries

	I	*II*	*III*	*IV*	*V*	*VI*
	Dependent variable: Log real value added					
Delicense	–0.01	–0.06	–0.02	0.00	0.00	0.00
	[0.11]	[0.94]	[0.38]	[0.04]	[0.02]	[0.03]
Share S, I in 1980* delicense	–0.02***	–0.01**	–0.02***	–0.02***	–0.02***	–0.02***
	[3.30]	[2.21]	[3.53]	[3.46]	[3.40]	[3.57]
Initial PCY in state s* delicense	0.02***	0.02*	0.03***	0.02***	0.02***	–0.10*
	[2.97]	[1.94]	[3.58]	[3.07]	[2.64]	[1.88]
Labor intensive industry* delicense	–0.18**	–0.21**	–0.20***	–0.18**	–0.18**	–0.18**
	[2.57]	[2.27]	[2.79]	[2.54]	[2.54]	[2.55]
LMR* delicense	–0.07	–0.05	–0.04	–0.10	–0.08	–0.05
	[0.74]	[0.50]	[0.48]	[1.13]	[0.93]	[0.57]
LMR* labor intensive* delicense	0.16*	0.16*	0.15*	0.15*	0.16*	0.15*
	[1.77]	[1.71]	[1.69]	[1.75]	[1.77]	[1.75]
PMR* delicense				0.12*		
				[1.81]		
Infrastructure* delicense					0.12**	
					[2.28]	
Bank credit* delicense						0.25**
						[2.38]
State–Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
State–Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry–Year FE	No	No	No	No	No	No
Industry trends	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13,257	7,540	12,728	13,257	13,257	13,257
Number of state–industry	579	322	550	579	579	579
R-squared	0.87	0.87	0.88	0.87	0.87	0.87

Source: Computed by the authors.

Note: Robust t statistics are given in brackets. *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. Standard errors are clustered by state–industry pairs in all specifications.

with inflexible labor regulations post-delicensing and our interaction term involving labor regulations, labor-intensive industries, and delicense could be picking up the effect on value added due to these industries. Similarly, there could be another state characteristic correlated with labor regulations that is associated with poor performance of labor-intensive industries post-delicensing. However, we think that omitted variables are not a problem for our results since labor intensity is not correlated with most other industry characteristics and labor regulation is not correlated with other state features that we have considered in the paper. Nevertheless, we conduct robustness tests where starting with our base specification in column I in table 6, we include other industry characteristics and other state characteristics.

In column II we report the results where along with labor intensity we include the infrastructure variable. Results for variables involving labor regulations and labor intensity of industries are unchanged. In the second robustness test we include per capita income interacted with delicensing and interacted with labor regulations and delicensing. Again, the results on variables involving labor regulations and labor intensity are preserved and are somewhat stronger. We also include variables pertaining to infrastructure and the financial sector in a similar fashion and find the results to be robust (these are not shown here for brevity). In the last two columns we experiment with different samples for the specification in column II—in column IV we drop states with neutral labor regulations and in the last column we drop petroleum and tobacco industries. We also estimate kitchen sink regressions with indicators of financial sector development and physical infrastructure variables thrown into the base specification in Tables 4 and 5. The results mostly show that the individual state level variables have insignificant coefficients (perhaps because of multicollinearity). In some specifications, indicators of physical infrastructure are found to be positive and significant.

Among other robustness tests that we conducted (the results are not reported here but are available upon request), we included the skill-intensive industries interacted with delicensing in our regressions to see whether the relatively worse performance of the labor-intensive industries, that is, the relatively better performance of the capital-intensive industries, is driven by the fact that the latter might be skill intensive, which, as has often been pointed out in the literature, have done better because of the capacities that India generated early on in the post-Independence period. This does not seem to be the case though. If it was, then the coefficient of labor-intensive industries would be insignificant once we included skill intensity in the regressions.

TABLE 6. Labor Market Regulations and Labor-intensive Industries, Robustness

	I	*II*	*III*	*IV*	*V*
	Dependent variable: Log real value added				
Delicense	–0.01	0.00	0.00	–0.06	–0.01
	[0.11]	[0.08]	[0.02]	[0.92]	[0.29]
Share S, I in 1980* delicense	–0.015***	–0.015***	–0.016***	–0.012**	–0.018***
	[3.30]	[3.26]	[3.49]	[2.36]	[3.75]
Initial PCY in state s* delicense	0.024***	0.03***	0.02***	0.02**	0.03***
	[2.97]	[3.40]	[2.98]	[1.99]	[3.59]
Labor intensive Industry* delicense	–0.18**	–0.19***	–5.9***	–6.82	–5.7***
	[2.57]	[2.73]	[2.85]	[1.55]	[2.74]
LMR* delicense	–0.07	0.07	–0.07	–0.05	–0.04
	[0.74]	[0.74]	[0.77]	[0.54]	[0.49]
LMR*labor intensive* delicense	0.16*	0.15*	0.22**	0.22*	0.21**
	[1.77]	[1.71]	[2.34]	[1.95]	[2.22]
Infrastructure industry* delicense		–0.12*			
		[1.71]			
LMR* infrastructure industry* delicense		–0.22***			
		[2.82]			
PCY* labor intensity* delicense			0.67***	0.77	0.64***
			[2.77]	[1.51]	[2.65]
State–Industry FE	Yes	Yes	Yes	Yes	Yes
State–Year FE	Yes	Yes	Yes	Yes	Yes
Industry–Year FE	No	No	No	No	No
Industry trends	Yes	Yes	Yes	Yes	Yes
Observations	13,257	13,257	13,257	7,540	12,728
Number of state–industry	579	579	579	322	550
R-squared	0.87	0.87	0.87	0.87	0.88

Source: Computed by the authors.

Note: Robust t statistics are given in brackets. *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. Standard errors are clustered by state–industry pairs in all specifications.

Instead, results show that even after controlling for skill intensity all the key results on labor-intensive industries hold.

Another test that we perform is to look at the value of output rather than value added as the dependent variable. The rationale is that if labor-intensive industries are outsourcing more of their activities in recent years, especially post-delicensing (perhaps because it is easier to do so technologically), then one would see these industries growing less in terms of value added. According to this argument, if we appropriately account for outsourcing, then the performance of labor-intensive industries would be similar to other industries. Our results using the value of output as a dependent variable are similar to those using value added. Thus, the outsourcing argument is not valid.

Looking at the role of labor regulations in determining the payoffs from reforms we consider another key variable where labor regulations are supposed to be making the biggest dent—employment (table 7). For employment, we use a slightly different specification: since employment can be expected to move closely with production, in order to examine movements in employment that are independent of changes in production, we include gross value added in the regressions. Results show that post-delicensing employment generation has been higher in the states with flexible labor regulations.

We include several other state characteristics in columns II–IV, to see whether these are associated with similar patterns in employment, but unlike the case of value added, we do not find state-level product market regulations and infrastructure and financial development variables to be associated with any specific patterns in employment gains stemming from delicensing. Interestingly, also unlike the case of value added, the effect on employment does not seem to differ across labor-intensive and capital-intensive industries, as may be seen in the last column of the table.

Conclusion

In this paper we analyze the effects of the reforms that liberalized India's industrial licensing regime, on the performance of registered manufacturing, using ASI data at the three-digit level for major Indian states, for 1980–2004. Following the existing literature, we use the date of delicensing, a policy whose timing varied across industries, but was national in scope, as our measure of policy reform. We highlight the heterogeneity in industrial performance across Indian states as well across industries. In particular, we

TABLE 7. Labor Market Regulations and Employment

	I	*II*	*III*	*IV*	*V*
	Dependent variable: Log employment				
Delicense	–0.03	–0.03	–0.03	–0.03	–0.03
	[1.30]	[1.26]	[1.25]	[1.27]	[1.25]
Share state in industry in 1980* delicense	0.00	0.00	0.00	0.00	0.00
	[0.19]	[0.33]	[0.24]	[0.31]	[0.18]
Initial PCY in state s* delicense	0.00	0.00	0.00	–0.01	0.01
	[1.16]	[1.20]	[1.01]	[0.62]	[1.54]
Gross value added (log)	0.45***	0.45***	0.45***	0.45***	0.45***
	[29.9]	[29.9]	[29.9]	[29.9]	[29.8]
LMR* delicense	0.09**	0.08**	0.08**	0.09**	0.08**
	[2.45]	[2.26]	[2.34]	[2.50]	[2.26]
PMR* delicense		0.03			
		[1.02]			
Physical infrastructure* delicense			0.02		
			[1.22]		
Bank Credit* delicense				0.03	
				[0.78]	
Labor-intensive industry* delicense					–0.04
					[1.18]
LMR* Labor-intensive industry*delicense					0.01
					[0.22]
State–Industry FE	Yes	Yes	Yes	Yes	Yes
State–Year FE	Yes	Yes	Yes	Yes	Yes
Industry–Year FE	No	No	No	No	No
Industry trends	Yes	Yes	Yes	Yes	Yes
Observations	13,257	13,257	13,257	13,257	13,257
Number of state–industry	579	579	579	579	579
R-squared	0.92	0.92	0.92	0.92	0.92

Source: Source: Computed by the authors.

Note: Robust *t* statistics are given in brackets. *Significant at 10 percent; **significant at 5 percent; ***significant at 1 percent. Standard errors are clustered by state–industry pairs in all specifications.

find that the impact of delicensing has been highly uneven across industries. Industries that are labor intensive, use unskilled labor, or depend on infrastructure or are energy dependent), have experienced smaller gains from reforms. We also find that the regulations at the state level matter. States with less competitive product market regulations have experienced slower growth in the industrial sector post-delicensing, as compared to states with competitive product market regulations. States with relatively inflexible labor regulations have experienced slower growth of labor-intensive industries and slower employment growth. Infrastructure availability and financial sector development are found to be important in determining the benefits that accrued to states from reforms.

The results imply that though important steps have been taken by liberalizing several specific policies to promote industrial growth in India, the task is not complete yet. These policy reforms have yielded gains that have been uneven geographically and modest overall. The relative magnitude of gains across states has depended on the availability of infrastructure, regulations governing the use of labor, and overall regulatory burden. In order to achieve favorable results at a wider level the reforms need to be carried forward. In particular, promoting the growth of labor-intensive industries and employment will require some rationalization of labor regulations governing industrial workers. In addition, in a federal democracy like India, reforms at the Center need to be complemented by reforms at the state level. Finally, provision of better infrastructure, both physical and financial is critical for faster industrial growth.

APPENDICES

Appendix 1: Data Sources

The primary data used in this paper comes from the Annual Survey of Industries (ASI) for 1980–81 to 2004–05. The ASI is the principal source of industrial statistics in India and it is undertaken by the Ministry of Statistics and Programme Implementation, Government of India. Aggregated tables at the all-India and the state level based on three-digit National Industrial Classification for India are used.

There are four different classifications (NIC 1980, NIC 1987, NIC 1998, NIC 2004) in use over this 25-year period. The first step in developing comparable data over time was to prepare a concordance matching industries across the four different classifications. The concordance exercise leaves us with forty-nine industries. This is a unique database on industrial statistics in India in terms of its coverage at the state–industry level and the time length. Data seems good and comparable pre- and post-1998, when there was a change in the sampling framework.

The following industries were excluded from the analysis: dressing and dyeing of fur, saw milling, publishing, processing of nuclear fuels, and reproduction of recorded media. In addition, following Aghion et al. (2008) we dropped "other manufacturing" (NIC-98 code 369) as this industry category is a grouping of different activities, and the activities are likely to vary from one state to the other rendering this industry category incomparable across states. For the purposes of this paper, since we are working with aggregated data, the sampling unit is the state–industry pair and the data are representative at that level. We observe repeated entry and exit of various state–industry pairs in the data. To minimize the role played by these observations, we further restrict the data following Aghion et al. We use only state–industry pairs with at least 10 years of data, and further, use only those industries that exist in at least eight states in each year. We further restrict ourselves to "major" Indian states only. The list of states included in the analysis is Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. The remaining states/union territories either have poor time-series data, or have very few industries, or their share in manufacturing Gross Value Added (GVA) is less than 1 percent. Newly formed states of Chhattisgarh, Jharkhand, and Uttarakhand were added to the respective states they were carved out from to create old states of Madhya Pradesh, Bihar, and Uttar Pradesh respectively and make the data comparable over time. The state characteristics of the original states in these cases have been used as if they would apply to the old state.

The ASI frame is based on the list of registered factories/units maintained by the Chief Inspector of Factories in each state/union territory. Factory is the primary unit of enumeration in the survey for the case of manufacturing industries, defined as the unit that is registered under sections 2m (i) and 2m (ii) of the Factories Act, 1948, that is, premises whereon 10 or more workers work with the aid of power or twenty or more workers without the aid of power.

Variables

Value added: Increment to the value of goods and services that is contributed by the factory.

Total employment: Includes all blue collar workers and persons receiving wages and holding clerical, supervisory, or managerial positions or engaged in the administrative office, store-keeping section, or the welfare section, sales department, and so on.

Delicense: Dummy that takes a value 1 from when an industry was delicensed.

Share of industry *i* in value added (VA) in 1980: Share of each industry in total industrial value added in 1980.

Size (log of fixed capital): Average fixed capital per factory in each industry in 1980.

Labor-intensive industry: Dummy that equals 1 when the industry has labor intensity above the median for industries.

L**o**w-Skill labor intensive: Dummy that takes a value 1 if the share of compensation to low-skilled workers in total value added exceeds the median for industries in 1980.

Infrastructure-intensive industry: Dummy that takes a value 1 if the share of expenditure on fuel and distribution is above the median for industries.

Share S, I in 1980: Share of state *s*, in industry *i's* value added in 1980.

Initial per capita income (PCY) in state *s*: State domestic product per capita in each state in 1980.

Initial industrial output per capita in state *s*: Industrial value added per capita in each state in 1980.

Income level: Takes a value 2 if the state belongs to the bottom one-third of the states on the basis of per capita income in 1980, 1 if the state belongs to middle one-third of states, and 0 if the state belongs to the top one-third of the states.

Physical infrastructure: Index of physical infrastructure at the state level in 1980 from Kumar (2002).

Roads: Log length of roads per capita (or per sq km) in each state in 1980.

Electricity: Log electricity generated per capita in each state in 1980.

Literacy: Literacy rate in 1980.

Credit by scheduled banks: Log credit per capita in each state by scheduled banks in 1980.

Branches: Bank branches per capita in 1990 in each state.

Credit by national banks: Log credit per capita in each state by nationalized banks in 1980.

Labor market regulations (LMR): Takes three values: +1 if the state is considered to have pro-business labor regulations, –1 if the state is deemed to have pro-labor regulations, and 0 if it has neutral regulations.

Product market regulations (PMR): Takes three values: +1 if the state has competitive regulations, –1 if the state has cumbersome regulations, and 0 if the state has neutral product market regulations.

Appendix 2: Delicensing

Year of delicensing	*Industry code*	*Description*
1985	151, 191, 210, 252, 261, 281, 300, 311, 319, 321, 322, 331, 341	Meat, fish, fruit, vegetables etc.; leather; paper; plastic products; glass; metal products; office/computing machinery; electric motors; other electric equipment; electronic components; television; radio transmitters; medical appliances and motor vehicle.
1989	251	Rubber products
1991	152, 153, 154, 155, 171, 172, 173, 181, 182, 192, 202, 221, 222, 233, 241, 269, 271, 272, 289, 313, 314, 332, 333, 351, 352, 359, 361, 369	Dairy products; grain mill products; other food products; beverages; spinning, weaving; other textiles; knitted fabrics; weaving apparel; articles of fur; footwear; wood products; publishing; printing; processing of nuclear fuels; basic chemicals; non-metallic; iron and steel; basic precious/non-ferrous metals; fabricated metal products; insulated wire and cable; accumulators, cells/batteries; optical and photographic equipment; watches; ships and boats; railway locomotives; transport equipment not elsewhere classified (nec); furniture; and manufacturing nec.
1993	293	Domestic appliances
1997	201, 223, 232	Saw milling; recorded media; and refined petroleum products.

Source: We update the data provided in Aghion et al. (2006) and map according to our three-digit classification, in Gupta et al. (2008).

Appendix 3: Industry Characteristics

Labor intensity: Defined as an index of the ratio of employment to real invested capital using the all-India ASI data averaged over the years 1980–84. Real invested capital is calculated by deflating nominal values of invested capital by the wholesale price index for the industry "other electrical equipment" (NIC industry 319).

Infrastructure dependence (distribution intensity): Calculated as the ratio of distribution and power and fuel expenses to gross value added using the Prowess data (ratio of distribution expenses to gross value added). It is the average of the ratio over the period 1994–98.

Energy dependence: Calculated as the ratio of power and fuel expenses to gross value added using the ASI data, averaged for 1980–84. Another series was calculated using the data for the US using the EU KLEMS database.

Unskilled labor intensity: Calculated as the share of labor compensation to low-skilled workers in gross value added for USA using the data from EU KLEMS.

TABLE A-1. Correlations between Different Industry Characteristics

	Labor intensity	*Low skilled labor*	*Infra-structure intensive*	*Fuel intensity*	*Distribution intensity*	*Energy dependence (ASI)*	*Energy intensive, US (EU KLEMS)*
Low-skilled labor	0.08	1					
Infrastructure intensive	–0.13	0.17	1				
Fuel intensity	–0.11	0.14	0.95***	1			
Distribution intensity	–0.13	0.15	0.60***	0.31**	1		
Energy dependence	–0.22	0.14	0.73***	0.76***	0.24	1	
Energy dependence—US	–0.31**	–0.12	0.31***	0.21	0.35***	0.45***	1
Exporting industries	0.18	0.29***	–0.15	–0.22	0.14	–0.20	–0.18

Source: Authors' own calculations.

Note: *, **, and ***indicate that the correlation coefficients are significant at 10, 5, and 1 percent levels of significance respectively.

Table A-1 shows that the correlation of similar industry characteristics calculated using different sources is high; correlation across different characteristics is not high. For each of these series, we have data from various points in time. The values of these series are highly correlated over time.

This reinforces the point that the relative input usage across industries reflects the technical requirements of various industries and is thus unlikely to change much over time or across countries.

Appendix 4: Infrastructure Indices for States

Various researchers have developed infrastructure indices at the state level that aggregate information on different kinds of infrastructure into one indicator. We use the infrastructure index developed by Ghosh and De, 2004 and Kumar, 2002. Both studies construct different sub-components of infrastructure, that is, physical infrastructure development index, social infrastructure development index, and financial infrastructure development index for the major Indian states and at different points in time. Kumar also constructs an overall infrastructure development index.

TABLE A-1. Infrastructure Indices: Variables and Sources

	Ghosh and De, 2004 (GD)	*Kumar, 2002 (TRK)*
Physical infrastructure development index	Transport facilities, irrigated area, consumption of electricity, telephone mainline.	Villages electrified, electricity consumption, railways and surfaced roads, post offices, telecommunication, irrigation extent.
Social infrastructure development index	Literacy rate, infant mortality rate, people living in *pucca* (concrete structure) houses.	Population with primary education, literacy rate, educational institutions, public health institutions, registered doctors per capita.
Financial infrastructure development index	Credit/deposit ratio in nationalized banks, the state's own tax effort (tax revenue/NSDP), and number of post offices per 10,000 population.	Bank offices per unit area, per capita bank deposits, per capita bank credit.
Overall infrastructure development index	Not constructed.	Village electrified, railways, and surfaced roads, post offices, irrigation extent, educational institutions, public health institutions, bank offices.

In a background paper for the Eleventh Finance Commission, Anant et al. (1999) also develop an infrastructure index at the state level. The different infrastructure series are correlated highly across different sources as well as across different points in time.

Appendix 5: Labor Market and Product Market Regulations

As noted in the text, India's Constitution gives its states control over various areas of regulation. In these areas, states have the authority to enact their own laws and amend legislations passed by the Center. Typically, states also have the authority to decide on the specific administrative rules and procedures for enforcing legislations passed by the Center (Conway and Herd, 2008). Labor market regulations and product market regulations are two areas in which states have such control over regulation and enforcement. Accordingly, various studies have attempted to codify state-level differences in regulation.

In what follows, we describe these studies' approach for characterizing states' stance on labor regulations and product market regulations. We also describe our attempt at combining the information from different studies, reconciling major differences when they come up, and coming up with a composite classification of regulatory regimes at the state level.

Labor Market Regulations

Besley and Burgess (2004): Besley and Burgess work with state-level amendments to the Industrial Disputes Act (IDA) between 1958 and 1992.[1, 2] Each amendment is coded as a 1, –1, or 0 depending on whether the amendment in question is deemed to be pro-worker, pro-employer, or neutral. The scores are then cumulated over time with any multiple amendments for a given year coded to give the general direction of change.

Since the actual time-series variation in the cumulated amendments within states is quite limited for the period we are interested in (1980 and beyond), we compute the average value for each state over 1980–97. These averages range from a high of 3.17 in West Bengal to a low of –2.28 in

1. The IDA lays down procedures for settlement of disputes as well as the conditions under which layoffs, retrenchment, and closure of an establishment can take place and the appropriate level of compensation in each case. The IDA also prescribes the terms under which employers may change the "conditions of service" of workers.

2. Given very limited amendment activity in the 1990s and beyond, the original Besley and Burgess coding can be treated as applicable up to the present period considered in this paper. As noted in OECD (2007), only eight amendments have been recorded since 1990. All of these can be accounted by three states. Most importantly, only one amendment—passed in 2004—appears "to be of any consequence to labor market outcomes" (OECD 2007).

Andhra Pradesh. Next, we use the following rule to assign to each state a particular stance on labor regulations: pro-worker (or inflexible), neutral, pro-employer (or flexible). States with an average greater (less) than zero are deemed to have inflexible (flexible) labor regulations; states with an average of zero are treated as having a neutral stance on labor regulations. Thus, for example, Andhra Pradesh would be classified as having flexible labor regulations while West Bengal would be classified as having inflexible labor regulations.

We make two important changes to the original coding. Gujarat has been designated as pro-worker by Besley and Burgess. As noted by Bhattacharjea (2006), this is on account of a "solitary amendment passed in 1973, allowing for a penalty of 50 rupees a day on employers for not nominating representatives to firm-level joint management councils." Given the fairly inconsequential nature of this amendment, we modify Besley and Burgess' coding of labor regulations in Gujarat as neutral. Similarly, in the case of Madhya Pradesh, the average of the Besley and Burgess cumulative amendments is very mildly negative over 1980–97. Since it is so close to zero, we treat it as effectively zero, or in other words, neutral. This is exactly how the state tends to appear based on a majority of the other studies. Column 1 of appendix table A-1 describes our final coding of states' stance on labor regulations based on Besley and Burgess' cumulative amendments data and the changes described above.

Bhattacharjea (2008): Bhattacharjea focuses his attention on characterizing state-level differences in Chapter VB of the IDA (which relates to the requirement for firms to seek government permission for layoffs, retrenchments, and closures). In a fairly radical departure from the work of Besley and Burgess, Bhattacharjea considers not only the content of legislative amendments but also the judicial interpretations to Chapter VB in assessing the stance of states vis-à-vis labor regulation. Moreover, Bhattacharjea carries out his own assessment of legislative amendments as opposed to relying on that of Besley and Burgess.[3] He considers two types of regulatory changes—those pertaining to the employment threshold beyond which permission for retrenchments, layoffs, or closures is required; and those to the requirement

3. Bhattacharjea (2006) argues that Besley and Burgess' coding of state-level amendments to the IDA as pro-worker, neutral, or pro-employer were flawed on several accounts, including misinterpretation of various amendments, assignment of identical scores to both minor procedural amendments as well as major changes in job security norms, and the use of a "misleading" cumulation of coded amendments over time.

of obtaining permission—for example, whether permission is needed for closure or for both closure and retrenchment.

Bhattacharjea's detailed account of legislative and judicial interventions affecting Chapter VB enables him to identify points at which one or more states has diverged from the rest of the country. Based on this account, the following characterization appears to emerge. Insofar as the employment threshold is concerned, West Bengal has the most pro-worker regime (a threshold of 50 workers since 1980) while UP has the most pro-employer regime (a threshold of 300 applies throughout the period under consideration). Maharashtra emerges as more pro-worker than the average state because of the lower threshold of 100 introduced in 1982 instead of 1984 as in most other states. Orissa emerges as slightly more pro-worker than the average state on similar grounds.

We accordingly classify Uttar Pradesh as having a flexible regime and West Bengal, Maharashtra, and Orissa as having an inflexible regime vis-à-vis the employment threshold. Admittedly, it may seem rather strong to treat Maharashtra and Orissa as inflexible on account of employment thresholds on the basis of two years (1982 and 1983). But the fact that a certain state passes a legislative amendment or judicial interpretation one way or the other probably suggests something meaningful about a state's stance on labor regulation over a non-trivial period of time.

States have also differed in terms of the requirement for government permission for retrenchments and closures. Maharashtra and Orissa emerge as having required permission on more counts than the typical state at various points of time in the early 1980s (two years for Maharashtra and one year for Orissa). We classify both states as inflexible insofar as the requirement for permission is concerned. Karnataka, Uttar Pradesh, West Bengal, and Tamil Nadu emerge as having had less stringent requirements on permission than the typical state over various years (3, 13, 11, and 3 years respectively, between the mid-1980s and 2001). We classify these four states as flexible.

Columns 2 and 3 of appendix table A-1 describe our coding of states' stance on the need for permission for retrenchments, layoffs, and closures and the threshold employment levels at which permission becomes necessary for retrenchments and/or closures, based on Bhattacharjea (2008). Column 4 describes a composite measure of labor regulations combining the information in columns 2 and 3. This composite measure is constructed as follows. We assign a score of 1 for flexible regulations, 0 for neutral regulations, and –1 for inflexible regulations. We next consider the average across the scores in columns 2 and 3. A positive number is deemed to represent flexible regulations while a negative number represents inflexible regulations.

OECD (2007): A recent OECD study on state-level labor reforms in India uses a survey to identify the areas in which states have made specific changes to the implementation and administration of labor laws. In particular, the survey scores progress in 21 states in introducing changes in recent years to not only regulations dealing with labor issues, but also to the relevant administrative processes and enforcement machinery. The regulations covered by the state-specific survey go well beyond the IDA and include the Factories Act, the Trade Union Act, and Contract Labour Act among others. Within each major regulatory area, a number of issues are considered. Scores are given on the basis of whether or not a given state has introduced changes. A higher score is given for changes that are deemed to be pro-employer.

The OECD study aggregates the responses on each individual item across the various regulatory and administrative areas into an index that reflects the extent to which procedural changes have reduced transaction costs vis-à-vis labor issues. The reduction in transaction costs can come about for different reasons including reductions in the scope of regulations, removing ambiguities in their application, and simplifying compliance procedures.

Based on the values of the index, we partition the states that are the concern of this paper into three equal groups of five. States with a flexible labor related regime include Andhra Pradesh, Gujarat, Haryana, Rajasthan, and Uttar Pradesh. States with an inflexible labor related regime include Assam, Bihar, Kerala, Maharashtra, and West Bengal. The remaining are treated as having a neutral stance. Column 5 of appendix table A-1 describes our coding of states' stance on labor regulations based on OECD (2007).

A Composite Measure of Labor Regulations across States

As noted in the text, labor market regulations can be notoriously hard to quantify. However, there do seem to be certain patterns that are common across the various studies of state-level labor regulations. This can be seen from a quick look at the various columns of appendix table A-1 where diametrically opposite classifications are unusual and not the norm. We create a composite classification of states' stance on labor regulations by first assigning scores of 1 for flexible regulations, a 0 for neutral regulations, and –1 to inflexible regulations in columns 1, 4, and 5, and then adopting a simple majority rule to decide on the overall composite stance of labor regulations. This composite classification is provided in column 6.

TABLE A-1. Labor Market Regulations (LMR) across States

State	*BB*** *(1)*	*AB** permission* *(2)*	*AB-threshold* *(3)*	*AB-composite* *(4)*	*OECD* *(5)*	*LMR* *(6)*
Andhra Pradesh	Flexible	0	0	0	Flexible	1
Assam	0	0	0	0	Inflexible	0
Bihar	0	0	0	0	Inflexible	0
Gujarat	0*	0	0	0	Flexible	0
Haryana	0	0	0	0	Flexible	0
Karnataka	Flexible	Flexible	0	Flexible	0	1
Kerala	Flexible	0	0	0	Inflexible	0
Madhya Pradesh	0*	0	0	0	0	0
Maharashtra	Inflexible	Inflexible	Inflexible	Inflexible	Inflexible	–1
Orissa	Inflexible	Inflexible	Inflexible	Inflexible	0	–1
Punjab	0	0	0	0	0	0
Rajasthan	Flexible	0	0	0	Flexible	1
Tamil Nadu	Flexible	Flexible	0	Flexible	0	1
Uttar Pradesh	0	Flexible	Flexible	Flexible	Flexible	1
West Bengal	Inflexible	Flexible	Inflexible	0	Inflexible	–1

Notes: *Original coding was changed on the basis of narrative/evidence from other studies. In the last column a 1 refers to flexible, 0 to neutral, and –1 to inflexible labor market regulations.

**BB: Besley and Burgess; AB: Bhattacharjea.

Product Market Regulations

Unlike the case of labor market regulations, studies characterizing product market regulations across Indian states are much fewer. In fact, only one study appears to have dealt with this issue in a systematic manner (OECD, 2007).[4] Below, we describe the measures of product market regulations based on OECD (2007). We also consider another indicator based on the World Bank's investment climate study (ICS) for India (World Bank, 2005).

OECD (2007)

OECD (2007) uses a survey instrument in order to assess the regulatory environment facing businesses across Indian states. The survey collects data from state government officials belonging to various regulatory departments as well as from a law firm on the state-specific requirements for setting up two different types of businesses. The information gathered pertain to two sets of issues: the extent of "state-control" and the "barriers to entrepreneurship." The former covers such issues as public ownership of enterprises, the scope of the public enterprise sector, its size, and the extent of direct control over business enterprises. Barriers to entrepreneurship cover administrative burdens on startups and administrative rules and procedures for obtaining clearances and approvals of various types, among other things. The information collected is used for constructing indicators of product market regulation.

In our analysis, we consider the indicator based on "barriers to entrepreneurship." A higher value on the indicator represents a more restrictive regulatory regime in product markets. Out of the fifteen states we consider, we consider the five states with the highest scores as having a restrictive regulatory climate in product markets. Five states with the low scores are treated as having a competitive regulatory climate. The remaining five are deemed to have a neutral regulatory climate. Column 1 of table A-2 also presents this coding.

Investment Climate Study (World Bank, 2004)

Although, the ICS does not present a ready measure of product market regulations across states, it records the perceptions of managers in Indian manufacturing firms across the major states regarding various aspects of the

4. The OECD study is based on the work of Conway and Herd (2008) and Conway et al., 2008.

TABLE A-2. Product Market Regulations across States

State	*OECD—barriers to entrepreneurship (1)*	*ICS—best votes (2)*	*PMR (3)*
Andhra Pradesh	0	0	0
Assam	Restrictive	Restrictive	−1
Bihar	Restrictive	Restrictive	−1
Gujarat	Restrictive	Competitive	0
Haryana	Competitive	0	1
Karnataka	Competitive	Competitive	1
Kerala	0	0	0
Madhya Pradesh	0	Restrictive	−1
Maharashtra	Competitive	Competitive	1
Orissa	0	Restrictive	−1
Punjab	Competitive	0	1
Rajasthan	Restrictive	Restrictive	−1
Tamil Nadu	Competitive	Competitive	1
Uttar Pradesh	0	0	0
West Bengal	Restrictive	0	−1

Note: In the last column, 1 refers to competitive, 0 to neutral, and −1 to restrictive product market regulations.

"investment climate." A particularly robust question across various rounds of the ICS is one in which firms' managers are asked their opinion on which state, other than that in which they are located, has the "best" investment climate. We assign to each state the percentage of respondents choosing that state as having the best investment climate. States with relatively large (low) proportion of votes for best investment climate are deemed to have competitive (restrictive) product market regulations with those in the middle deemed to have a neutral stance on product market regulations. We considered an assignment whereby we would have an equal number of states in each of the three categories. However, this presented a problem. Andhra Pradesh was the fifth-ranked state from the top; therefore, it should be coded as having competitive product market regulations according to an equal three-way categorization. But the proportion of votes it received was very similar to that of Haryana (the sixth ranked) and quite different from Karnataka (the fourth ranked). Thus we coded Andhra Pradesh as having a neutral stance on product market regulations. Column 2 of table A-2 presents the coding.

A Composite Measure of Product Market Regulations across States

As may be seen, by comparing columns 1 and 2, the classification of states' product market regulations are fairly similar across the OECD and ICS based measures. In other words, classifications based on a reading of actual regulations are fairly similar to perceptions of managers of manufacturing enterprises. In order to arrive at a composite measure of product market regulations, we assign a score of 1 for competitive regulations, 0 for neutral regulations, and –1 to restrictive regulations. We next consider the average across the scores in columns 1 and 2. A positive number is deemed to represent flexible regulations, while a negative number represents inflexible regulations.

It may be noted that Gujarat is the only state where the OECD and ICS-based measures yield diametrically opposite classifications of product market regulations. As noted in Conway et al. (2008), the low score of this state on the OECD indicators arises from a very large public enterprise sector and relatively high administrative burdens on firms. Why managers' perceptions are very different for this state is unclear. While it could be because of the manner in which regulations are enforced (perhaps in a light manner, as speculated by Conway et al.), managers' perceptions may also be influenced by the quality of public infrastructure.

TABLE A-3. Correlation between Regulatory and Infrastructure Variables

	LMR	*PMR*	*PCY*	*Infrastructure*	*Roads*	*Electricity*	*Bank credit*
Product market regulations	0.23	1					
Per capita income	–0.21	0.71***	1				
Infrastructure	0.10	0.78***	0.72***	1			
Roads	0.34	0.82***	0.71***	0.70***	1		
Electricity	–0.08	0.73***	0.83***	0.71***	0.81***	1	
Bank credit	–0.08	0.82***	0.86***	0.80***	0.72***	0.77***	1
Bank branches	0.05	0.78***	0.73***	0.86***	0.73***	0.73***	0.89***

Note: *, **, and *** indicate that the correlation coefficients are significant at 10, 5, and 1 percent levels of significance respectively.

Comments and Discussion

T. N. Srinivasan: The authors argue that India's growth experience in the period 1980–2004 is puzzling on two counts. First, the dominant contributor to the acceleration in growth after 1980 as compared to the three decades prior to 1980 has been the services sector and not manufacturing, Second, the relatively lackluster performance of manufacturing cannot be ascribed to lack of reform since there has been substantial product market reforms since the mid-1980s. The manufacturing sector did not respond to the reforms with growth acceleration as it did in other high-growth countries, and the subsectors within manufacturing that performed better happened to be relatively capital or skill-intensive and not labor-intensive industries whose rapid growth would be the desired goal in India's labor-abundant economy. The authors examine their puzzles using aggregate data at the three-digit level of industries for major Indian states from the Annual Survey of Industries (ASI). Their principal findings are (*a*) performance (measured as the logarithm of real value added) varied across states and industries; (*b*) labor-intensive and infrastructure-dependent industries performed relatively poorly; (*c*) performance of labor-intensive industries in states with relatively inflexible labor regulations was relatively poor; (*d*) states with relatively more competitive product market regulations and better infrastructure have performed relatively better in all industries. The authors do not note that the services sector grew faster than manufacturing except during 1950–51 through 1964–65, 1991–92, and 1996–97. The more rapid growth of manufacturing in the first three plans is no surprise, given the substantial increase in investment, particularly in heavy industry by the public sector. Thus the first puzzle, if it is indeed a puzzle, is a long-standing aspect of Indian growth and not just a post-reform phenomenon (Mohan, 2008, Table 1).

For those, such as myself, who believe in the virtues of competition as a means for enhancing efficiency and growth through efficiency gains, and in the deleterious consequences of Indian regulation that increased costs, broadly speaking, including costs of hiring (and firing once hired) of labor and more generally costs of entry, operation, and exit, costs of participation in world markets as well as costs of investment (for domestic and foreign investors), the findings of the authors ought to be comforting. However, I do not feel as comforted as I ought to and thought I would because of several concerns with the empirical analysis. I had expressed some of these when the paper was first presented and to which the authors have responded though not altogether to my satisfaction, in the final revision.

Let me begin with the proxy for reforms in the empirical analysis called "delicense"—it is an industry- and time-specific dummy variable that takes the value 1 for the years and industries in which these industries did not require an industrial capacity license, or more precisely, permission from the government to set up new capacity or increase capacity or change product mix from existing capacity, and the value 0 for other years or industries. The license specified the amount of capacity licensed and the products for the production of which the capacity was licensed, with no freedom for an enterprise to change its product mix given its licensed capacity in response to market conditions. In fact, one of the reforms of the mid-1980s was the so-called broad-banding in which firms with a licensed capacity to produce specified product(s) were allowed flexibility to produce related products, also specified by the government. Although technically this is not delicensing in the sense of removal of the licensing requirement altogether, it certainly is an enabling policy reform that raised the potential output from existing capacity without additional investment. If I understood the authors' definition of "delicense" correctly, it does not include broad-banding.

The most important point to note is that delicensing and even broad-banding without delicensing are both *enabling policies* in that they either removed restrictions on capacity creation altogether or allowed a more flexible use of existing capacity. Whether or not the enabling policy reform in fact was utilized to add capacity and/or produce more from existing capacity than earlier and thus accelerated growth would depend on whether or not the constraint on capacity imposed by licensing was the binding constraint on the expansion of output. Without any presumption about this, one cannot say, *a priori*, whether capacity delicensing *per se* should raise output or its growth. Besides, even if licensed capacity in general was the only binding constraint, its removal will have differential effects over time and across industries. The authors' econometric specification in Equation 1 postulates a common regression coefficient gamma for the delicensing dummy variable that by definition ignores this heterogeneity.

To be fair to the authors, they try to tackle this problem in part by interacting the delicensing dummy with other possible constraining variables such as industry characteristics, state characteristics, and the interaction between state and industry characteristics. But this is inadequate—the point is simple, the value of 1 for the delicensing dummy, say for industry 1 in year 1980 and 1985 (or say in year 1980 for industries 1 and 2) could in principle have different impacts on the log output or log employment of industry 1 in years 1980 and 1985 (or for output of industries 1 and 2 in year 1980), not only because of possible differences in the values of other variables with which it is interacted but also more importantly because the process of granting or withholding a license was discretionary and at the level of *individual firms*, whereas the authors' analysis is based on aggregate data. What a firm did with its license if it got one depended both on its *ex ante* motive for applying for a license, particularly for augmenting capacity, and its market environment after the license was issued. A firm may not create the capacity it was licensed to produce if *ex ante* it applied for the license only to prevent others from entering its market or if the market environment no longer made investment profitable.

I am afraid that judging the success or failure of a reform agenda of which capacity delicensing is only one component by the dummy variable methodology of the authors is inadequate. It is indirect, focusing on the impact of delicensing on output or employment of industries without explicitly bringing in the precise *mechanisms* through which capacity delicensing could potentially affect *both* and examining whether such mechanisms were present in the industry–states–time periods analyzed, and if one or more of them was present, whether their operation was not constrained in some way or the other. In other words, the authors' methodology is best viewed as estimating *one equation* of a set of reduced-form equations of an unspecified structural model by using variations across industries and states and over time in the pattern of delicensing as the identifying strategy. On the other hand, the problem requires the specification of a structural model, identifying and estimating it.

Let me cite just one example, namely, that of trade liberalization to illustrate the problems with the authors' estimation strategy. The pre-reform trade policy regime at different time periods included some or all of several elements: formal tariff barriers, non-tariff barriers of various kinds including, most importantly, quantitative restrictions on imports, multiple exchange rates as well as foreign exchange allocations, and import licensing, which not only distinguished between (and among) capital, consumer, and intermediate goods imports, both in the tariff structure and between importers such as traders and actual users, and so on. This structure of restrictions on foreign investment, import of technology, royalty payments, and so on, and of exchange control was also equally complex. Clearly, any *single* dummy variable, albeit time–state–industry specific, cannot capture the time-varying and state-varying restrictiveness of such a complex regime and its liberalization and also allow for the fact that not all restrictions were removed at once (for example, the quantitative restrictions on imports were not eliminated until 2001). Moreover, the response of the system to removal of some of the restrictions would depend both on which restrictions remained and on whether resources (such as labor and capital) could move to sectors experiencing liberalization from those that are not. In fact, resource movement is a major mechanism by which trade liberalization is expected to improve efficiency, productivity, and growth. Any analysis that attempts to link an aggregate liberalization variable with proxies for efficiency or growth rates, without bringing in explicitly the mechanisms of resource movements and restrictions, if any, on their operation ignores the fact that the world of Indian or other liberalization is one of “second best.” As is well known, predictions of the effects of trade liberalization based on a hypothetical world of “first best,” such as growth and welfare gains, do not necessarily hold in the “second best” world. Alas, a lot of empirical research on India’s trade liberalization and/or policy reform, including the authors’, is fundamentally flawed for this reason.

Incidentally, external sector reform, an important, if not the most important component of the reform agenda, does not figure in the Gupta et al. analysis although the introduction claims that promotion of manufactured exports was a major objective of reforms. After all, given that external sector reforms (and indeed other components of reforms as well) largely excluded agriculture, in a paper focused on the manufacturing sector, not including external sector reforms is surprising.

I will conclude with some relatively less important issues. First, the authors’ analysis is based on ASI data at the establishment-level and not firm-level data, but many of the controls operated at the firm level. Moreover, since ASI data include a “census” component covering all large establishments and a “sample” component that is based on a random sample of smaller establishments, the authors should make it clear whether they have used both components and if so, whether they distinguished them in the analysis. This matters because *a priori* one could argue that the behavior of census establishments could be different from that of sample ones since the two differ not only in size but possibly in other dimensions as well.

Second, figure 4 of the paper presents simplistic “head count” rates of the proportion of industries delicensed—no data are provided showing how significant the delicensed industries were in terms of their share of industrial value added, capital stock, or employment. Moreover, possible variations in the nature of delicensing across industries are not captured by these rates.

Third, the authors cite studies purporting to show that India's draconian labor laws had no impact on industrial performance since they have been either evaded or avoided. The authors do not recognize that most of these studies are flawed both because of their not taking into account that evasion and avoidance actions are not costless and because they are mostly static, based on data from firms in existence and thus subject to survivor bias, that is, the data obviously cannot take into account firms that could have entered an industry but did not because labor laws raised their hiring and firing costs, and also firms that entered and later exited because they could no longer afford such costs.

Fourth, the authors "assign" a code of –1 to inflexible labor laws, 0 to neutral ones, and 1 to flexible ones. Implicitly this means that the effect on performance of changing laws from inflexible to neutral would be the same as a move from neutral to flexible. There is no reason for such a presumption. Instead, the authors could have used these dummies for the three categories so that any pattern of the effects of inflexible, neutral, and flexible labor laws could emerge from the analysis. Moreover, they code the states as pro-labor, pro-business, or neutral "if the majority of studies in the literature which have calculated these codes do so" and claim that this way of coding weeds out those instances in which a "particular methodology or data used by a researcher is subject to measurement error." A moment's reflection is enough to convince anyone that this claim has no analytical foundation. Moreover in the majority-based coding, each study is treated symmetrically regardless of its methodology, its database, or any other relevant feature.

Fifth, the authors separately estimate their full model of Equation 1 and various versions of it. Since all these versions are nested in the full model, they could have derived all their conclusions from the estimates of the full model itself.

Sixth, as I had pointed out in my comments last year, the myriad fixed effects in the model (there are about 1000 of them!) explain most of the variation in industrial performance across industries, states, and over time, and the delicensing variable and its interactions, labor law codes, and so on, have collectively negligible explanatory power. While conceding this point, the authors suggest that the statistical significance of coefficients (that is, whether they are significantly different from zero) is of greater interest than their contribution to R squared. However, statistical significance is not the same as economic significance—the latter is proxied by R squared. Thus, the fact that fixed effects contribute virtually all of R^2 essentially means that we are largely ignorant of what drives the variation. To illustrate, if, say, the coefficient of a state's fixed effect is significantly negative, we know only that the state's performance relative to the 1, which is the base comparator, is significantly worse, but we have no clue from this fact as to why it is worse.

Finally, the authors' response to some of my last year's comments is to claim that they are essentially following what is "common practice" in the *literature*, such as "borrowing" data of other countries without examining whether following common practice makes sense. True, the authors do some robustness checks, but these have their own limitations.

In sum, the authors are to be commended for attempting to analyze the impact of policy reforms empirically. Unfortunately, the weakness of their empirical methodology and data used warrant extreme caution in accepting their findings.

Rajiv Kumar: The paper by Gupta et al. is important because it helps us to improve our understanding of the Indian manufacturing sector especially in the context of the stagnation in manufacturing sector's share in the GDP. It is crucial that we identify the constraints on pushing up manufacturing sector growth because it is a myth that some people try to perpetrate that India can do without manufacturing and simply leapfrog this stage of development and achieve rapid growth only on the basis of services sector growth. But some people are now pointing out that the whole definition of manufacturing in India has changed with the sector now shedding or outsourcing a large segment of activities that were earlier subsumed under manufacturing and are now included in the burgeoning services sector. Apparently and expectedly, Professor Jagdish Bhagwati had already talked about the phenomenon of "disembodiment of manufacturing" as early as the 1970s or 1980s. This disembodiment of manufacturing, which is what is probably happening now in India, implies a structural break in the data over time and makes it difficult to estimate trends in manufacturing sector's share in GDP. One example would suffice. Tata Motors, until the beginning of 2000 or late 1990s, would have had under its corporate umbrella, and hence as part of the manufacturing sector, the entire range of activities ranging from their designing center, the production of special machine tools to the service station managed by the company itself. But lo and behold, of course, in the last 5–10 years, a number of these activities have been outsourced and, therefore, just the core activity of Tata Motor's production plants in Jamshedpur and Pune are the only output and employment that are now included under Tata Motors, and as part of the manufacturing sector. The sector's share shrinks without a shrinkage in the level of activity. Therefore, all time series data is open to scrutiny and this is why I think TN's advice on not depending on industry-level aggregate data and going to the firm level is important in this situation.

I think probably the paper's data ends at 2003–04 financial year. However, there has been a manufacturing sector take-off after that, which has been quite amazing. The sector's growth has, in fact, in a couple of years, surpassed that of services. I think that would be much better to capture that change in the authors' empirical exercise. This is important because until this recent spurt in growth, there was not much differential in manufacturing sector growth rates either across industries or across states. So it is difficult to see what the empirical exercise will capture. We need to update the exercise for the period after 2003–04 to be able to identify the drivers of growth because by updating the data set there will be rich information from the thirty-four or thirty-six quarters of rapid growth in industrial output. That is the period that the authors would want to capture to do an empirical exercise of that level.

Given that results obtained are not very different from those obtained in previous studies, a natural question will be on the usefulness of yet another quantitative exercise. However, in my view there is no harm in reiterating what we may know already, especially when policy action is still missing. But I think given existing work on labor market regulations and their impact on firm behavior, which covers a large range of issues such as judicial oversight, implementation problems, large firms being able to handle these regulations much better than smaller ones, it may be more useful to take the discussion to a more detailed level. I think we need to perhaps shift the debate and discussion in India away from simply talking of Section 5 of Act 35 of the Industrial Disputes Act to something deeper and more detailed in the context of the labor market. I do not know whether exercise like the one undertaken in this paper is able to do this.

I am a little bit surprised at the recommendation that the choice is between having a policy/reform package or nothing at all. That is very dismaying because that really would not be possible. Therefore, to that extent, I would have preferred that the authors would have been able to rank their recommendations in some order of priority because to make policy recommendations that are well beyond the political or administrative capacity of the state governments simply results in no action at all. We have to follow an incremental approach even if it is clearly second best because making some advance is certainly better than no policy movement at all.

It is not clear why we would suddenly combine export intensity as one of the industry characteristics while all other industry indicators that have been selected such infrastructure dependence, labor intensity, and so on, relate to the supply side. I do not know what it does to the econometrics but it does make your industry-set somewhat incomparable by expanding the range of industries that you are including in your exercise. This could affect the results.

Let me then come to the assumption about technology being fixed, which implies that relative labor intensities do not change either across industries or over time. I shall give you an example—let us say, of the plastics and chemicals industries. De-reservation and de-licensing have made a big impact on the downstream segment of this industry. Nearly all the units were earlier in the small-scale industry segment and therefore, hugely labor-intensive. But with the entry of larger firms in this downstream segment as a result of the de-reservation policy in sectors such as plastics and textiles and garments, technology has changed significantly and consequently, labor intensities would also have changed. Given such industry-specific policy changes, which are rather the norm in India, technological progress can be significantly varied across industries and thus affect relative factor intensities very differently. So this assumption does need to be examined, and if possible, should be dropped. Apart from the issue of different rates of technological progress across industries, as Professor Srinivasan has said, assuming that technology remains unchanged also implies that incentives do not really matter.

The other thing is, why is infrastructure a policy variable? In the time frame that the authors are considering, there has not been much policy change here. It is just the supply of infrastructure. So, either we bring in something of an argument that advent of public–private partnership has improved the availability of infrastructure in the current years compared to the past or that the supply of private infrastructure is different from the past. Unless this is the case and the rate of growth of infrastructure capacity has been changing over the years, the empirical exercise does not really reveal very much. The only conclusion can be that the infrastructure constraint on manufacturing sector growth is a binding one and this is, of course, incontestable.

The other puzzling feature about the data is to assume that both Gujarat and Uttar Pradesh are at the same level of product market reform. This is simply not true. And it is akin to the conclusions of Besley and Burgess study on labor market reforms, which concludes that Gujarat public policy was negatively inclined toward investment and has been pro-labor, ahead of a state like Uttar Pradesh. To me this suggests the need for a more detailed and nuanced study of product and labor markets across states that will help us understand the true picture. The majority rule that the authors follow is I think very safe, but at some stage, as authors, they will have to take a view of their own on what they think are the major constraints or determinants of manufacturing activity in the country. Therefore, we would require them to look at these state-level reforms more deeply rather than just depend on others' findings.

I am quite surprised at the authors' omission of foreign direct investment (FDI) as one of the determining variables especially when they consider the performance across industry segments. One of the key weaknesses of the Indian manufacturing sector is its inability to get into mass labor-intensive export-oriented manufacturing. The principal reason for this in my view has been the relative absence of FDI in industries unlike China and unlike all Asian Tigers in the past. I would, therefore, urge to examine the reasons for which FDI is relatively weak in India as this may well turn out to be one of the key determinants of manufacturing sector performance.

This brings me to my last point, which is that having been in the Confederation of Indian Industry and seen it a little bit from the inside, I think we have to address the broader issue of defining the objectives of industrial policy in the country. Could it be that the implicit objective of public policy is to develop indigenous industry along with its own branding and brand equity? There can be a trade-off between developing the indigenous industry capacity and brand equity on the one hand and the larger objective of pushing growth and employment generation in industry. Given the implicit policy objective, there seems to be a clear bias in favor of the former. Some experts like Alice Amsden of MIT may perhaps endorse this policy of developing national champions even at the cost of lower rates of growth and employment. I am firmly on the other side because for me, achieving full employment in a poor country like India must be the key policy objective as it is not only an issue of reducing poverty and improving material conditions but also of assuring self-esteem that comes with being productively employed. So, following are the two issues that I leave for the authors' consideration. Please do include FDI as an important determining variable when looking across industries and, secondly, do think about what you want in this issue of the trade-off between generating mass employment versus developing indigenous firms and brand equity.

My last point is about employment generation in the manufacturing sector. We know that National Sample Survey Organisation's latest data shows that between 1999 and 2004, all increase in employment in manufacturing has occurred in the unorganized sector. Therefore, any discussion on employment generation in industry that only looks at registered and organized industry would perhaps not clearly capture this positive development and in fact could be misleading. Therefore, we have got to look at the unorganized sector if we want to get the true picture of manufacturing sector employment.

This will perhaps help us to answer the important question as to why the dualism persists and 94 percent of our labor force still remains in the unorganized sector. We need to identify the policies at the state and the Central Government level that are responsible for the persistence of this dualism. Addressing this issue is perhaps crucial in order to understand why Indian manufacturing is not growing as fast as it can and as rapidly as it should to be able to absorb the increasing workforce and draw out labor from the agriculture sector.

General Discussion

Sisira Jayasuriya noted that the growth of manufacturing in China had a number of special features: the role of foreign direct investment, the importance of transnational companies, and the fragmentation of production throughout East Asia. These reflected a series of policy reforms affecting the international sourcing of factor and product inputs whereas the present study seemed to assume that all such inputs would be domestically sourced.

Esther Duflo raised two points, subsequently pursued by other participants. These were, whether the sector or the firm was the most appropriate level of analysis and how to judge the importance of labor legislation in retarding growth of organized-sector manufacturing.

Since the empirical results suggested that markets were not successful at allocating inputs efficiently across firms within sectors, she felt that individual firms might be the better unit of analysis. And the fact that the labor regulations variable had differential effects as between labor-intensive and non-labor-intensive industries in equations with other interactive variables was not conclusive to her about the strength of the effect of this variable on industrial growth. She also expressed surprise that not much attention had been paid in the paper to the role played by credit markets.

Based on her own experience, Anne Krueger was more skeptical as to the value of firm-level analysis. Individual firms were subject to numerous idiosyncratic shocks (such as strikes) and had their own growth patterns, which made it difficult to draw meaningful generalizations on the impact of policy. On outsourcing, she thought it made sense not only to look at value added, as had been done by the present paper, but also gross value of output. She also believed that the impact both of small-scale reservations policy and of labor market regulations, particularly the disruptive power of trade unions, were more powerful in shaping industrial structure than the paper's methodology allowed.

The authors responded that they had put in a great deal of thought and effort in reviewing and assessing alternative industrial datasets. The available firm-level data (Prowess) was limited to a fixed sample of firms. Nonetheless, it had useful information on such issues as the growing importance of outsourcing of production. However, what would seriously affect their empirical results was whether the importance of outsourcing differed systematically by industry; on this there was little evidence. It was not certain that increased outsourcing necessarily would result in slower industry growth; increased productivity could compensate for greater specialization.

Surjit Bhalla believed that a critical assessment needed to be made of the Annual Survey of Industries (ASI) data on manufacturing employment, which the paper had used, by comparing it to the data from other official sources such as the National Sample Survey (NSS). For example, one of the figures suggested that employment in registered employment had only grown by 10 percent in the period 1977–2004. Such an assessment would in turn impact on measures of labor productivity growth in manufacturing, which at an average of 7 percent per year over a span of thirty years, did not strike him as plausible. The authors responded that they intended to look at NSSO's data on the unorganized sector to establish whether large firms (that should have been part of the ASI frame) were being excluded in a systematic way. A generalized worsening of the ASI frame would not affect their qualitative results.

Devesh Kapur, returning to the impact of labor legislation, noted that there were multiple senses in which the term "labor legislation" was employed and measured. There was the law as passed by the state legislature, its enforcement by the state Labor Tribunal, and the interpretation of the legislation and its implementation by the Supreme Court.

The most widely used state-level measures (such as those of Besley and Burgess) focused on the first whereas what mattered were business expectations of the actual likelihood of implementation. Judgments of the Supreme Court since the late 1990s marked a sea change in stance, and were influencing the appeals to state tribunals and the decisions of those tribunals. He also pointed out that labor laws needed to be assessed both in their effects on incumbents and on new entrants, which were likely to differ. With regard to recent data, he drew the attention of the authors to recent firm-level data collected by the Indian Institute of Management Ahmedabad for the National Manufacturing Competitiveness Commission. He also noted that in recent years, firm responses to the ASI had deteriorated as compliance was now voluntary.

Arvind Panagariya noted that, for reasons that were not completely established, India (unlike China) had few large-scale firms in labor-intensive industries. The usual assumption was that the development of such firms had been inhibited by small-scale reservations, which primarily applied to the labor-intensive sectors. The results for labor-intensive industries could, in part, be picking up this scale effect. He also noted that small-scale reservations had in practice largely been eliminated since 2000 for firms primarily producing for export.

Dilip Mookherjee returned to the issue of the appropriate level of analysis. He noted that an important response mechanism to policy reform was the reallocation of production within a sector from less efficient to more efficient firms. Such "cross-firm effects" could only be captured by examining trends at the industry level. Noting that the paper's main result was what he called the "triple interaction" effect (among labor market flexibility, labor-intensive industries, and response to delicensing), he believed that it was exactly this set of industries that would respond by resorting to outsourcing. In this context he believed that it was important to study the interactions between the formal and informal sectors, and the efficiency costs of substitution away from the formal sector to the informal sector. These important issues could not be addressed by the present data. While the focus of the paper was on the impact of delicensing, in reality, delicensing was captured by a time (and industry) dummy which also would pick up other reforms that took place concurrently, such as reduction of import tariffs.

Kaushik Basu noted that while the authors' focus was on liberalization of entry, an equally important determinant of private investment was the ease of exit. This was only partly a matter of labor laws; it was equally influenced by the general bankruptcy regime, where India lagged well behind other emerging markets, as indicated, for example, by the World Bank's surveys. This determinant of industrial performance could be explored by the paper. He also noted that a relatively low share of manufacturing in GDP was not specific just to India; it was also true of other countries in South Asia, notably Pakistan, which were characterized by fewer restrictions on labor laws than India.

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Some New Perspectives on India's Approach to Capital Account Liberalization

Introduction

Capital account liberalization remains a highly contentious issue. Proponents argue that it fosters financial globalization—a term that broadly encompasses cross-border flows of financial capital in various forms. This phenomenon, in principle, should allow for a more efficient allocation of financial resources across countries and also permit countries to share their country-specific income risk more efficiently thereby increasing economic welfare on both counts. Detractors have blamed capital account liberalization as being the root cause of the financial crises experienced by many countries and argue that the deck is particularly stacked against non-industrial countries, which have experienced few benefits but exposed themselves to considerable risks (see, for example, Bhagwati, 1998; Rodrik, 1998).

The polemics on both sides are again becoming heated as emerging market economies and even some low-income countries are having to cope with volatile capital inflows, even as major economies like China and India are contemplating further opening of their capital accounts. Meanwhile, there have recently been important advances in the academic literature. This is causing researchers to take a more nuanced approach to the issue and to frame the debate in terms of a complex set of cost–benefit tradeoffs. One of the key conclusions of the new literature is that the principal benefit of financial openness for developing economies may not be access to foreign capital that helps increase domestic investment by relaxing the constraint

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imposed by a low level of domestic saving. Rather, the main benefits may be indirect ones associated with openness to foreign capital, including the catalytic effects of foreign finance on domestic financial market development, enhanced discipline on macroeconomic policies, and improvements in corporate governance as well as other aspects of institutional quality.

A major complication, however, is that economies that have weak initial conditions in certain dimensions seem to have much worse outcomes from their integration into international financial markets, in terms of both lower benefits and higher risks. For countries below these "threshold" conditions, the benefit–risk tradeoff becomes complicated and a one-shot approach to capital account liberalization may be risky and counter-productive. Some of these threshold conditions (for example, level of financial development and quality of domestic institutions) are similar to the list of indirect benefits, pointing to a difficult tension faced by low- and middle-income countries that want to use financial openness as a catalyst for those benefits but would then face the risks associated with being below the threshold conditions.

At the same time, the practical reality is that emerging market countries are having to adapt to rising financial globalization. Capital controls are being rendered increasingly ineffective by the rising sophistication of international investors, the sheer quantity of money flowing across national borders, and the increasing number of channels (especially expanding trade flows) for the evasion of these controls. Hence, emerging market economies like China and India are perforce grappling with the new realities of financial globalization, wherein capital controls are losing their potency as a policy instrument (or at least as an instrument that creates more room for monetary and other macro policies).

Developments in international financial markets also have a bearing on this issue. In recent years, emerging markets had been getting more capital inflows than they could comfortably handle, causing complications for domestic macroeconomic policies and also exposing these economies even more to the volatility of foreign capital. International investors, especially from industrial economies, had turned up in droves at the shores of emerging markets in recent years but are now retreating due to the recent global financial turmoil. It is likely that once financial markets settle down, they will again be lured by the strong growth prospects of many emerging mar-kets as well as weak growth and low interest rates in their home countries. The same forces are also likely to cause domestic investors in emerging markets to resume repatriation of their capital from abroad.

Against this background, the objective of this paper is to provide a critical analysis of India's approach to capital account liberalization program through the lens of the new literature on financial globalization (Bhagwati's essay presages many of the ideas being developed in this literature). In recent years, the Reserve Bank of India (RBI) has taken what it calls a calibrated approach to capital account liberalization, with certain types of flows and particular classes of economic agents being prioritized in the process of liberalization (Reddy, 2007). I will evaluate the effectiveness of this approach in terms of the narrow objectives of influencing the quantity and composition of flows, and also in terms of macroeconomic consequences. This will involve an empirical characterization of the evolution of financial openness based on *de jure* measures of capital account openness as well as *de facto* measures of financial integration. I will also examine the evolution and structure of inflows and outflows. I will then relate these to the literature on the determinants and effects of external capital structure.

The cautious and calibrated approach has meant that India's capital account liberalization has proceeded in fits and starts but the net effect is that, over time, the capital account has become increasingly open and India has been rapidly integrating into international capital markets. While this approach has to some extent helped protect the country from the volatility induced by financial flows, a key question is whether this approach may have subtle costs in terms of efficiency and welfare that outweigh this benefit.

The main thesis of this paper is that, at this juncture, a more reasonable policy approach is to accept rising financial openness as a reality and manage rather than resist (or even try to reverse) the process of fully liberalizing capital account transactions. Dealing with and benefiting from the reality of an open capital account will require improvements in other policies, especially monetary, fiscal, and financial sector regulatory policies. This approach could in fact substantially improve the indirect benefits to be gleaned from integration into international financial markets.

This line of reasoning does not mean that capital account liberalization should be a key policy priority and that the remaining restrictions on the capital account should be dropped at one fell swoop. But it does imply that there are some subtle risks and welfare consequences that can arise from holding monetary and exchange rate policies as well as financial sector reforms hostage to the notion that the capital account should be kept relatively restricted for as long as possible. It may seem reasonable to maintain whatever capital controls that still exist in order to get at least some protection from the vagaries of international capital flows. Not only is this not a realistic proposition, but I will also argue that it could detract from many of the potential indirect benefits of financial integration. In summary, steady progress toward a more open capital account may be the most pragmatic policy strategy.

In the next section, I provide an overview of the new literature on the benefits and risks of financial globalization. In the section titled "How Open is India's Capital Account," I describe the evolution of India's financial openness based on a wide range of indicators. In the subsequent three sections, I provide a detailed analysis of the structure of and changes in India's balance of payments, cross-border financial flows, and international reserves. In the final section of the paper, I discuss the implications of India's approach toward capital account liberalization for monetary and exchange rate policies and for financial sector reforms. While full capital account liberalization is hardly an end in itself, it can provide a useful framework for setting in motion a broader set of macroeconomic reforms.

Paradoxical Results but Composition of Liabilities Matters

Despite the strong theoretical presumption that financial openness should boost growth in developing countries, macroeconomic evidence of the growth benefits of financial openness remains elusive (see Kletzer, 2004 and Kose et al., 2006 for surveys). Although there is a positive correlation between measures of financial openness and growth, this correlation vanishes once one controls for other determinants of growth such as financial development, quality of institutions, and macroeconomic policies. More recent evidence based on better measures of *de facto* financial openness or specific types of liberalization (such as equity market liberalizations) does show more positive effects. Analysis based on industry- or firm-level data is also more supportive of the efficiency and growth benefits of financial globalization. But this evidence is hardly conclusive.

Indeed, there is some remarkable new evidence that non-industrial countries that rely *less* on foreign capital have on average posted better long-run growth outcomes (Aizenman et al., 2007; Gourinchas and Jeanne, 2007; Prasad et al., 2007). This result is not just limited to the recent period of rising global imbalances, when some fast-growing economies like China have on net been exporting massive amounts of capital. This result holds up over much longer periods of time and is not specific to countries in any particular region. Rodrik (2007) interprets these new findings as suggesting that the real constraint to growth in many less-developed economies is investment not savings. Ineffectual financial systems may not be up to the task of efficiently intermediating domestic savings into investment, let alone being able to intermediate foreign capital efficiently.

Given these empirical findings, a new paradigm is emerging that the main benefits of financial globalization may not be through the direct channel of providing more financing. Rather, the main benefits may be in terms of catalyzing financial market and institutional development, stimulating gains in efficiency through competition and access to new technologies, and disciplining macroeconomic policies (figure 1). There is accumulating evidence for this paradigm although it is by no means conclusive yet.[1] Nevertheless, this paradigm has important implications for empirical analysis of the effects of capital account liberalization and also for designing such liberalization programs.

A complication, however, is that there appear to be some threshold conditions that influence the cost–benefit tradeoff. Indeed, factors such as financial market development and the quality of institutions also seem to play a crucial role in determining the extent of benefits a country can derive from financial openness and also how vulnerable it is to the risks associated with capital flows. These thresholds are considerably lower for certain types of financial flows—foreign direct investment (FDI) and portfolio equity, in particular—and higher for debt inflows.[2] Indeed, there are many examples of how underdeveloped or poorly regulated financial markets and weak institutions can interact in ways that result in misallocation of foreign capital and make countries vulnerable to financial crises.[3]

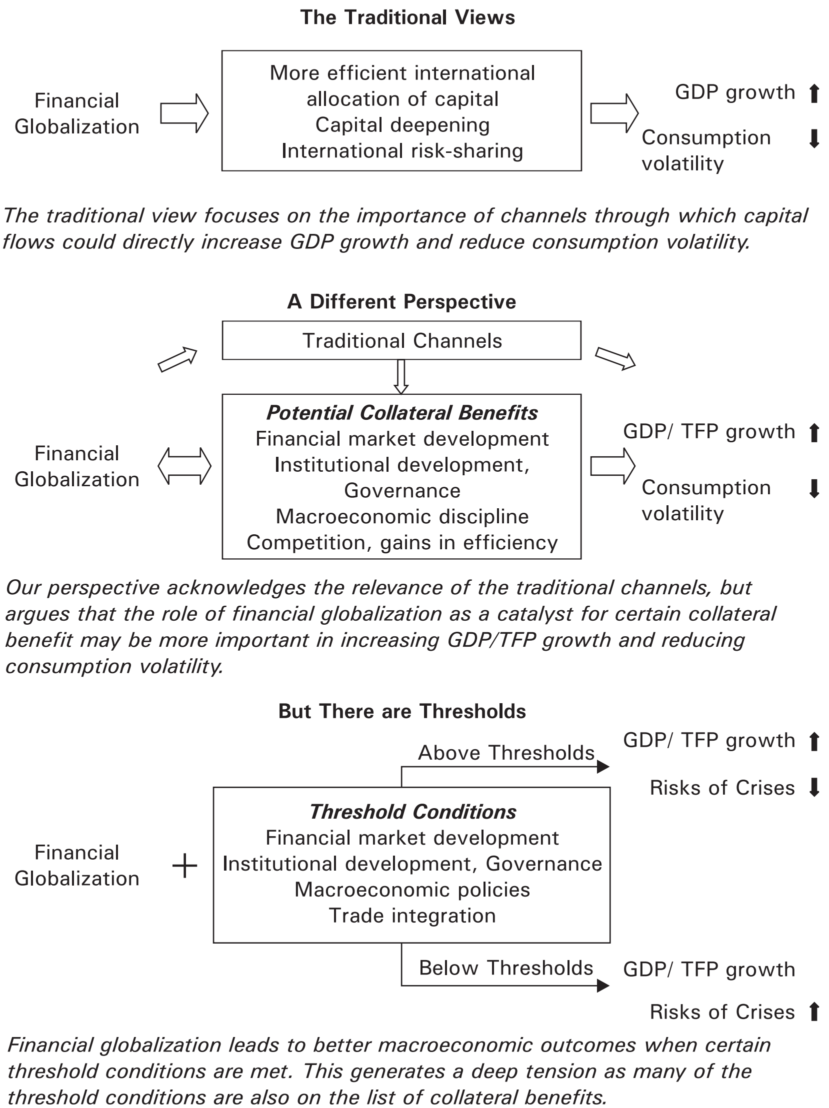
This framework clearly highlights some deep tensions in the process of capital account liberalization that cannot easily be avoided. But the collateral benefits-thresholds framework also suggests a way forward. If one can

1. Kose et al. (2006) develop this framework and survey the evidence on each of these potential indirect (or "collateral") benefits (also see Mishkin, 2007). There is a growing body of evidence—based on country case studies as well as cross-country analysis using both macroeconomic and microeconomic (firm- and sector-level) data—that financial openness tends to positively influence financial development and institutional quality. The evidence that it boosts macroeconomic discipline remains sparse, however. For skeptical views about the notion that financial integration delivers such indirect benefits, see Eichengreen (2007) and Rodrik and Subramanian (2008).

2. Kose et al. (2008) review the theoretical basis for such threshold effects and provide some quantitative evidence that thresholds matter, even though it proves difficult to pin down precisely the exact levels of various thresholds. Mukerji (2009) provides evidence that higher levels of financial development and stable macroeconomic policies enable countries to gain modest growth benefits from capital account convertibility, while weak financial systems and macroeconomic vulnerabilities increase growth instability without raising average growth.

3. See Krueger and Yoo (2002) and Desai (2003) for interesting narrative accounts.

FIGURE 1. Gains from Financial Globalization: Alternative Views



Source: Kose et al. (2006).

prioritize the indirect "collateral" benefits that a country needs, it should in principle be possible to undertake a controlled capital account liberalization that helps attain these benefits while reducing the risks. Thus, the framework encompasses a general approach that can still take account of country-specific circumstances and initial conditions. For instance, Prasad and Rajan (2008) propose a method for countries experiencing sustained large inflows to securitize their reserve accumulation. This would, in a controlled way, help balance the inflows by encouraging outflows, and would deliver the indirect benefits of broadening financial markets and allowing citizens of these countries to benefit from international portfolio diversification.

Risk Sharing

It is also worth considering other potential benefits of financial openness rather than just its effects on GDP growth. One of the main presumed benefits of international financial integration is that it should facilitate international trade in financial assets, thereby enabling countries to diversify away their income risk and thereby smooth their consumption growth. Remarkably, the evidence shows that financial integration has, on average, led to *worse* risk sharing outcomes for emerging market economies during the period of globalization. Only industrial countries have been able to more efficiently share risk through the process of financial integration. Kose et al. (2007) document these patterns in the data. They also probe more deeply into why financial integration seems to hurt emerging markets on this dimension.

They find that stocks of FDI and portfolio equity liabilities are in fact associated with better risk sharing outcomes while stocks of external debt liabilities are not. Indeed, this goes a long way toward explaining the paradoxical outcomes for emerging markets. Until recently, financial integration for these economies largely took place in the form of debt accumulation. Not only are debt flows themselves procyclical, interest payments on external debt are typically not indexed to the business cycle, so they have a procyclical element to them as well. FDI and portfolio equity flows by their very nature involve a sharing of risk between foreign investors and their host countries. They have also tended to be more stable than debt flows. Interestingly, advanced economies do not seem to suffer similar problems from debt flows, which still dominate cross-border flows among these economies. This could be because they have better-developed financial markets and, typically, more flexible exchange rates, both of which act as shock absorbers in the face of capital flow volatility.

Productivity Growth

The literature about the indirect benefits of financial integration emphasizes that the main benefits of financial integration are in terms of total factor productivity (TFP) growth. Interestingly, while there has been a vast literature examining the effects of integration on output growth, scant attention has been paid to its effects on TFP growth. In a recent contribution, Kose et al. (2008) find that *de jure* capital account openness is positively associated with TFP growth. Surprisingly, however, overall *de facto* financial integration is not correlated with TFP growth. This turns out to mask a novel and interesting result. FDI and portfolio equity liabilities are in fact associated with much higher productivity growth, while stocks of debt liabilities are negatively correlated with TFP growth, especially in economies with underdeveloped financial systems. What explains this difference? The indirect "collateral" benefits of financial flows tend to flow from FDI, in terms of technological and skill spillovers, and from portfolio equity, in the form of increased depth and innovations in equity markets. Financial sector FDI has also been found to help in the import of good governance practices and financial innovations (Goldberg, 2004).

A common theme that emerges from this new literature is that, in terms of evaluating the potential benefits and risks of financial integration, the composition of the stock of external liabilities is highly relevant in a number of dimensions. This is of course not a big surprise—for instance, it is in line with the earlier literature on sequencing of capital account liberalization. Nevertheless, it is comforting that some of the theoretical predictions about the benefits of financial integration can be recovered with a suitable disaggregation of the data.

This brief overview of the new literature on the benefits and costs of financial openness will help us in understanding the implications of India's rising financial openness. To begin with, we need to know how open India's capital account actually is.

How Open is India's Capital Account

The traditional approach to measuring financial openness is to use measures of legal restrictions on cross-border capital flows. The conventional binary indicator of capital account openness is based on information contained in the International Monetary Fund's (IMF) *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER) for each of the IMF's member countries (Schindler, 2007). Authors such as Miniane (2004), Chinn and Ito (2006), and Edwards (2007) have developed finer measures of capital account openness using disaggregated information from the AREAER.[4]

4. See Mohan (2008, Annex 1) for a comprehensive listing of capital controls still in place in India.

An alternative approach is to use a *de facto* measure that tries to take into account how much a country is integrated into international capital markets in practice.[5] A measure of gross flows as a ratio to GDP captures two-way flows, which one would expect to see if economies were in fact sharing risk efficiently in a world with multiple financial instruments and agents with different risk profiles. Using the sum of gross inflows and outflows as a ratio to national GDP also yields a nice symmetry with the widely used measure of trade openness, which is the sum of imports and exports as a ratio to GDP.

However, such annual flows tend to be quite volatile and are prone to measurement error. To mitigate (but obviously not eliminate) these problems, Kose et al. (2008a) propose using the sum of gross stocks of foreign assets and liabilities as a ratio to GDP. For some purposes—particularly, risk sharing—the stock measures are more appropriate. For instance, if countries have large gross stocks of assets and liabilities, small exchange rate changes can have large valuation effects and serve as a mechanism for risk sharing even if net asset positions are small. For emerging market countries, another relevant measure of *de facto* financial integration is the ratio of gross stocks of external liabilities to GDP—a cumulated measure of inflows that is most closely related to the notion of openness to foreign capital that could be associated with technological and other spillovers. We take these measures of *de facto* financial integration from the widely used database created by Lane and Milesi-Ferretti (2007).

There is an important information in both the *de jure* and *de facto* measures. *De jure* measures are relevant for analysis of the effects of capital account liberalization policies. But the existence of capital controls often does not accurately capture an economy's actual level of integration into international financial markets. These measures do not capture the degree of enforcement of capital controls (or the effectiveness of that enforcement), which can change over time even if the legal restrictions themselves remain unchanged. Many countries with extensive capital controls have still experienced massive outflows of private capital, while some economies with open capital accounts have recorded few capital inflows or outflows. For instance, despite its extensive regime of capital controls, China has not

5. Another approach has been to look at price-based measures of asset–market integration. However, there are serious practical problems in using such measures for developing economies. Returns on financial instruments in those economies may incorporate a multitude of risk and liquidity premia that are difficult to disentangle. Even interest parity conditions sometimes do not hold because of inefficiencies and the lack of depth in some of these markets.

been able to block inflows of speculative capital in recent years (Prasad and Wei, 2007). A further complication is that despite the extensive coverage of the IMF's annual AREAER publication, there could be other regulations that effectively act as capital controls but are not counted as controls. For instance, prudential regulations that limit the foreign exchange exposure of domestic banks could, under certain circumstances, have the same effect as capital controls.

The *de facto* measure may be conceptually more appropriate to the extent that one is interested in the effects of an outcome-based measure of financial integration. On the other hand, many of the indirect benefits of financial integration may be vitiated by the presence of capital controls. Efficiency gains from competition, technology transfers, spillovers of good corporate and public governance practices, and so on, may be associated with an open capital account. Inward flows that manage to circumvent capital account restrictions are much less likely to convey many of the indirect benefits of financial integration. Many authors have also pointed out that capital controls can impose significant distortionary costs at the microeconomic (firm or industry) level, even if economic agents find ways to evade those controls (see the survey by Forbes, 2007).

How does India stack up on these different measures of financial openness? Table 1 presents some summary statistics on each of the measures of *de jure* capital account openness discussed above at different points of time. For each measure and each date, the table shows the median value for the full sample of countries, different values for emerging market countries, and the value assigned to India. By any of these measures, it looks like India is at the low end of the distribution of the respective capital account openness measure in 1995. There is a trend increase over time in average capital account openness for the full sample of countries. By 2005, India remains near the bottom of the distribution of Chinn–Ito measures but moves up significantly as per the Edwards measure.[6] These are all relatively crude measures of *de jure* openness, based on a reading of the IMF's annual AREAER reports on each country. But in India's case, they do signal that there are some restrictions on capital account transactions even in categories of flows that have been liberalized (even minimal registration requirements do get counted as restrictions).

6. A different measure of *de jure* capital account openness is the equity market liberalization indicator created and used by Bekaert and Harvey (2000) and Henry (2000). This is considered a one-off liberalization that occurs when domestic equity markets are opened up to foreign investors. These authors list India as having liberalized its equity markets in 1992 (and China as having done so in 1994).

TABLE 1. ***De Jure* Capital Account Openness**

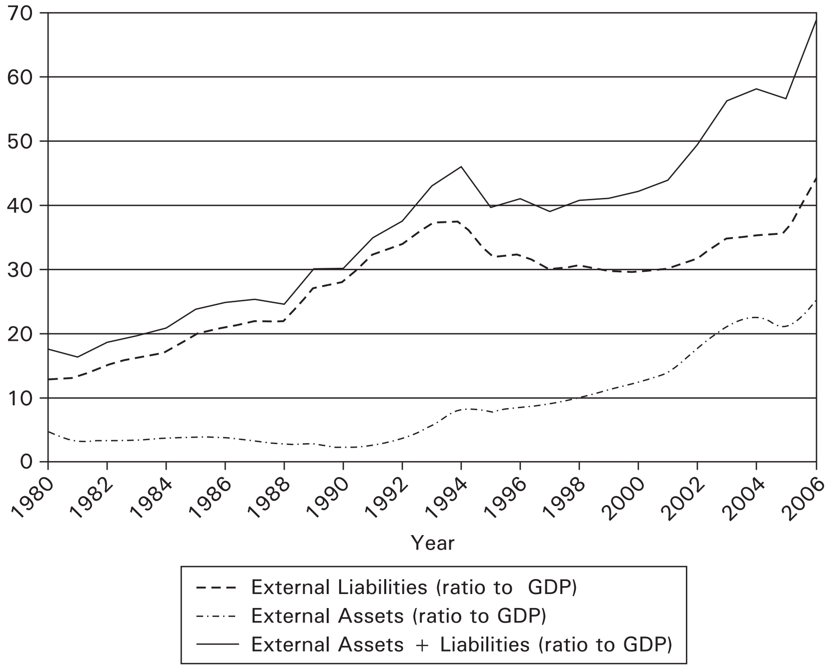
	Full sample	*Emerging markets*				
	Median	*Minimum*	*Median*	*Maximum*	*India*	*China*
Chinn and Ito						
1985	−1.13	−1.80	−1.13	2.54	−1.13	−1.13
1995	−0.09	−1.80	−0.09	2.54	−1.13	−1.13
2006	0.14	−1.13	0.03	2.54	−1.13	−1.13
Edwards						
1985	50.00	12.50	37.50	75.00	25.00	37.50
1995	75.00	25.00	50.00	100.00	25.00	37.50
2000	81.25	37.50	62.50	100.00	75.00	37.50
Miniane						
1985	0.86	0.83	0.86	1.00	0.83	
1995	0.43	0.71	0.86	1.00	0.83	
2000	0.36	0.71	0.86	0.86	0.86	

More substantively, the RBI has in fact eased a number of controls, both on inflows and outflows. For instance, although capital outflows by individuals are in principle still restricted, each individual is allowed to take up to US$ 200,000 of capital out of India each year, a generous ceiling by any standard.[7] The restrictions on outflows by Indian corporates are even weaker. As for inflows, FDI inflows into certain sectors such as retail and banking are restricted, and foreign investors are not allowed to participate in the government debt market. These restrictions are gradually being lifted. Equity market investments are permitted by registered foreign institutional investors (although there are limits on their ownership shares in certain types of Indian firms), and those who do not wish to register can invest only indirectly through an instrument called participatory notes, which are tightly regulated by the government.

We now turn to India's *de facto* integration with international capital markets. Figure 2 shows that gross external liabilities, gross external assets, and the sum of these two variables (expressed as ratios to GDP) have all increased significantly in recent years, indicative of the rapid pace at which India has been integrating into international capital markets. From 1980 to the mid-1990s, the total integration measure rose by about 25 percentage points, with almost this entire increase accounted for by an increase in

7. There are a few minor and relatively innocuous restrictions on these outflows (for example, money cannot be taken abroad without RBI permission for margin calls to a small group of neighboring countries and to countries identified as not cooperating with international anti-money laundering regulations).

FIGURE 2. *De Facto* Financial Openness: Emerging Markets

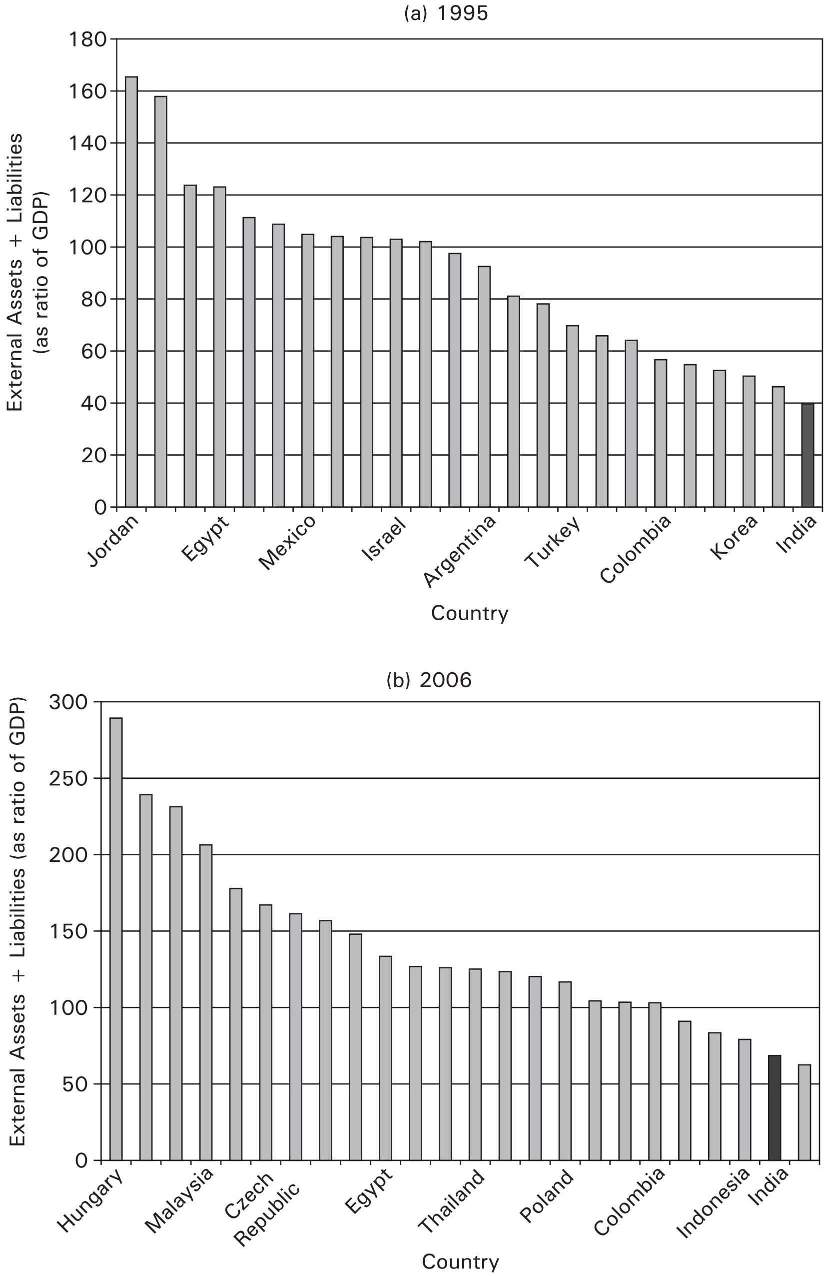


Source: Lane and Milesi-Ferretti (2006) dataset and author's calculations.

external liabilities. In the mid-1980s, especially with the onset of the Asian financial crisis, *de facto* integration leveled off although it is interesting to note that foreign assets continued to increase gradually during this period. From 2000 to 2006, the integration measure shot up by nearly 26 percentage points, with accumulation of external liabilities and assets accounting in almost equal part for this increase.

Nevertheless, on a cross-country comparison and relative to its size, India appears to have one of the least financially open economies amongst the group of emerging markets. Figures 3a and 3b show that India was near the bottom of the distribution of the preferred *de facto* integration measure; its relative position among emerging markets remains quite stable despite the rapid increase in its absolute level of integration. Thus, in terms of both *de jure* and *de facto* measures, India's low level of financial openness puts it well below the levels attained by most other emerging market economies, including the other large BRIC economies—Brazil, China, and Russia. This perspective is useful to keep in mind while discussing whether India has

FIGURE 3. ***De Facto* Financial Openness: Emerging Markets**



Source: Lane and Milesi-Ferretti (2006) dataset and author's calculations.

exposed itself to considerable risks from rapid integration into international capital markets.

Balance of Payments

In order to dissect the forces behind the accumulation of foreign assets and liabilities, we now turn to an analysis of the underlying flows. India's engagement with the world economy through both trade and financial linkages can best be seen through the prism of the balance of payments. There have been dramatic changes in the evolution of India's balance of payments since the currency crisis of the early 1990s (table 2). During and right after the period of the Asian financial crisis, the current account and capital account roughly balanced each other. In the early part of this decade, the current account balance turned slightly positive, despite a trade deficit. Indeed, this has been a consistent story in India during this decade—that the trade deficit has been offset to a considerable extent by a surplus on invisibles trade and remittances from Indian workers abroad.

Reserve accumulation gradually picked up speed during the early 2000s. There has been a marked shift in the structure of the balance of payments during the last two years (2006–07 and 2007–08). The merchandise trade deficit has risen sharply (to 8 percent of GDP) and the current account deficit is now 1.5 percent of GDP, both larger than at any other time during the past decade. But large capital inflows have more than offset the current account deficit, leading to rapid reserve accumulation.

At the end of financial year 2008, gross international reserves stood at US$310 billion, representing about 27 percent of nominal GDP. Figure 4 shows that reserve accumulation has hardly been a steady and unrelenting process in India (unlike in China, where it has). There were a number of months, even during this period of unprecedented reserve accumulation, when reserves actually fell. But the overall trend until the summer of 2008 was clearly one of not just a rising level of reserves but also a rising pace of reserve accumulation. The global financial turmoil that swept on to India's shores in September 2008 led to depreciation pressures on the rupee and the RBI has used up about US$30 billion of its stock of reserves to limit the depreciation of the rupee. It is too early to tell if the era of large capital inflows to India is past or if inflows will recover when the global financial system settles down.

It is instructive to break down the reserve buildup into its components to examine what factors can explain the increase in the rate of accumulation.

TABLE 2. The Balance of Payments (in billions of U.S. dollars)

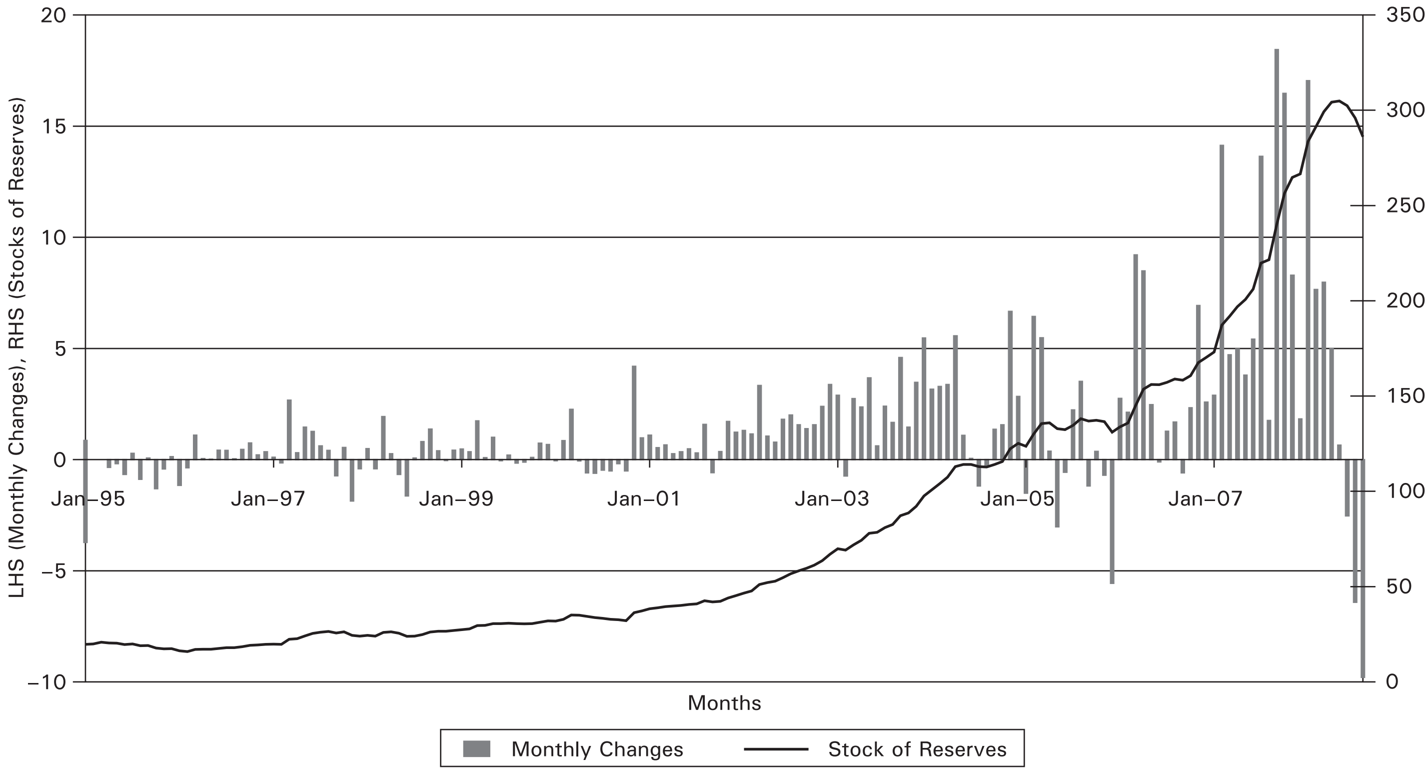
	1997–98	*1998–99*	*1999–00*	*2000–01*	*2001–02*	*2002–03*	*2003–04*	*2004–05*	*2005–06*	*2006–07*	*2007–08*	*2008–09**
Gross international reserves	29.7	33.2	38.7	42.9	54.7	76.1	113.0	141.5	151.6	199.2	309.7	312.1
(in percent of GDP)	*7.2*	*8.0*	*8.6*	*9.3*	*11.4*	*15.0*	*18.8*	*20.3*	*18.8*	*21.6*	*27.2*	
Change in international reserves	2.9	3.5	5.5	4.2	11.8	21.4	36.9	28.5	10.1	47.6	110.5	2.4
A. Current account balance	–5.5	–4.0	–4.7	–2.7	3.4	6.3	14.1	–2.5	–9.9	–9.8	–17.4	–10.7
(in percent of GDP)	*–1.3*	*–1.0*	*–1.0*	*–0.6*	*0.7*	*1.2*	*2.3*	*–0.4*	*–1.2*	*–1.1*	*–1.5*	
Merchandise trade balance	–15.5	–13.2	–17.8	–12.5	–11.6	–10.7	–13.7	–33.7	–51.9	–63.2	–90.1	–31.6
(in percent of GDP)	*–3.8*	*–3.2*	*–4.0*	*–2.7*	*–2.4*	*–2.1*	*–2.3*	*–4.8*	*–6.4*	*–6.8*	*–7.9*	
B. Capital account balance	9.8	8.4	10.4	8.8	8.6	10.8	16.7	28.0	25.5	45.8	108.0	13.2
FDI, net	3.5	2.4	2.1	3.3	4.7	3.2	2.4	3.7	3.0	8.5	15.5	10.1
portfolio flows, net	1.8	–0.1	3.0	2.6	2.0	0.9	11.4	9.3	12.5	7.1	29.3	–4.2
C. Errors and omissions, net	0.2	–0.2	0.7	–0.3	–0.2	–0.2	0.6	0.6	–0.5	0.6	1.5	–0.3
D. Valuation change	–1.6	–0.7	–0.9	–1.7	0.0	4.5	5.5	2.4	–5.0	11.0	18.4	0.2
Memorandum Items												
Non-FDI capital account balance (including errors and omissions)	6.5	5.9	9.0	5.3	3.6	7.4	14.9	24.9	22.0	37.9	94.0	2.8
Nominal GDP	410.0	414.0	450.0	460.0	478.0	508.0	602.0	696.0	806.0	922.7	1140.0	

Source: CEIC, RBI and author's calculations.

Note: * The data for 2008–09 are end June data.

The non-FDI capital account balance is the capital account balance minus net FDI plus net errors and omissions.

FIGURE 4. Foreign Exchange Reserves: Flows and Stocks (in billions of US dollars)



Source: CEIC Data Company Ltd. and author's calculations.

For this exercise, I split the nine-year period since the Asian financial crisis into three periods: 1998–99 to 2000–01, 2001–02 to 2005–06, and 2005–06 to 2007–08. For many Asian and other emerging market economies, the pace and sources of reserve accumulation differ markedly across these three periods (see, for example, Prasad and Wei, 2007, for the case of China). The first three columns of table 3 show the average annual increase in foreign exchange reserves during each of these periods and the breakdown of this increase into the main components. The next two columns show the changes in these averages across periods.

TABLE 3. A Decomposition of the Recent Reserve Buildup

(*in billions of U.S. dollars*)

	Annual averages			*Changes*	
	1998–2001	*2001–06*	*2006–08*	*2001–06 – 1998–2001*	*2006–08 – 2001–06*
	(1)	*(2)*	*(3)*	*(2) – (1)*	*(3) – (2)*
Increase in foreign reserves	4.4	21.7	79.1	17.3	57.3
Current account balance	−3.8	2.3	−13.6	6.1	−15.9
Capital account balance	9.2	17.9	76.9	8.7	59.0
FDI, net	2.6	3.4	12.0	0.8	8.6
Errors and omissions, net	0.1	0.1	1.1	0.0	1.0
Valuation Changes	−1.1	1.5	14.7	2.6	13.2
Non-FDI capital account balance (including errors and omissions)	6.7	14.6	66.0	7.8	51.4

Sources: CEIC, RBI, and author's calculations.

Note: The non-FDI capital account balance is the capital account balance minus net FDI plus net errors and omissions.

The rate of reserve accumulation was higher by an average of US$17 billion per year in the second period relative to the first. The current account balance shifted from an average deficit of US$4 billion per year in the first period to a surplus of US$2 billion per year in the second period, implying that the current account contributed about US$6 billion to the increase in the rate of reserve accumulation in the second period compared to the first. The change in the non-FDI capital account balance, which mainly constitutes portfolio flows, accounts for most of the remainder.

During 2006–08, the rate of reserve accumulation jumps by a further US$57 billion per year relative to the preceding period. The forces driving the reserve buildup in this period are very different from the previous period. The current account switches back into a deficit, resulting in a negative contribution of nearly US$16 billion per year from the current account. The FDI and valuation changes account for US$9 billion and US$13 billion respectively. The latter factor represents an increase in the dollar value of reserve assets held in currencies other than dollars as a consequence of the significant depreciation of the dollar against other major reserve currencies during this period. The big story during the last two years has clearly been the surge in portfolio inflows and various other debt inflows, which together meant that the non-FDI capital account balance contributed nearly US$51 billion per year to the faster pace of reserve accumulation during this period.

To better understand the implications of these patterns in the balance of payments, it is important to examine in more detail the structure of inflows and external liabilities.

Composition of Gross Flows and External Liabilities

I now provide a disaggregated perspective on India's *de facto* financial integration. As discussed in the review of the academic literature in the section "Paradoxical Results, but Composition of Liabilities Matters", the costs and benefits of financial openness are crucially dependent on the nature of financial integration. In this section, I review the composition of India's capital inflows and outflows, the structure of its external liabilities, and the implications for the benefit–cost tradeoff.

Gross Flows

Table 4 indicates that gross inflows have risen sharply since the early 2000s, from an average level of about 2 percent of GDP over the previous decade to nearly 9 percent in 2007–08. The shares of the components of gross inflows fluctuate markedly from year to year and it is difficult to detect any clear trends over the full sample of data. Focusing on the last four years, it is clear that FDI and portfolio inflows have together become a major constituent of overall inflows. The trend in outflows, which still remain at very low levels (2 percent of GDP in 2007–08), is much clearer with FDI accounting for the lion's share of outflows in recent years and portfolio flows barely registering on the scale.

Composition of External Liabilities

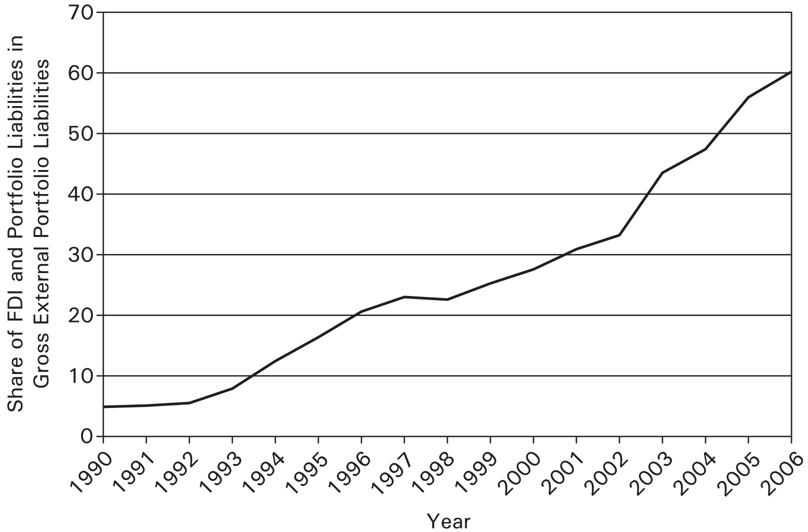
As discussed earlier, stocks of external liabilities are more reliable measures of the benefits that emerging markets can potentially attain from financial integration, and also the potential risks. For this part of the analysis, we turn again to the dataset of Lane and Milesi-Ferretti (2007). Figure 5 shows that

TABLE 4. Composition of Gross Inflows and Outflows

	Gross inflows		*Components*					*Gross Outflows*		*Components*			
	(in USD billion)	*(percent of GDP)*	*FDI*	*Portfolio*	*Loans*	*Other*		*(in USD billion)*	*(percent of GDP)*	*FDI*	*Portfolio*	*Loans*	*Other*
			(as percent of gross inflows)							*(as percent of gross inflows)*			
1995–96	7.8	2.1	27.6	34.3	28.4	9.6	1995–96	3.5	0.9	5.4		0.2	94.4
1996–97	13.6	3.5	20.9	24.4	35.3	19.4	1996–97	3.1	0.8	6.1		0.0	93.9
1997–98	14.0	3.3	25.4	13.1	34.3	27.2	1997–98	2.5	0.6	1.5		0.4	98.0
1998–99	10.8	2.5	23.0	–0.6	41.0	36.7	1998–99	2.9	0.7	3.4		0.5	96.0
1999–00	10.8	2.4	20.0	28.0	14.8	37.2	1999–00	2.9	0.6	2.5		–0.3	97.8
2000–01	14.9	3.2	27.0	18.5	35.3	19.2	2000–01	3.5	0.8	21.6	4.8	0.6	72.9
2001–02	9.2	1.9	66.7	22.0	–13.7	25.0	2001–02	3.1	0.6	45.4	2.3	2.7	49.6
2002–03	4.0	0.8	125.7	24.4	–96.1	46.0	2002–03	3.1	0.6	57.9	1.1	0.7	40.2
2003–04	16.3	2.8	26.4	69.5	–26.7	30.8	2003–04	4.3	0.7	44.9	0.0	2.3	52.7
2004–05	35.4	5.1	16.9	26.3	30.9	25.9	2004–05	6.8	1.0	33.5	0.4	4.9	61.2
2005–06	35.2	4.3	25.3	35.4	22.4	16.9	2005–06	10.9	1.3	53.9	0.0	2.9	43.2
2006–07	61.3	6.7	35.9	11.4	40.1	12.6	2006–07	17.5	1.9	77.0	–0.3	1.8	21.5
2007–08	98.1	8.6	18.3	33.5	28.9	19.3	2007–08	26.0	2.3	64.6	–0.6	0.1	35.9

Source: CEIC, RBI, and author's calculations.

FIGURE 5. Share of FDI and Portfolio Liabilities in Gross External Liabilities



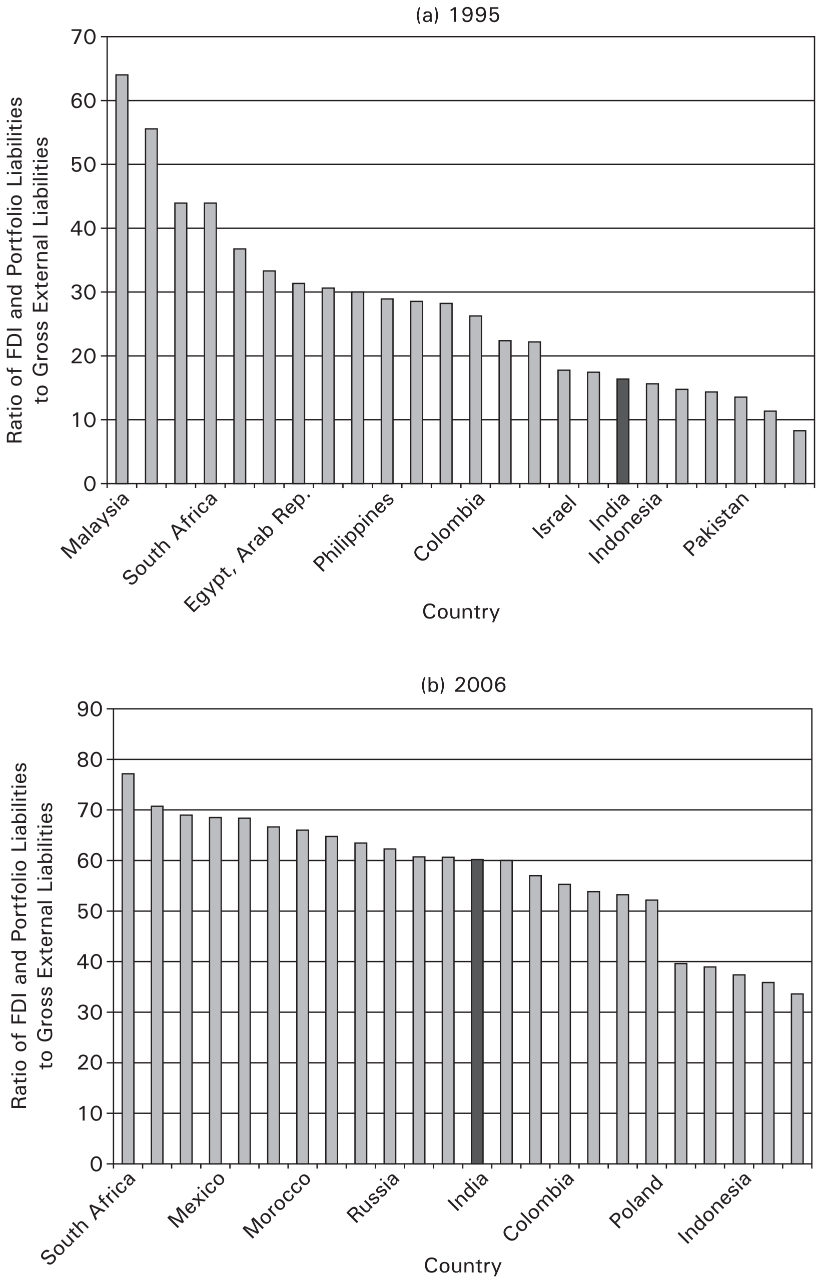
Source: Lane and Milesi-Ferretti (2006) dataset and author's calculations.

the ratio of FDI and portfolio liabilities in gross external liabilities risen steadily, from a level below 10 percent in the early 1990s to 60 percent at present. Based on the discussion in the section "Paradoxical Results but Composition of Liabilities Matters" about the relative merits of different forms of capital, this is clearly a positive development.

Figures 6a and 6b, which provide a cross-country comparison of this ratio for emerging markets, shows that India is now in the middle of the pack and not too far off the level of the leading country. Indeed, India has moved up quite significantly from its position near the bottom of this cross-country distribution in 1995. It is also interesting to note that the dispersion of this ratio across emerging markets has decreased considerably over the past decade. This is of course consistent with other evidence that the composition of private capital flows to emerging markets has shifted markedly toward FDI and portfolio flows in recent years.[8] Thus in India, as in most other emerging markets, the structure of external liabilities has become quite favorable in terms of attaining the risk sharing and TFP growth benefits of financial openness.

8. Kose et al. (2006) report that in 2000–04, debt accounted for about 52 percent of gross external liabilities of emerging markets, while FDI accounted for 37 percent. Portfolio equity liabilities accounted for most of the remainder. Back in 1980–84, the corresponding shares for debt and FDI were 85 percent and 14 percent respectively.

FIGURE 6. Ratio of FDI and Portfolio Liabilities to Gross External Liabilities



Source: Lane and Milesi-Ferretti (2006) dataset and author's calculations.

Structure of External Debt

One component of foreign liabilities that is of particular interest is the stock of external debt. The size of the stock of short-term external debt denominated in foreign currencies has been identified as an important factor triggering many emerging market financial crises of the last two decades. Moreover, short-term debt flows tend to be highly procyclical and so do the financing terms for these flows (Kaminsky et al., 2004). Consequently, countries that rely to a great extent on short-term foreign currency debt face a double whammy when they are hit with negative shocks and when external financing is in principle even more important to smooth domestic consumption.

India has taken a cautious approach to allowing the accumulation of foreign-currency denominated external debt, resulting in a low level of vulnerability on this front. The ratio of external debt to GDP has fallen from levels of around 38 percent in the early 1990s to under 20 percent in the last five years (table 5). The share of short-term debt in total external debt has risen to 20 percent although this number should be interpreted with some caution as there appears to be a discontinuity in the split between short- and long-term debt in 2005. Between 2005 and 2008, the share of short-term debt in total debt has risen by nearly 7 percentage points, so the trend is clear at any rate.

With the opening up to capital inflows, the share of deposits by Indians who live abroad and other foreign currency deposits in total debt rose from 12 percent in the early 1990s to 28 percent in 2004, before declining to 20 percent by 2008. External commercial borrowings by corporates have risen to about 28 percent of total debt, from about 12 percent in the early 1990s.

Consider adding together three elements of the debt structure that could represent potential flight capital—foreign currency deposits, external commercial borrowings, and short-term debt. If one adds all of these together, for 2007 the total amounts to about 13 percent of GDP. Some authors such as Williamson (2006) have expressed concerns that the liberalization of debt inflows may bode ill for India. The levels of debt are not high enough to warrant significant concern although of course one could make the legitimate argument that this relatively benign outcome is *because* the government has limited external commercial borrowings and short-term debt. The problem is that it is now relatively straightforward to evade controls on this type of flow by bringing in capital as portfolio equity and swapping it for other instruments (including over-the-counter debt instruments).

In any event, the surge in external commercial borrowings does bear further consideration. Given the practically nonexistent domestic corporate debt

TABLE 5. External Debt Stocks: Levels and Composition

	Total		By maturity		Composition of long-term debt						
	(in USD billion)	(percent of GDP)	Long-term	Short-term	Multilateral	Bilateral	IMF	Export credit	Commercial borrowing	Non-residents and foreign currency deposits	Rupee debt
						(as percent of total debt)					
1990	75.9	26.7	90.1	9.9	25.3	17.9	2.0	6.1	12.3	12.0	14.5
1991	83.8	28.6	89.8	10.2	24.9	16.9	3.1	5.1	12.2	12.2	15.3
1992	85.3	38.6	91.7	8.3	27.1	18.1	4.0	4.7	13.7	11.8	12.2
1993	90.0	37.3	93.0	7.0	27.8	17.9	5.3	4.8	12.9	12.4	11.8
1994	92.7	33.5	96.1	3.9	28.3	18.8	5.4	5.6	13.3	13.7	10.9
1995	99.0	30.7	95.7	4.3	28.8	20.5	4.3	6.7	13.1	12.5	9.7
1996	93.7	26.9	94.6	5.4	30.5	20.5	2.5	5.7	14.8	11.7	8.8
1997	93.5	24.4	92.8	7.2	31.3	18.7	1.4	6.3	15.3	11.8	8.0
1998	93.5	24.2	94.6	5.4	31.6	18.1	0.7	7.0	18.2	12.7	6.3
1999	96.9	23.5	95.6	4.4	31.5	18.1	0.3	7.0	21.7	12.2	4.9
2000	98.3	22.0	96.0	4.0	32.0	18.5	0.0	6.9	20.3	13.8	4.5
2001	101.3	22.5	96.4	3.6	30.7	15.8	0.0	5.8	24.1	16.4	3.7
2002	98.8	21.2	97.2	2.8	32.3	15.5	0.0	5.4	23.6	17.4	3.1
2003	104.9	20.3	95.5	4.5	28.6	16.0	0.0	4.8	21.4	22.1	2.7
2004	111.6	17.8	96.0	4.0	26.2	15.5	0.0	4.2	19.7	28.0	2.4
2005	133.0	18.5	86.7	13.3	23.9	12.8	0.0	3.8	19.9	24.6	1.7
2006	138.1	17.2	85.9	14.1	23.6	11.4	0.0	3.9	19.1	26.3	1.5
2007	169.7	17.8	84.5	15.5	20.8	9.5	0.0	4.2	24.6	24.3	1.1
2008	221.2	18.8	80.0	20.0	17.8	8.9	0.0	4.6	28.0	19.7	0.9

Source: CEIC Data Company Ltd., Ministry of Finance, Government of India, and author's calculations.

market, firms interested in issuing debt may have been pushed to issue debt abroad. Moreover, the RBI's attempts to resist exchange rate appreciation during 2006–07 may in fact have created incentives for firms to seek capital abroad using debt denominated in foreign currencies. Firms may have been using this financing instrument to effectively place bets on an eventual currency appreciation. Thus rather than viewing foreign debt as the problem to be dealt with, it would be more appropriate to think about the aspects of the financial system and macro policies that may be creating incentives for firms to obtain financing through foreign currency debt. I will return to this theme in the concluding section.

Does India Have Enough Reserves?

In determining a country's vulnerability to external shocks, the structure of external assets and liabilities is an important indicator. I now examine the evolution of India's official international investment position (IIP) and its implications for India's financial openness.[9] The IIP effectively represents a country's balance sheet vis a vis the rest of the world. Table 6 shows that at the end of financial year 2007–08, India had a net negative IIP position of US$53 billion. This represents a significant improvement from the level of minus US$81 billion in 1996–97, just before the Asian financial crisis. The stock of external assets has grown six-fold from US$62 billion in 2000–01 to US$381 billion in 2007–08. A substantial portion of this stock is accounted for by reserves. At the end of financial year 2007–08, the total stock of reserve assets was US$310 billion, of which foreign exchange reserves amounted to US$299 billion.

From an insurance perspective, the adequacy of the stock of foreign exchange reserves is typically measured relative to a country's imports or the level of short-term external debt. Table 7 shows that by both these measures, India has more than adequate reserves. Even as of 2007, reserves were sufficient to cover more than a year's worth of imports, well above the conventional threshold of six months of imports. Moreover, reserves even exceed the level of total external debt; recall that short-term debt is only 20 percent of

9. Due to some differences in how valuation effects are computed for various components of external assets and liabilities, there are some discrepancies between the values of these stocks in the official IIP data and the Lane and Milesi-Ferretti (2006) dataset. These discrepancies have grown in the last few years as the stocks have increased, along with the magnitude of fluctuations in the value of the US dollar. Hence, I use the official IIP data here but have used the Lane and Milesi-Ferretti in other sections to facilitate international comparisons.

TABLE 6. India's International Investment Position

(*in billions of U.S. dollars*)

	1996–97	*1997–98*	*1998–99*	*1999–00*	*2000–01*	*2001–02*	*2002–03*	*2003–04*	*2004–05*	*2005–06*	*2006–07*	*2007–08*
Net Position	–81	–81	–79	–77	–76	–69	–60	–47	–54	–60	–62	–53
A. Assets	38	42	47	55	62	74	96	136	166	184	246	381
1. FDI	1	1	2	2	3	4	6	8	10	16	29	46
2. Portfolio	0	0	0	0	1	1	1	0	0	1	1	1
Equity	0	0	0	0	0	0	0	0	0	1	1	1
Debt	0	0	0	0	0	0	0	0	0	0	0	0
3. Other investments	10	11	12	14	16	14	13	15	14	15	16	25
4. Reserve assets	27	30	33	39	43	55	76	113	142	152	199	310
Foreign exchange reserves	22	26	30	35	40	51	72	107	136	145	192	299
B. Liabilities	119	122	126	132	139	143	156	183	220	244	308	434
1. FDI	11	14	15	18	20	25	31	38	44	52	76	116
2. Portfolio	19	20	23	25	31	32	32	44	56	64	79	119
Equity	14	14	13	16	17	19	20	34	43	55	63	98
Debt	5	6	10	9	14	13	12	10	13	10	16	21
3. Other investments	89	88	87	89	87	86	92	101	119	128	152	199

Source: Reserve Bank of India and CEIC.

TABLE 7. Reserve Adequacy

	Non-FDI external liabilities	*External debt*	*Months of imports*	*M3*
1992		0.1	3.3	0.1
1993		0.2	6.6	0.1
1994		0.2	7.6	0.1
1995		0.2	4.8	0.1
1996	0.2	0.2	6.0	0.1
1997	0.2	0.3	6.7	0.1
1998	0.3	0.3	6.7	0.1
1999	0.3	0.4	6.9	0.1
2000	0.3	0.4	7.4	0.1
2001	0.4	0.5	9.6	0.2
2002	0.6	0.7	10.8	0.2
2003	0.7	0.9	12.6	0.2
2004	0.8	1.0	11.4	0.3
2005	0.8	1.1	9.5	0.2
2006	0.9	1.1	9.6	0.3
2007	0.9	1.4	12.5	0.3

Source: CEIC Data Company Ltd., RBI, and author's calculations.

external debt (table 5), so reserves are many multiples of the level of short-term external debt.

From the perspective of capital account liberalization, an even more stringent criterion than the coverage of external debt is whether reserves cover a major portion of the stock of all non-FDI foreign liabilities, on the assumption that all liabilities other than FDI are relatively liquid and could fly out of a country at short notice. The IIP numbers show that at the end of 2007–08, India's foreign exchange reserves (US$299 billion) were nearly adequate to cover its entire stock of non-FDI liabilities, which amounted to US$318 billion.

A different criterion suggested by some authors is whether reserves are sufficient to cover a significant portion of a broad monetary aggregate such as M2.[10] Demand deposits and currency can in principle flee a country at short notice; protecting the economy from the financial instability that could arise from such an event could be an important benchmark for policymakers to gauge a "safe" level of reserves. By this criterion, India, like many other

10. Obstfeld et al. (2008) argue that concerns about domestic financial stability could be a key motive for the massive amount of reserve accumulation by emerging market economies in recent years. Given their current levels of imports and external debt, the levels of reserves in many of these countries are well above those that could be justified on precautionary grounds based on these standard criteria. These authors find that a model that includes the ratio of M2 to GDP does a much better job of fitting cross-country variations in reserve levels.

emerging market economies (including China) does not have an excessively high level of reserves. The last column of table 7 shows that India's reserves cover about 30 percent of an even broader aggregate M3. This is a large share but obviously not enough to offset a complete financial collapse and the accompanying loss of confidence in the domestic banking system. Given the relative prudence of the RBI and the large banks themselves, this seems a highly unlikely scenario.[11]

The basic conclusion of this section is that India has accumulated a level of foreign exchange reserves that exceeds most standard norms of reserve adequacy from an insurance perspective. Indeed, the fact that India has accumulated an additional US$110 billion of reserves during 2007–08 makes this picture look even more benign than indicated by the ratios in table 7. The traditional risks faced by emerging markets with open capital accounts—sudden stops or reversals of capital flows—are therefore not a major concern. Nevertheless, there is clearly an important difference relative to China, which has been accumulating reserves at a hectic pace through current account as well as capital account surpluses.

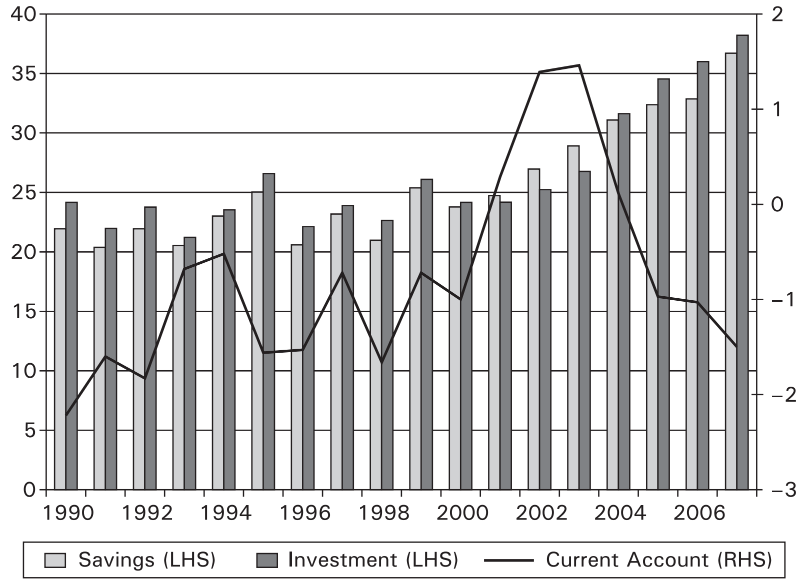
While China is running a current account surplus in excess of 12 percent of GDP, India registered a current account deficit of 1.5 percent in 2007–08. Is India vulnerable on this dimension? Since foreign exchange reserves amount to about a quarter of GDP, a sudden stop of capital inflows by itself is not going to create major problems for financing the current account deficit. Moreover, as recent developments have indicated, the RBI is willing to let the rupee depreciate quite significantly to prevent the current account deficit from rising. Nevertheless, current account deficits that reflect consumption booms have often ended disastrously—is this a risk for India? On this score, there is not a strong case for concern. Figure 7 shows that both the national savings and the investment rates have been rising since the early 2000s although the investment rate has risen a little faster, accounting for the current account deficit. Thus, India seems to fit the textbook example of a developing country borrowing from abroad to finance investment as its capital to labor ratio is low and its productivity growth is high relative to its major trading partners.[12]

One aspect in common with China is the risk of a banking crisis—a significant tremor in the banking system may trigger a surge of outflow of deposits

11. Indian banks, both private and public, are well capitalized and the ratio of nonperforming loans to total deposits in the banking system is estimated to be less than 2 percent.

12. Bosworth and Collins (2008) conducted a growth accounting exercise for India and China. They concluded that India has in recent years been experiencing higher productivity growth than most industrial countries (but less than China).

FIGURE 7. The Savings–Investment Balance



Source: World Development Indicators (World Bank).

from the banking system and into foreign currency assets (Prasad, 2008). Accumulating enough reserves to deal with this potential source of financial instability may seem prudent. But the costs of accumulating such a large stock of reserves—especially in terms of the other distortions in the system needed to maintain a rapid pace of accumulation—implies that this insurance may have costly welfare consequences. On the other hand, a different—and less sanguine—perspective comes from the rapid loss of nearly US$30 billion worth of reserves in recent weeks as the global financial turmoil led to a flight to quality (and out of emerging markets, including India) and the RBI sought to slow down a sharp depreciation of the rupee. I will return to this issue in the concluding section.

India's Position in the International Financial System

With its strong growth prospects, India will remain an attractive destination for capital inflows once global financial markets settle down. And its emergence as an economic power will mean that the economy is likely to continue to export private capital. But what forms these inflows and outflows take will of course determine the effects on macroeconomic outcomes. While such prognostications are difficult, a first step is to evaluate how much of various types of flows to emerging markets can be accounted for by India. For this exercise, we rely on IMF data on total gross inflows into and outflows from all emerging markets and other developing countries. This includes not just flows between these countries and advanced industrial economies but also flows amongst these countries themselves.

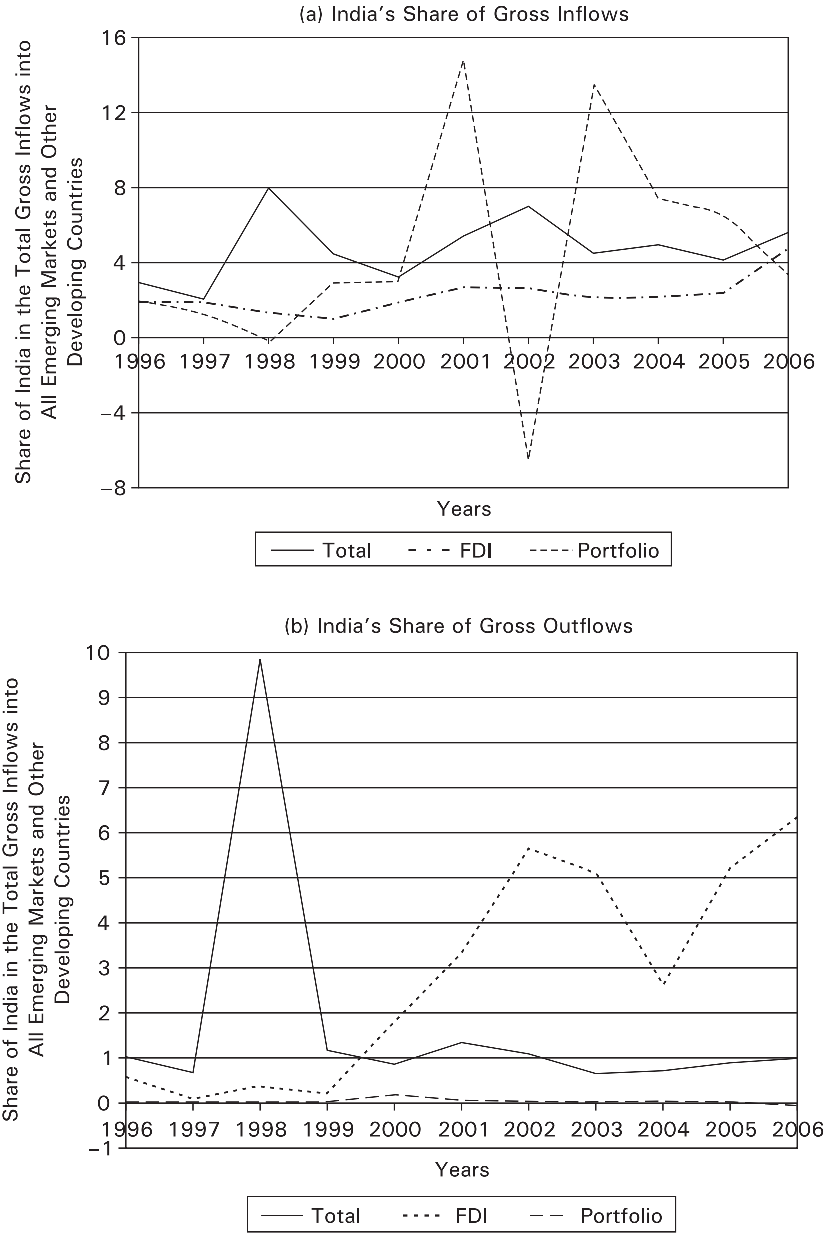
Figures 8a and 8b show India's share in total gross flows to emerging markets and other developing countries. This share was just 2 percent in 1997 but shot up to 8 percent in 1998, the second year of the Asian financial crisis, mainly because the overall quantum of flows to emerging markets shrank substantially and economies like China and India, which were not devastated by the crisis, got more of whatever flows there were. The share has averaged about 5 percent during the 2000s and has been quite stable. India's share of FDI has been quite low over the last decade and inched up to just over 4 percent in 2006. Likewise, India's share of portfolio flows to non-industrial countries hit 12 percent in a couple of years (2001 and 2003) but has otherwise been rather low, amounting to only 4 percent in 2006 (based on the strong portfolio inflows in 2007–08, it has no doubt gone up by at least a couple of percentage points).

In parallel with the inflows it has been receiving, India has of course been investing abroad. Encouraged by the RBI's easing of restrictions on outward FDI, Indian corporates have ramped up these flows, which now account for more than 6 percent of total gross FDI flows emanating from all non-industrial countries (including flows going to other emerging markets). The share of portfolio flows, by contrast, has remained at minuscule levels.

Its low share of total inflows into emerging markets suggests that, despite its growth story, India has a considerable way to go in terms of even obtaining a significant share of total flows to non-industrial countries. It also suggests that unless there is a fundamental shift in the structures of world financial markets, there could be a lot more capital coming into India if growth prospects remain strong and other international investors "discover" it.[13] Factors that could lure more capital into India include its relatively high productivity growth, well-developed equity markets, and the profit

13. Patnaik and Shah (2008) note that India's actual weight in the global equity portfolio is only about one-sixth the predicted weight that India should have according to a standard International Capital Asset Pricing Model (ICAPM). This is in fact an improvement relative to 2001, when the actual weight was only about one-tenth the predicted weight (and, of course, India's ICAPM weight has risen substantially—almost four-fold—from 2001 to 2007).

FIGURE 8. India's Share in Gross Inflows to and Outflows from Emerging Markets and Other Developing Countries



Source: CEIC, Global Financial Stability Report 2008, and author's calculations.

opportunities from rising income levels and a rapidly expanding domestic market.

At the same time, India's growth is also likely to unleash resources that will result in more capital outflows. As household income levels rise, the demand for international portfolio diversification will increase. Indian institutional investors will also be looking for a wider range of investment opportunities, both domestically and abroad, as their asset pools increase. And Indian companies will almost certainly continue to expand their reach abroad.

The net implication is that there are powerful forces that will impel a substantially higher degree of integration into international financial markets, with capital controls becoming increasingly irrelevant even if they remain on the books. Given India's financial structure and changes in the structure of international financial flows, much of this integration is likely to take the form of inflows and outflows of FDI and portfolio equity, which would of course be a favorable outcome. But the reality is that it will become increasingly difficult to bottle up specific types of flows if the economic incentives favoring them are powerful enough. So the best that macroeconomic policies can do is to foster macroeconomic and financial stability, which could serve to promote the right kinds of flows in both directions.

Implications for Policies toward Capital Account Liberalization

India has taken what seems to be a convoluted approach toward capital account convertibility. On the one hand, the capital account has become quite open and restrictions on both inflows and outflows have been eased significantly over time.[14] Nevertheless, there seems to be a residual element of government control that is maintained on many types of flows—sometimes as modest as registration requirements on foreign investors but also some as onerous as virtually keeping foreign investors out of the government debt market—which seems to go against the spirit of unrestricted financial flows. These elements are part of a strategy of cautious and calibrated capital account liberalization that has served India well in at least one dimension—reducing its vulnerability to crises.

In terms of overall *de facto* financial integration, India has come a long way and has experienced significant volumes of inflows and outflows in

14. For a chronology, see Bery and Singh (2006). Patnaik and Shah (2008) discuss a few recent steps toward more openness, some remaining restrictions, and their consequences. Also see Reddy (2005), Mohan (2007), Shah (2008), and *Report on Making Mumbai* (2007).

recent years. Relative to the size of its economy, however, these flows are rather modest, putting India at the low end of the distribution of *de facto* financial integration measures in an international comparison across emerging market economies.

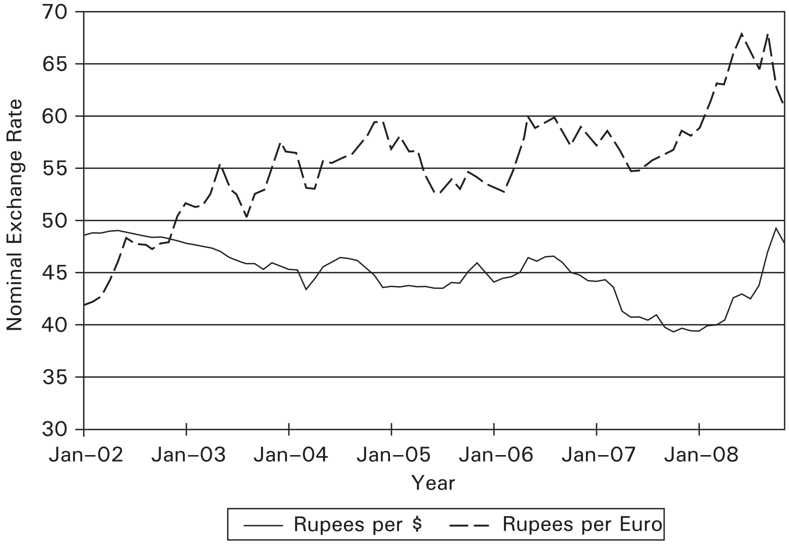
The RBI's calibrated approach to capital account opening has resulted in a preponderance of FDI and portfolio liabilities in India's stock of gross external liabilities. All elements of the literature point to this as being a favorable outcome in terms of improving the benefit–risk tradeoff of financial openness. But at the same time the limited degree of openness has probably limited the indirect benefits that seem to accrue from financial integration.

Why not move more rapidly toward fuller capital account convertibility? The recent global financial turmoil suggests that a high degree of caution may be warranted in further opening of the capital account. The question is where to strike the balance—this is a judgment call as the benefits of caution need to be weighed against the possibility that excessive caution in further capital account opening may be holding back financial sector reforms and reducing the independence and effectiveness of monetary policy.

One of the main concerns about capital account liberalization is that it makes exchange rate management harder. Some authors have argued that opening of India's capital account should be resisted as that would make it harder to maintain an undervalued exchange rate and thereby promote export-led growth (for instance, Bhalla, 2007; Subramanian, 2007). This is not a realistic proposition; worse still, it has detracted from many of the potential indirect benefits of financial integration. Although India does not have a formal exchange rate target, the Indian rupee has been managed to varying degrees at different times. Even though the nominal exchange rate relative to the US dollar has fluctuated over a wide range in the last decade (figure 9), the effective exchange rate—measured in either nominal or real terms—has been managed within a much narrower range (figure 10). The problem is that this has constrained the independence of monetary policy, which now involves a mix between inflation and exchange rate objectives. The RBI does in fact seem to have an implicit medium-term inflation objective (or at least a tolerance level) but also focuses on the exchange rate when needed. As recent events have indicated, this has made the central bank more susceptible to political pressures and might have made it harder for the RBI to manage inflationary pressures.[15]

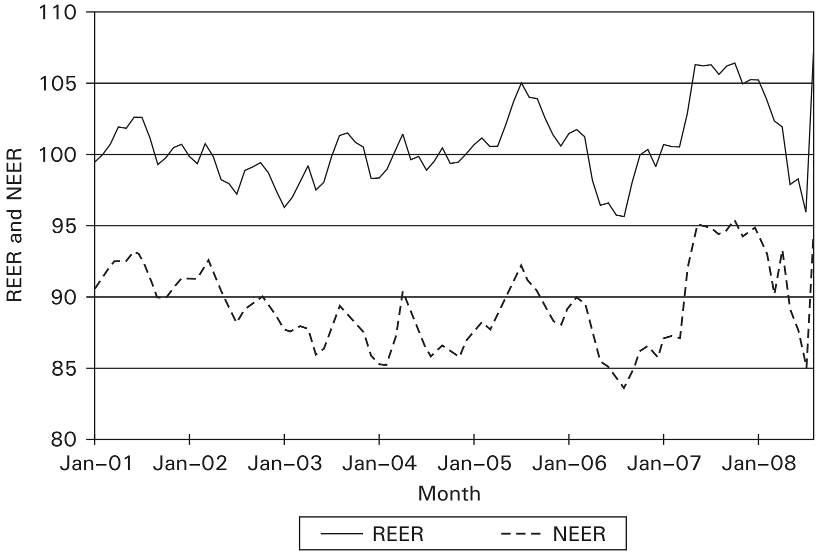
15. Some authors such as Panagariya (2008, see Chapter 10) argue forcefully that the RBI has in fact been very successful with its "pragmatic" approach to monetary and exchange rate policies, delivering a high rate of GDP growth as well as low inflation.

FIGURE 9. Nominal Exchange Rate



Source: CEIC Data Company Ltd.

FIGURE 10. Real and Nominal Effective Exchange Rates

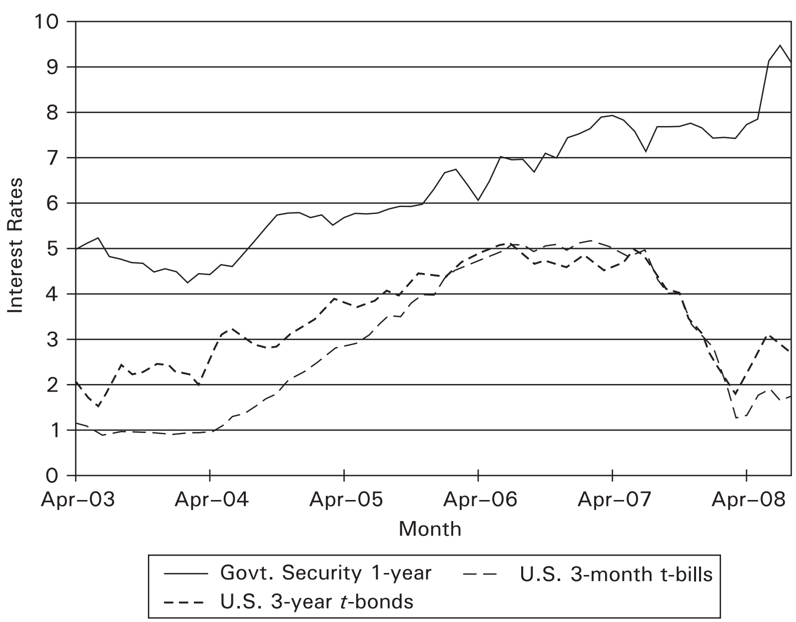


Source: CEIC Data Company Ltd.
Note: REER: Real Effective Exchange Rate; NEER: Nominal Effective Exchange Rate.

Resisting exchange rate appreciation has resulted in large costs of sterilizing inflows that are recycled into foreign exchange reserves, which are usually held in low-yield industrial country government bonds. Figure 11, which shows the interest rate differential between Indian and US government securities, drives home this point. The stock of sterilization bonds (Market Stabilization Bonds) also rose sharply during 2006 and 2007 (figure 12), implying that the quasi-fiscal costs of the RBI's sterilization operations have mounted rapidly. Clearly, tight exchange rate management is not a viable strategy, especially as the capital account is becoming more open in *de facto* terms over time. This is also evident in developments since the summer of 2008—the RBI has been unable to hold back pressures for the exchange rate to depreciate significantly despite large-scale intervention in the foreign exchange market.

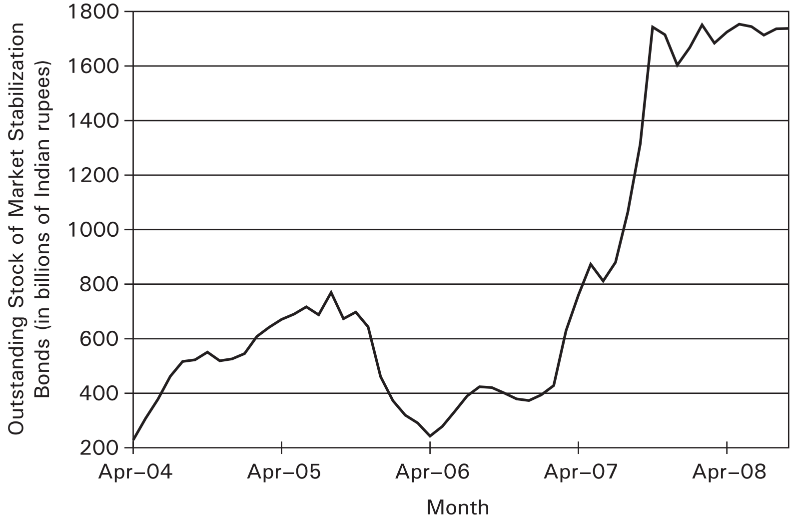
The Rajan Committee report (2008) makes the point that monetary policy would be far more effective if it was focused on the objective of a low and stable inflation rate. Indeed, the evidence suggests that making an inflation objective the key priority of monetary policy would be the best contribution that monetary policy can make to stabilizing domestic business cycles,

FIGURE 11. Interest Rates in India Relative to the US



Source: CEIC, US Treasury, and author's calculations.

FIGURE 12. Outstanding Stock of Market Stabilization Bonds (in billions of Indian rupees)



Source: CEIC Data Company Ltd.

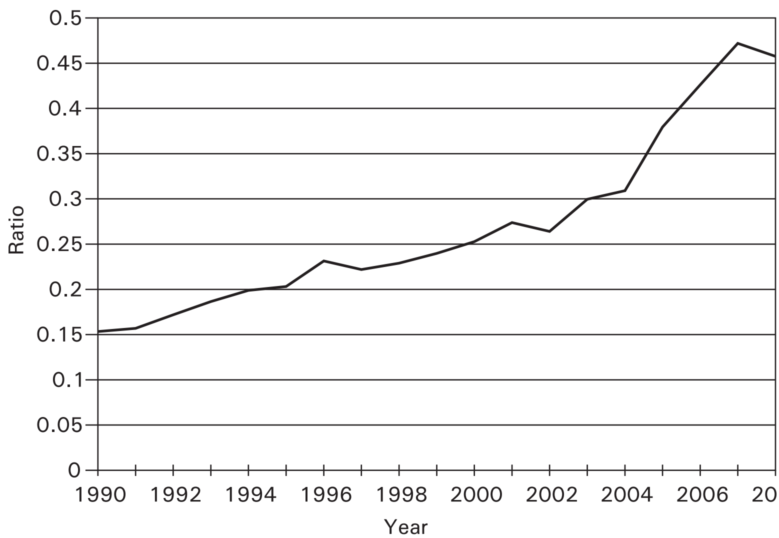
maintaining financial stability, and even reducing exchange rate volatility (Rose, 2007). In short, maintaining capital controls as a device to try and manage the exchange rate better is unlikely to work and also weakens monetary policy in insidious ways, especially in terms of managing inflation expectations.

Williamson (2006) argues that India may have liberalized its capital account too quickly and that it should slow down the process noting, in particular, that liberalizing debt flows could be risky and would have few benefits. This proposition has some validity to it but comes up against the reality that it is now very difficult to bottle up specific types of flows. As discussed earlier, the increase in external commercial borrowings in foreign currencies by Indian corporations during 2007 and the first half of 2008 may have been driven in large part by the attempts to resist currency appreciation as well as the absence of other markets to hedge currency risk. Maintaining capital controls simply perpetuates some of these distortions without any actual benefit in terms of reducing inflows. Flows of different forms are ultimately quite fungible and it is increasingly difficult, given the rising sophistication of investors and financial markets, to bottle up specific types of flows. Indeed, rising *de facto* openness in tandem with *de jure* controls may lead to the worst combination of outcomes—the complications for domestic macroeconomic management from volatile capital flows and far fewer indirect benefits from financial openness.

One key issue is whether India falls below the threshold conditions that seem to make a big difference to the benefit–risk tradeoff of financial openness. Kose et al. (2008) report that while it is difficult to precisely identify the critical levels of the threshold conditions that influence the outcomes of financial openness, there are a few general propositions that do come out of the analysis for particular countries such as India. Given India's level of financial and institutional development, the accumulation of FDI and portfolio equity liabilities is relatively "safe" as the levels of these two thresholds for such liabilities are rather low. As for debt accumulation, India is moving toward the threshold in terms of financial development but is not there yet.

Another important threshold condition is related to trade integration. Many authors have found that greater openness to trade not only reduces the risks of financial crises but also makes it easier for a country to recover quickly if it does get hit by a crisis (see, for example, Frankel and Cavallo, 2004, and references therein). On this dimension, it is encouraging that there has been a rapid increase in India's external trade, with the standard trade openness measure (ratio of the sum of exports and imports to GDP) nearly doubling from its level of 25 percent in 2000 (figure 13).

FIGURE 13. Trade Openness Ratio



Source: CEIC and author's calculations.

Note: This figure shows the sum of imports and exports of goods and services as a ratio to GDP.

Thus, in terms of the collateral benefits thresholds framework, India is a good example of a country where the benefit–risk tradeoff of further capital account is finely balanced. It turns out that there is another important threshold condition, which is the level of financial integration itself. Countries that are more integrated into international financial markets seem to achieve better risk sharing outcomes and also seem to suffer few ill effects of even a stock of external liabilities that is tilted toward more debt.

Given the cushion provided by India's high level of reserves, there is now an opportunity to push forward more aggressively with certain aspects of capital account liberalization in order to gain more of the indirect benefits of financial integration. For instance, a specific recommendation of the Rajan Committee (2008) is that allowing foreign investors to invest in government bonds could improve the liquidity and depth of this market. This would have numerous ancillary benefits. A deep and well-functioning government bond market is a prerequisite for serving as a benchmark for pricing corporate bonds, which could allow that market to develop. By providing an additional source of debt financing, it would create some room for the government to reduce the financing burden it currently imposes on banks through the statutory liquidity ratio—the requirement that banks hold a certain portion of their deposits in government bonds. And it might even have the beneficial effect of imposing some discipline on fiscal policy since foreign investors could pull out and raise the cost of debt financing if the government budget deficit were to start rising again.

An opportunistic approach to liberalization of outflows during a period of surging inflows is also worth considering as it would serve multiple objectives. If undertaken in a controlled manner along the lines suggested by Prasad and Rajan (2008), it would generate a variety of collateral benefits—sterilization of inflows, securities market development, international portfolio diversification for households—without the risks of a full and irrevocable opening of the taps for outflows. More recently, the RBI has taken an opportunistic approach to liberalizing inflows by raising ceilings on external commercial borrowings in order to compensate for capital outflows. These are steps in the right direction. One potential problem is that such measures—when taken in isolation and perceived as subject to reversal if they are not seen as part of a broader and well-articulated capital account liberalization agenda—are not likely to be very productive.

Does all this mean that financial integration should be a key policy priority and that the capital account should be opened at one fell swoop? Hardly. As Panagariya (2008) notes, liberalizing all types of short-term flows in a precipitous manner could heighten the risk of financial crisis, which in turn would put paid to a whole host of other essential reforms. But my perspective on this is slightly different—that holding exchange rate policy and financial reforms hostage to the notion that the capital account can be kept closed or restricted for a prolonged period (even 3–5 years) may ultimately prove to be a costly proposition. While full capital account convertibility may not be an immediate priority, it is important not to lose sight of the longer-term objective while dealing with short-term pressures caused by surges of inflows or outflows. Indeed, in terms of facilitating adjustment and deriving more indirect benefits, there is a case to be made for taking advantage of the various favorable circumstances discussed in this paper and laying down a well-articulated roadmap toward rapid capital account liberalization in the near term (next 2–3 years) rather than over the indefinite future.[16]

16. The reports of the Mistry Committee (2007) and Rajan Committee (2008) lay out a fairly aggressive timetable, noting the large benefits that could be gained from financial openness, including how it could foster more effective monetary policy and boost financial sector reforms. The Tarapore Committee (2006) recommends a much slower pace of liberalization. Rajan and Zingales (2003) note that capital account liberalization can also be useful as a framework for building consensus around reforms and for thwarting coalitions that try to block reforms.

Comments and Discussion

John Williamson: I find this paper somewhat schizophrenic. The author is in favor of pushing forward more aggressively with capital account liberalization, at least certain aspects of it, as he says rather emphatically in the final paragraph. But he also commends the cautious and calibrated path to capital account liberalization that has been adopted by the Indian authorities. So whatever a discussant may say, there are certain to be some quotations that can be cited back at one.

Prasad's paper is in part a competent summary of recent developments in India's external sector. I found nothing to quarrel with here, so I shall restrict my comments to the other big theme of his paper—the discussion of capital account convertibility.

Prasad accepts, as does almost everyone nowadays, that foreign direct investment (FDI) is a good thing. He is also positive about portfolio equity investment, as am I. The evidence is overwhelming that this brings benefits in terms of bigger investment and hence faster growth. Its flight is also self-limiting in that equity sales depress prices, which provides a natural disincentive to push capital flight to a damaging extreme. But if FDI and portfolio equity inflows both contribute positively to growth and overall capital inflows have the zero impact on growth (at best) indicated by the empirical evidence cited by Prasad, then it follows that loans—the third component of the capital account—have a negative impact. This seems to me quite plausible: it is loans that can be liquidated and repatriated at fixed nominal prices. If they are denominated in foreign currency, as is usual in the case of loans, then their repatriation becomes even more burdensome when the exchange rate depreciates. This is the way that crises are manufactured. This seems to me the central fact about capital flows that Prasad's analysis implies but that he fails to emphasize.

One remark: The "new paradigm" argues that capital inflows benefit growth through their catalytic effects rather than their direct effects in providing additional financing. Perhaps they do, but if so, that should be picked up by the tests that have regressed growth on measures of whether the capital account is liberalized, rather than whether the country has had a big capital inflow. Those tests have basically been negative too.

Note that Prasad attaches considerable importance to threshold conditions. He argues that these are lower for FDI and portfolio equity than for loans, and hence one should be pleased with the present composition of India's foreign debts. Yes, I am (though not for the recent pronounced increase in short-term loans, shown in table 5).

What I do not understand is his sympathy for the liberalization of loans, given his judgment that "India is moving toward [the relevant] threshold… but is not there yet." It would be imprudent to heed the call for a firm 2- or 3-year roadmap to full capital account liberalization in his final paragraph unless one is convinced that India will get there in that time period.

The pronounced depreciation of the rupee that occurred between the conference of the National Council of Applied Economic Research (NCAER) and the finalization of this paper was reportedly in substantial measure caused by the difficulties Indian corporates found in rolling over the short-term foreign loans that had been taken to finance Indian FDI in the outside world. Given that they retain a residual right to seek rupee finance in the event of such difficulties materializing, it seems to me only prudent of the Indian authorities to continue to exercise exchange control over the foreign borrowing of Indian corporates. Such control should discriminate, and strongly, against short-term loans. Prasad says (in criticism of an article of mine) that this increase in external borrowing may have been driven by the desire of Indian corporations to speculate on further appreciation of the rupee. If that was indeed the case (which is possible though it is not obvious to me), it surely strengthens the argument for exerting control by the Reserve Bank of India (RBI). If India had already liberalized as he seems to want, then it would not be in the strong position that he applauds, with a debt composition that includes relatively few short-term loans. Let no one be in doubt: today India is liberalized (at least on the inward side) except with regard to loans, so that calls for capital account convertibility amount to pleas to liberalize loans.

It is doubtless true, as Prasad asserts, that it becomes increasingly less possible to control what instrument is held as countries develop and markets become more sophisticated. There will always be marginal actors who are prepared to bend the law because they can get away with it. This is a factor to bear in mind and feed into an appraisal of whether it is sensible to keep a law. But it does not in itself make an overwhelming case for abolishing laws. One needs also to recognize that most actors obey laws because they exist, and ask whether, given this fact, social welfare would be increased by abolition.

Partha Sen

Introductory Comments

India's integration in the world economy is recent. Trade flows and capital flows, as documented in Eswar Prasad's paper, have increased tremendously in the last two decades. While there are easy and incontrovertible measures of trade openness, measuring capital account openness is more tricky. As the paper documents, by most measures India's capital account is increasingly more open. But its relative position among other developing countries has not moved very much. Prasad points out that flows to India represent a small proportion of flows to non-industrial countries (usually well below 10 percent).

Capital inflows to India, which are relatively free of controls, have held its monetary policy hostage.[1] In order to prevent an appreciation of the exchange rates, the RBI has bought foreign exchange. In order to prevent the money supply from going up, as a consequence of this purchase of foreign exchange, the RBI has sterilized the inflows by selling government bonds in an open market operation. The fact that in spite of the RBI's efforts, there is an ever-increasing merchandise trade deficit, means that the policy is only partially successful. If the current account does not show a bigger deficit, it is due to invisibles and transfers. Are foreign exchange reserves that the RBI has accumulated "enough?" They are, if import financing is a concern. They are not, if capital flows are reversible (other than FDI).[2]

India's capital account remains more or less closed to outflows (for businesses, there has been some easing of restrictions in recent years, but not for households, though). Debt inflows are frowned upon but again in recent years, with the accumulation of reserves, there has been some tolerance of these.

As is well known, the RBI's policy of sterilized interventions implies a quasi-fiscal cost, in that the interest paid on government securities turns out to be larger than the interest earned on foreign exchange reserves (in a common currency). Before the recent meltdown, there was a call for the "securitization" of these reserves, a call that Prasad renews in this paper.

1. See Joshi and Sanyal (2005), Kletzer (2005), and Sen (2007) for details.

2. Prasad's discussion of foreign exchange reserves being greater than M2 is a red herring because there are legal restrictions on the convertibility of M2 components. This point is meaningful if there is full capital account convertibility.

Having taken us through the Indian data, Prasad goes back to argue for full capital account convertibility. This policy shift is to be effected not because of the traditional macroeconomic reasons—I discuss these later—but for "collateral benefits" that such a policy bestows. These include financial development and transparency and also making liberalization irreversible. I will ignore the last reason, which is really a right-wing conspiratorial one—given that probably a majority of mainstream economists do not embrace capital account convertibility, why would anyone outside Chicago or the International Monetary Fund (IMF) want to support this coup willingly?

When I first commented on this paper at the NCAER conference in July 2008, the global economy had just started to go into a tailspin. But it was not clear at that time what the effect on the international capital flows would be. I was critical of this paper's case for a liberalization of their capital accounts by developing countries. I had drawn on the experiences of other developing countries to highlight what in my views were the potential pitfalls of such a move. Let me go over these again now that events have almost proved me prophetic (this does not happen very often!). But before turning to these arguments, it is important to realize that capital flows (other than to mining, trade credits, and so on, that have been around since the colonial era) to developing countries is a very recent phenomenon and consists of a few episodes—hence, not much (even less than usual) faith should be placed on cross-country regressions.

Capital Account Convertibility: Pros and Cons

Capital account convertibility means no legal restrictions on inflows or outflows of assets, that is, the domestic financial market is integrated with the international one. The international market would then price return and risk of all assets and liabilities. Given these asset prices and returns, flows would be determined. The potential gains from integration are well known, namely, consumption smoothing across time and states of nature (that is, risk sharing) and resources for investment augmentation (since a developing economy by definition is capital deficient). The experience of developing economies does not seem to square with this Arrow–Debreu dynamic general equilibrium view. Asset markets differ from goods markets and forcing the pace of liberalization of asset markets has often invited crises. There are agency problems, non-existent or "thin" markets, and so on. In short, there are distortions galore, and therefore a move toward a more competitive environment is not necessarily Pareto-improving.

The problems faced by an economy trying to cope with inflows and outflows are different. It is widely known that capital inflows cause real appreciation, that is, these flows make the domestic economy's goods more expensive compared to the rest of the world—this is known as the "Dutch Disease." This real appreciation occurs irrespective of whether the inflows consist of FDI, portfolio inflows, or bank lending. The real appreciation could cause a current account deficit big enough to put the liberalization process at risk.

In addition, if the host country's economy is not prepared with an adequate level of financial development then there could be pressure on the domestic financial sector resulting in a banking crisis (since in the early stages of development, bank lending constitutes a large proportion of the financial sector). The banking system, usually after years of financial repression, is geared toward financing of the government budget deficit. There may well be a macroeconomic crisis if the government's (monopoly) access to domestic savings is suddenly cut off.[3]

Lending to developing economies is subject to sudden reversals, that is, the tap of capital inflows is suddenly turned off due to events that are only remotely related to the recipient countries' policies. The Asian crisis of 1997 and the Latin American crisis of 1998 were good examples of this (that is, before the current crisis, which is more than just a capital account shock).[4] Here is what happened to Latin America in 1998:

> Russia's default in August 1998 … represented a fatal blow for Latin America.… In tandem with the rest of emerging markets, interest rate spreads for LAC-7 rose from 450 basis points prior to the Russian crisis to 1,600 basis points in September 1998.... As a result, capital inflows to LAC-7 countries came to a Sudden Stop, falling from 100 billion dollars (or 5.5 percent of GPD) in the year ending in II-1998 prior to the Russian crisis, to 37 billion dollars (or 1.9 percent of GDP) one year later (N)on-FDI flows … fell by 80 billion dollars during that period. After the initial blow, capital flows to LAC-7 suffered an additional blow after

3. There is of course the problem of moral hazard here. The financial sector, being the soft underbelly of capitalism, is full of instances of moral hazard and time inconsistency.

4. Total private capital flows fell from US$ 176 b in 1996 to US$ 70 b in 1997. Bank loans were the main reason for this decline—they fell from US$ 113 b to US$ 10 b (Williamson, 2001). Between 1997 and 1999, total private capital flows to Latin America fell from US$ 108 b to US$ 69 b. Bank loans fell from US$ 46 b to US$ 7 b, while portfolio investments fell from US$ 13 b to US$ 5 b over these years (Williamson, 2001).

> the Argentine crisis in 2001 … and, later, the ENRON scandal…. By the year ending in IV-2002 capital flows to LAC-7 were less than 10 billion dollars, back to the very low levels of the late 1980s. The Russian virus affected every major country in Latin America, with the exception of Mexico.... Even Chile, a country with very solid economic fundamentals—a track record of sound macroeconomic management, a highly praised and sustained process of structural and institutional reforms that completely transformed and modernized Chile's economy, and an average rate of growth of 7.4 percent per year between 1985 and 1997, the highest growth rate in LAC-7—and tight controls on the inflows of foreign capital, experienced a sudden and severe interruption in capital inflows…. That a partial debt default in Russia, a country that represented less than 1 percent of world GDP and had no meaningful financial or trading ties with Latin America, could precipitate a financial contagion shock wave of such proportions, posed a puzzle for the profession. (Calvo and Talvi, 2005: 8–9)

In any case, there is now overwhelming evidence that capital flows from the developing countries to the developed ones (Prasad et al., 2007)—Prasad is one of the authors of the study! This flies in the face of traditional growth theory of the Solow–Ramsey type (or even endogenous growth theories). Some of the faster growing Asian economies have run current account surpluses (and exported capital) by maintaining undervalued real exchange rates (Japan, China, Taiwan, Singapore, and so on, come to mind—South Korea is an exception). The secret of an outward-oriented growth strategy is combining free trade with "mercantilism."

Discussion and Conclusions

In conclusion, I remind the readers that Prasad acknowledges that the data do not support the traditional macroeconomic reasons for capital account convertibility. Thus the capital-deficient economies are net exporters of capital rather than net importers and there is no evidence of risk-sharing or total factor productivity (TFP) growth with openness either. Hence we have to resort to "the Lord works in mysterious ways" and argue for capital account openness for the "collateral" benefits. Even if these were true, we would need to trade off the macroeconomic downside of these policies with the presumed benefits. It is then all a matter of faith. His sales pitch reminds me of a Bengali story in which a doctor asks the patient if his symptoms include vomiting every morning. When the patient replies in the negative, the doctor assures him, "You do vomit but you don't realize it." Ditto for the benefits of capital account convertibility!

General Discussion

Surjit Bhalla expressed puzzlement as to why the financial integration variables, constructed quite intelligently, exhibited very, very weak relationship with growth, growth acceleration, or TFP growth. He also noted that if equity liability includes capital gains and its positive relationship to growth, it is likely to indicate a two-way causation: investors came in, thinking this was a good investment opportunity and it turned out to be right. Bhalla also raised the issue of the jump in the savings rate from 20 to 23 percent of GDP in the early 2000s to something like 35 to 37 percent by 2007–08. It needs to be investigated as to what caused this jump. Finally, Bhalla noted that we had not given enough attention to the political economy of inflows and outflows. The group that has been most opposed to opening up of Foreign Institutional Investor (FII) inflows into India consists of the major investment banks in the world, who derive a substantial amount of rent from the operations of the India's FII policy.

T. N. Srinivasan began by noting that Eswar Prasad had made a long presentation on why he did not find the expected benefit from capital account liberalization in the data. But if you have the wrong benchmark—a theory that lays out an expected benefit assuming a world of no other distortion whereas the distortions are actually present in the data—you do not learn much when you find the benefits are not there. All you have learnt is that there are distortions and these distortions are possibly preventing the benefits predicted in the first-best equilibrium from being realized. Srinivasan did not think this was a useful way of thinking at all about the capital account liberalization.

Regarding growth, Srinivasan said one could think in terms of its standard sources: accumulation, efficiency of resource allocation across time and sectors, and TFP. In each of these dimensions, there is a problem. Take capital accumulation. Looking at the aggregate savings and investment in India does not tell you that more than 50 percent or 55 percent of personal savings is the direct savings by the household in the form of physical assets and does not go through the financial intermediation at all. This is the world of savings, investments, and financing, that is India. In this context, focusing on the international integration through the capital market does not seem to me to be a useful exercise.

Srinivasan concluded by stating that Prasad had a sensible argument on capital account liberalization. In the first-best world, capital account liberalization would yield benefits, but because of second-best considerations those benefits are not being realized. How does setting a date for capital account liberalization help? That helps by more credibly addressing the threshold effect and the domestic distortion problems than you would otherwise do. That is the benefit from pre-announced date for integrating India fully with the international capital market.

Abhijit Banerjee expressed sympathy for the general framework underlying the author's work and added that many years ago he had co-authored a series of papers with precisely the predictions documented by Prasad. He noted, however, that our understanding of thresholds remained very incomplete. Specifically, threshold is likely to differ according to who the borrowers are. If it is a small number of large corporations that are going to borrow short term, the threshold will likely be different than if it is a large number of small entrepreneurs. Banerjee said we did not have a model that actually captures these differences and says something useful about whether we are close to the threshold or far from it. At some point, we will have to bite the bullet and jump in, but it does not seem to be that research-wise we are anywhere close to it.

In response, Eswar Prasad noted that there was clearly a disagreement on the issue of capital account convertibility. What he had done was to let the data speak for themselves. Srinivasan had argued that we should not use the neoclassical model because data did not seem to validate it. But in fact, the model has powerful implications in terms of how large the welfare benefit should be. So, it is a useful benchmark to check whether data agree. Here again, there are perplexing results. A model that seems entirely reasonable in a variety of dimensions and yields very strong predictions does not work in practice. We try to understand why it does not work. In that sense, it is still going to be productive.

Prasad further noted that in his view, capital account liberalization had more to do with getting other policies right than the capital inflows themselves. Whether or not you get large amounts of capital is immaterial. The financial system is ultimately going to greatly influence growth and welfare outcomes. On the flip side, capital controls end up serving as an illusion to protect a set of distortionary policies. In the case of China, for instance, the capital controls were kept in place to support such policies as managed exchange rate and financial repression. The problem is, viewing capital controls as essentially providing room is becoming increasingly untenable not just in the context of India but every other emerging market economy.

Responding to the comment by John Williamson that he had made wild and unsubstantiated assertions, Prasad stated that he had summarized a large volume of research in the paper. So, many statements had been drawn from elsewhere. Much of what has been stated in the paper is in fact based on fair amount of research. It is not just an article of faith that financial integration is good for financial development. There are good theoretical reasons why it should be so. Specifically, in the context of banking reforms, why the entry of foreign banks should improve the efficiency of domestic banking system? If you look carefully at the micro data and not just the macro data, you can trace out some of the channels of efficiency gains.

In concluding, Prasad stated that the political economy factors were critical in thinking about liberalization of both inflows and outflows. This is where capital account liberalization program made a lot of sense. It could help in making a progress, not in terms of getting more capital inflows but in terms of providing a framework for other reforms.

Shankar Acharya began by noting that he was in the Williamson–Bhagwati camp, which advocated that capital account liberalization was good so long as liberalization was limited to FDI or portfolio flows. It is probably bad if you are doing too much of it, especially on debt flows. He pointed out that Prasad was not pursuing what his data were throwing up. To some degree, disaggregation was the name of the game. Whether you were seeking the benefits from an institutional point of view, a political economy point of view, or whatever, one could argue, a lot of these could be gotten while maintaining controls on external debt.

Acharya went on to push the argument a little further. We must ask if the existing level of capital account convertibility in India is too little or too much. When it comes to debt, for example, there may have been premature liberalization on what Indians like to call "external commercial borrowings," which essentially allow Indian corporations to borrow abroad. In the last couple of years, high levels of these borrowings have probably exacerbated the underlying problem of foreign capital surge and engendered a temporary "Dutch disease" problem leading to excessive exchange rate appreciation. Acharya concluded by reminding that the world was facing a credit crunch; the huge energy price shock had led to a large current account deficit of 3.5 to 4 percent of GDP and fiscal deficit had shot up to 8 to 10 percent range. In that context, he asked, was it prudent to pursue a lot of capital account liberalization and if so, why?

Concurring with Acharya, Barry Bosworth said that there seems agreement that FDI is good. Evidence seems overwhelming that on the average, equity investment has been a positive force. As John Williamson said, however, it is the debt that poses a question mark. But it is more than debt, other assets, and other liabilities. The biggest thing we need here is lot of disaggregation. Capital account convertibility is not a meaningful term.

Bosworth went on to add that the paper also provides useful data. In table 3 of the paper, the author decomposes recent reserve buildup into various sources, which was very informative. In table 6, the author provides India's international investment position. It shows that a very large part of capital inflows are offset by reserves buildup. This seems to be a strange bargain. Foreigners are coming to this economy, I would think, looking to the available turn, somewhere between 10 and 20 percent a year. On the other side, two-thirds of that money that comes in, gets offset by the central bank investing in something that does not appear to be earning more than about 3 to 4 percent in real return. This seems to be a costly strategy in the long run.

Suman Bery observed that it was interesting that we paid a lot of attention to crises and perhaps rightly so. Crises have marred the experience of Latin America and to some extent, Eastern Europe. But there has been relatively smooth integration of much of Southern Europe into global financial system. One wonders what is it that they had and they got right and India lacks. We may think of sophistication of financial system as the factor but it is doubtful. Equally, historically, India was an economy with an open capital account, until Independence. So it is not as though capital account liberalization is unknown to India. Therefore, the key factor would seem to be lots and lots of other distortions in the economy that we do not think that the politicians are ready to give up.

Reacting to the comment by Barry Bosworth, John Williamson said that capital account convertibility implied that all capital flows were convertible. That is the reason he had said that capital account convertibility in India now was a question about liberalizing debt flows. Is debt convertibility dangerous? The experience of Indonesia suggested so. Indonesia had lot of foreign denominated corporate debt and all the debtors ran for cover when the crisis broke. That is what led to crisis in Indonesia.

Turning to the issue of threshold, Williamson said this was not just the question of Indian attitudes and policies. There is a tendency in India to think that if you suggest that India has not yet reached the threshold, you are saying something about India. When the Chileans discussed this in the early 1990s, they did not think this was a question of the Chilean attitude. Chileans talked about the attitude of capital market toward them: Would the capital markets continue to lend them if there were a crisis, particularly, if there were a big fall in the price of copper. It seems India has to face the same problem. India may have its act completely together, but as long as it is not completely trusted by the rest of the world, capital account convertibility would be premature.

Anne Krueger observed that the distinction between debt and equity in practice was not as sharp as it is in theory. It is altogether possible to sell shares abroad with the promise to buy them back a year later at an agreed-upon price. Such a transaction would appear to be equity sale abroad but is effectively a debt inflow. This actually happened in Mexico. There was a lot of selling of equity so to speak but with the promise to buy, it was nothing but debt inflow. On the Mexican side, it was recorded as equity and not debt. You have to recognize that you cannot always keep the two baskets entirely separate.

Krueger also noted her discomfort with the idea that as long as debt was held within the domestic banking system, the country was safe. There would seem to be real risks of such an approach. Krueger stated that if she had to choose between a foreign exchange crisis and domestic banking crisis, she would choose the former.

In his final response, Eswar Prasad noted that there seemed general agreement that short-term foreign currency denominated borrowing by government was bad. It is true that if you look at the growth outcomes, foreign currency denominated debt seems to have many of the perverse effects. But we are in a very different world now and things have fundamentally changed in a variety of ways. It is not that the countries did not recognize that debt was not such a great thing. But it was all they could get and it was used to finance things like consumption boom. But now that countries are able to get FDI and portfolio equity inflows, they want more of those. Even countries that used to have difficulty in getting any money are now able to even issue domestic currency denominated bonds.

But if you think about where the vulnerability in the system lies, it is very likely to come from the domestic financial system. Equally, efficient financial intermediation can help long-term economic growth. That makes capital account liberalization important in an indirect way. China offers a very specific example. There are some parallels to India and some differences. In China, the financial system already needs to be reformed. But they are trying to do it essentially with one hand tied behind their backs because they have a managed exchange rate. So, they do not have an independent monetary policy: they cannot use the interest rate instrument to guide credit growth or investment growth. So, they go back to the usual way of controlling the banks, namely, picking up phone from the central bank and calling big state commercial banks to tell them what to do. Ultimately, this is not quite the right way to proceed with financial system reforms. A lot of risks get embedded in the financial system and that is where the real vulnerabilities are likely arise, in both China and to a lesser extent in India. This is where capital account liberalization can be helpful.

The key policy issue, noted Prasad, still is whether India should open the doors to unfettered capital flows immediately. If you were to wait for the optimal moment to undertake capital account liberalization, it is never going to happen. But the broader issue is that we need some sort of timetable rather than making specific comments about whether we should start it today or two months from now. Does that mean that we need to throw open the capital account tomorrow or day after? The answer is in the negative because we do not have the institutional mechanism in place. If we had a more open capital account, slightly more normal exchange rate volatility in the short run, currency derivatives in the markets that could help people hedge some of the risks, it would be a different story. So we need to develop some of these instruments and institutional mechanisms. This is not something that can happen overnight.

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What Explains India's Real Appreciation?

The price of nontradable goods in India has been growing much more rapidly than the price of tradable goods. This change is significant because the ratio of nontradable to tradable goods' prices is a critical relative price—it is a measure of the real exchange rate (RER). An increase in the relative price of nontradable goods therefore corresponds to a real exchange rate appreciation. Our earlier work identified major structural changes in India's economy that might be driving the real appreciation (Kohli and Mohapatra, 2006). Amongst other things, export growth has been robust since 1990 and the share of tradables in aggregate output has expanded to almost 31 percent in 2006–07 as against 18 percent in 1980. Productivity in the tradable sector has risen after 1990, while real per capita income growth has accelerated to an average 5.2 percent in 2000–06 from an average of 3.8 percent and 3.7 percent in the previous two decades. In summary, India is *catching up* with other countries—an ineluctable process where faster productivity growth in the tradable sector may be leading to resource shifts away from the nontradable sector, a higher inflation rate for nontradables, and a real appreciation of the exchange rate.

At first blush, this result seems unsurprising. For Balassa (1964) and Samuelson (1964) argued that real exchange rates typically appreciate as countries develop—and India has been developing rapidly. This hypothesis has been empirically documented in numerous cross-section studies. However, it does not fit the Indian case, or rather, does not fit it completely. For after 1990, precisely when the economy was opened up to foreign competition, we find that the tradable–nontradable productivity

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gap virtually disappeared. So then what explains India's real appreciation? This paper attempts to answer this question, which is critically important for the framing and conduct of macroeconomic policy.

One may well ask: Why define the real exchange rate as the relative price of nontradables instead of the familiar purchasing power parity (PPP)-based definition? Indeed, the bilateral real exchange rate (or the external RER), computed as the relative domestic to foreign currency price levels expressed in a common currency, is preferable for its availability, frequency, and resultant empirical utility. Nevertheless, the two measures differ from a conceptual perspective because one refers to competitiveness in terms of relative price levels, domestic and foreign, while the other refers to the relative price of two different categories of goods, tradable, and nontradable. The relative nontradable–tradable price therefore is an indicator of the incentives for production and consumption of the two categories of goods in an economy. Most recent theoretical works on real exchange rates (for example, Obstfeld and Rogoff, 1996) refer to the relative price of nontradables (also referred as the internal RER), and this definition is in the widest use for analytical purposes in a developing country context (Hinkle and Montiel, 1999). It not only identifies the incentives that guide resource allocation in an economy but is also a key relative price determining the external current account position of the economy.[1] Characterizing the real exchange rate as the relative price of nontradables thus allows us to examine competitiveness in terms of the factors that drives these price trends, making this definition a useful tool for analyzing competitiveness issues—an important area of concern for a country like India. Currently, no such framework of analysis exists for India.[2] This paper contributes by providing such a framework: it constructs a tradable–nontradable price series for India, traces relative price developments and analyzes their determinants, the post-reform triggers of relative price changes, and the implications of these shifts for macroeconomic policies.

The empirical literature research on the subject of real appreciation has grown rapidly in recent years though much of it relates to industrialized countries (Canzoneri et al., 1999; De Gregorio et al., 1993; De Gregorio and Wolf 1994, amongst others). As cross-country productivity levels among

1. A rise in the prices of tradable goods, for example, induces resources to move out of the nontradable to the tradable sector. It also creates incentives for consumers to reduce consumption of tradable goods through substitution with nontradable goods. The switching of production from tradable to nontradable and of expenditures from tradable to nontradable will therefore improve the external current account position (Hinkle and Montiel, 1999: 9).

2. Lal et al. (2003) use the nontraded to traded goods definition of the real exchange rate to analyze macroeconomic developments in India.

industrial countries have begun to converge, divergent inflation rates in the tradable and nontradable sectors in emerging and developing countries have inspired more empirical interest. A sizeable literature has emerged in the case of transition and accession countries in Central and Eastern Europe, where inflation divergence is an important issue for accession to the European Union.[3] Productivity growth-induced real exchange rate appreciation trends for some Asian and Asia-Pacific Economic Cooperation (APEC) economies have been analyzed by Chinn (2000) and Ito et al. (1997), while Choudhri and Khan (2004) have focused on a panel of 16 developing countries. Nonetheless, the non-industrialized country sample remains limited, with a lack of country-specific, longitudinal studies. In part, the gap is due to the lack of disaggregated information on prices and productivity, which is a major drawback to research on the subject.

This paper aims to fill this gap by analyzing the increase in the relative price of nontradables in India over 1980–2006. Using the integrated theoretical framework developed in Bergstrand (1991) and De Gregorio et al. (1994), we examine the role of both demand and supply factors. Our findings reveal that both demand and supply factors are relevant in explaining relative price developments. *After 1991, demand pressures originating from per capita income growth have been the key driving force behind relative nontradables inflation.* Fiscal and import price trends have also played an important role. Finally we find a small Balassa–Samuelson (B–S) effect, which we suspect to be underestimated due to data reasons.

The paper is organized as follows. The section, "The Evidence: A First Look," takes a preliminary look at the data, the section, "What Explains the Increase in Relative Price of Nontradables—Theory?" discusses the theoretical frameworks for explaining relative price developments, and the next section, "What is Driving the Relative Price Increase—Demand or Supply?" formally analyzes the role of different factors in relative price changes. The fifth section, "Determinants of the Relative Price of Nontradables: Formal Evidence," discusses the implications for nominal exchange rate and fiscal policies.

The Evidence: A First Look

This section takes a preliminary look at relative price trends and the relevant demand and supply indicators through descriptive statistics. In the absence of

3. See Backe, 2002 for a review.

a traded/nontraded goods price index, as is the case for India, it is a difficult task to compute this measure of the real exchange rate. Computing tradable and nontradable prices poses several conceptual and practical problems (see Hinkle and Montiel, 1999, for an extensive discussion). Defining tradability is a major conceptual issue, necessarily subjective in the absence of concrete and specific information on what goods might potentially be traded versus those that are absorbed domestically. Traditionally, "services and construction" have been assigned to the nontradable category, a notion that has changed with some services being traded. Many researchers also draw a distinction between tradable and traded: traded goods are defined as items *actually* entering into international trade (exports and imports) and subject to the law of one price, while items that have the *potential* to be traded (either at an appropriate relative price, as with improvement in competitiveness, or become transportable, for example, technological innovation, as with some services) are called tradable. Then there are methodological issues in determining the size and composition of export and import sectors as distinct subsets of the tradable and nontradable sectors.

The problem is compounded for India, which also lacks a services' price index.[4] Although an attempt has been made by Lal et al. (2003) to compute a traded/nontraded price series by classifying the components of the existing wholesale price index (WPI) into traded and nontraded goods, yet more than half of aggregate output is excluded in such a classification. To overcome these constraints and obtain a comprehensive price series for traded and nontraded sectors, we compute the relative price of nontradables by deriving an implicit price series from the nominal and real output data (Box 1).[5] The implicit price series are then classified by their tradability. To remove subjectivity attached to *a priori* reasoning in determining *potentially* tradable items, we determine our tradable and nontradable sectors on the basis of *actual* trade.[6] Further to reduce aggregation bias, we compute tradable/nontradable sectors using disaggregated data on gross domestic product (GDP) by sector of origin.

We then use the allocation criterion proposed by De Gregorio et al. (1994), which is based upon the degree of participation in foreign trade. Thus, if an

4. See T. N. Srinivasan (2008) "Some Aspects of Price Indices, Inflation Rates and the Services Sector in National Income Statistics" for an up-to-date discussion on these issues.

5. Two direct methods, namely, expenditure method, using expenditure data from the national accounts, and the production method, splitting sectors of production into tradable and nontradable categories, have been used in the literature. Valued added in current and constant prices are then used to derive implicit price deflators for the two sectors.

6. The two terms, tradable and traded, are used interchangeably throughout in this paper.

BOX 1. Implicit Price Series in Services Sector in India

The implicit price deflators represent farm gate prices of goods and services and are producer price inflation proxies in the case of goods. India currently lacks a services' price index, which complicates the task of deriving implicit price indices for services as services' output for some sub-categories is computed through extrapolation of wholesale and/or consumer price indices.

The implicit GDP deflators in the National Accounts Statistics (NAS) are derived as a ratio of Gross Value Added (GVA) at current prices to that of GVA at constant (base year) prices. The compilation of GVA at current and constant prices requires data on quantity of output as well as base and current year prices. These data are gathered by the Central Statistical Organisation (CSO) through both direct and indirect methods. Approximately 54 percent of the services GDP (28 percent of aggregate GDP) is estimated through the direct method, while the balance is estimated indirectly (24 percent of aggregate GDP).

Under the direct method data are gathered separately on output as a quantum index (QI) and prices as a producer price index (PPI) to estimate GVA at current and constant prices. The implicit GDP deflator derived through this methodology is thus statistically a fair approximation to the producer price trend observed in the sector. Service activities like banking and insurance, public administration and defense, railways, and all public sector as well as some private sector activities in trading, transport, storage, communication, education, medical, and media are estimated directly. In sectors where data on both quantities and prices are not available, the indirect method is used to estimate nominal output. Each service activity is extrapolated with respect to its relevant benchmark indicator. The GDP estimation for each item at current prices is extrapolated by an indicator of current prices while constant price items are extrapolated similarly by an indicator of constant prices. The relevant consumer price index (CPI) is used as the deflator in a majority of the cases, exceptions being trade (index of gross trading income), some transport (implicit price indices of road, air, and transport), ownership dwellings (index of house rent), recreation/ entertainment (tax rate and collections), and so on.

The derived implicit GDP deflator using the indirect method is therefore a mix of producer and consumer prices; since producer and consumer prices in services are usually identical, the use of the CPI as price deflator in most cases is a fair approximation to the actual prices level for the sector. Potential circularity arising from the use of WPI/CPI as deflators is limited to 23 percent of services' GDP (12 percent of aggregate GDP).

Source: Computed by the authors.

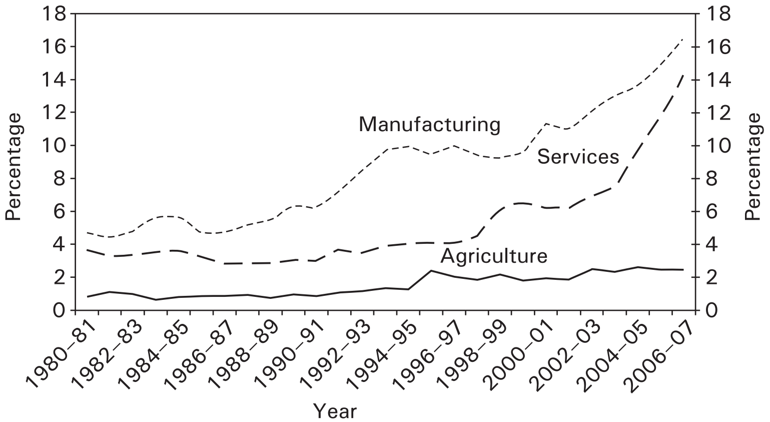
average of 5 percent or more of total production of a sector is exported, the category is considered tradable.[7] Compared to the convention of classifying agriculture and manufacturing as traded and services as nontraded goods, this method allows a more accurate tradable/nontradable characterization for some services might be traded while some agricultural and manufacturing goods might not. It thus reduces the bias in the measured relative price of nontradables, which could be potentially quite large for India, a significant

7. De Gregorio et al. (1994) used a 10 percent share of exports in production as the threshold level for defining tradability of a sector. Export/production ratios for India are far lower though with few manufacturing subsectors exporting more than 10 percent of their total value of output.

exporter of services (figure 1). The classification is also dynamic as it allows for changes over time. We do not consider imports in defining the tradable sector due to conceptual as well as practical problems. The inclusion of imports to determine the degree of participation in trade for each sector at a sufficiently disaggregated level involves identifying the degree to which domestic production of each industry is substitutable with imports, over and above which the production share could be considered import competing. This involves exercising a judgment or an assumption about the relevant prices, thereby increasing the subjectivity or arbitrariness in determining tradability. It also implies potential tradability rather than actual tradability, further increasing the subjectivity in the determination. Finally, in deriving price indices from the national accounts, the tradables are the exports on the production or the supply side of the economy;[8] were the indices to be derived from the expenditure accounts, then imports would be the tradables.[9]

The trends in sectoral export shares in the total value of production (agriculture, manufacturing, and services) show that the share of tradables in the value of total manufacturing output in India started rising in the mid-1980s,

FIGURE 1. Export/Value of Total Production, 1980–2006 (in percentage)



Source: WITS Database and CSO, India.

8. Imports would figure indirectly as raw materials plus intermediate goods to arrive at the value added numbers in the GDP computation.

9. Practical difficulties involve matching imports from the trade statistics at a sufficiently disaggregate level to the various production categories in the national accounts. While finished goods do not pose a problem, an enormous amount of judgment has to be exercised in the case of raw material/intermediate goods in the production of goods in different sectors. Moreover, many items (for example, oil, lubricants, many metals, alloys, and so on) would figure as inputs across several sectors.

accelerating in the next two decades (figure 1). The disaggregate sectoral trends in table 1 uncover further interesting features. Between 1980 and 2006, at least seven of the fifteen manufacturing subsectors more than trebled their export shares, with non-metallic products, textiles, other manufacturing, chemicals, electrical and non-electrical machinery, and basic metals as the primary drivers of export growth in the manufacturing sector.

In contrast to manufacturing, the share of tradable services in total value of its output changed little between 1980 and 1995, but almost doubled between 1993 (3.9 percent) and 2003 (7.4 percent) and then again in the fol-lowing three years reached 14.3 percent in 2006. Almost three-quarters of business services were tradable in 2006. Still, only three of the eleven categories classified as services under the *National Accounts Statistics* are tradable, namely, transportation, insurance and business, and legal and communication services. Finally, the export–production ratio of agriculture almost doubled

TABLE 1. Tradable/Nontradable Classification by Total Export/Total Production Ratios

	1980	*1990*	*2000*	*2006*	*1980–2006*	*1990–2006*	*T/NT*
Agriculture	**0.8**	**0.9**	**1.9**	**2.5**	**1.5**	**1.9**	**NT**
Mining	14.5	8.1	6.8	16.9	9	9.6	T
Manufacturing	4.7	6.2	11.3	16.6	8.6	10.7	
Food products	2.3	2.7	5.8	5.7	4.2	5.1	T
Beverages, tobacco, etc.	31	18.7	17.9	10.7	20.6	16.8	T
Textile group sub-total	8.6	16.3	35.6	36.5	20.3	26.6	T
Wood, furniture, etc.	2	0.5	1.4	8.2	1.9	2.4	NT
Paper and printing, etc.	0.2	0.2	2.1	2.9	1	1.5	NT
Leather and fur products	8.6	14.4	18.8	24.1	14.7	16.3	T
Chemicals, etc.	2.7	6	9.9	15.8	7.3	9.8	T
Rubber, petroleum, etc.	0.9	3.5	5.4	16.3	5.7	6.6	T
Non-metallic products	15.1	33.4	48.9	42.7	37.5	46.3	T
Basic metal industries	3.4	3.4	7.6	12.6	5.6	7.1	T
Metal products and machinery	3.4	3.4	7.6	12.6	5.6	7.1	T
Transport equipments	2.9	2.1	4.3	7.1	3.3	4.2	NT
Other manufacturing	4.7	3.7	12.1	20.7	9.5	12.1	T
Services	**3.7**	**3**	**6.2**	**14.3**	**5.1**	**6.2**	
Travel & transportation	33.6	22.1	26.6	39.2	28.1	29.7	T
Insurance	8.8	6.7	9.6	13.5	8.5	9.1	T
Business (incl software), legal and communication services*	56.7	43.8	45.8	71.4	52.9	51.1	T

Source: Staff calculations from CSO National Accounts data, RBI Handbook of Statistics, and WITS database.

Notes: *The three services have been clubbed together as the export data (miscellaneous exports) indicates export values in aggregate for these services. Export and GDP values in US dollars used for computation of the ratios.

T: Tradable; NT: Nontradable.

between 1990 and 2000, after remaining stagnant in the previous decade. With an average export share of 1.5 percent in total production over the sample period, however, agriculture lies much below the threshold value and is classified as nontradable.

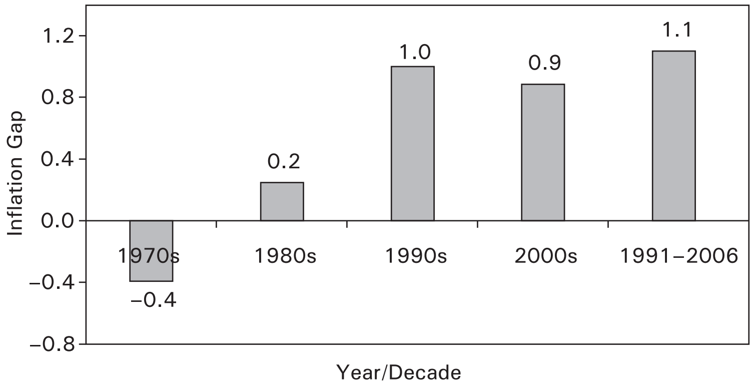
It can be seen that were a more aggregate classification or a higher threshold—10 percent—used to define tradability, the only tradable sector would be manufacturing. A lower threshold of 5 percent and disaggregated export shares in output allow us to include emerging export industries that increased their export–total production ratios substantially in the 1990s, for example, chemicals, metal products, non-electrical machinery, rubber, and so on. Likewise, our choice affects insurance in the services sector; at an average export share of 8.5 percent in its total output over the sample period, it falls between a 5 and 10 percent benchmark and is classified as tradable.

Rising Relative Nontradable Prices

Utilizing this classification, implicit inflation rates were derived for the tradable and nontradable sectors of the economy. The mean divergence in the nontradable–tradable inflation rate, or the relative nontradables' inflation rate, is plotted in figure 2 for every decade from 1970. The inflation differential turns positive in the 1980s and exceeds 1 percentage point from the 1990s till the end of the sample period, 2006–07. In the post-1991 period, it averages 1.10 percent, indicating that the relative nontradables' inflation rate accelerated in this period. The inflation divergence is robust to an alternate tradable/nontradable classification. To test whether the result is driven by an arbitrary choice of a threshold, we relaxed it to a 10 percent export share of each subsector in the total value of its production. The recomputed sectoral inflation rates confirm the robustness of the divergence trend (figure A-1 in appendix 1); nontradable inflation rate exceeded the tradable inflation rate from the 1980s, crossing the 1 percent bar in the post-reform period. Our quantitative criterion is further compared with an illustrative subjective criterion through the inclusion of agriculture as a tradable sector in the classification (figure A-2 in appendix 1). This throws up an interesting result: unlike the steady increase in the nontradable–tradable inflation gap from the 1980s, we observe a widening inflation differential between the two sectors only for the current decade and for the post-reform (1991–2006) average. But the gap is much smaller (0.4 percent) relative to the 1.1 percent differential observed when excluding agriculture, emphasizing the artificial repression of agriculture prices.[10]

10. We are indebted to Robert Lawrence for this suggestion.

FIGURE 2. Nontradables–Tradables Inflation Differential (Decade Means in percentage)



Source: WITS database and CSO, India.

Relative Nontradable Prices and Other Measures of the Real Exchange Rate

Since the relative price of nontradables is a measure of the real exchange rate and an increase in it corresponds to a real appreciation, how does its evolution compare with the bilateral real effective exchange rate (REER), the commonly used real exchange rate measure in India? While in theory the relationship between the external and the internal measure of the real exchange rate is clear, empirical movements of the two measures need not necessarily be similar simply because of the role of domestic/foreign country prices of traded goods and that of the internal real exchange rate of the foreign country. A lot depends upon whether the law of one price holds for tradable goods; if this does not hold for long periods of time then the two series will diverge as the effects of external real exchange rate movements upon the internal exchange rate are muted (Hinkle and Nsengiyumva, 1999).

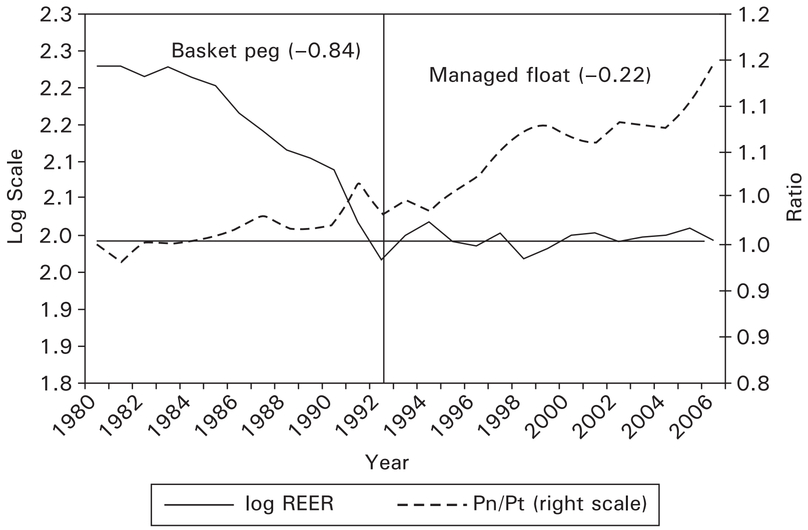
Figure 3 shows the nontradable–tradable price ratio and the thirty-six-country, trade-weighted REER moving in opposite directions before 1991 (correlation –0.84). After 1991, the negative correlation between the two measures is considerably diluted (–0.22). How can this difference be explained? Quite easily, it turns out.

Consider a simple, two-country formulation of the REER:

$$r = \frac{p}{e.p^*} \tag{1}$$

where r is the real exchange rate, p is the domestic price level, e is the nominal (spot) rate, and p^*, the foreign price level. Now consider the case

FIGURE 3. Nontradable/Tradable Price Ratio and the Real Effective Exchange Rate



Source: RBI, CSO and author's calculations.
Note: Figures in parentheses are correlations. Pn/Pt: Nontradable/tradable price ratio.

where tradable and nontradable shares, α and $(1 - \alpha)$ are the same in both countries. Then we can write:

$$r = \frac{P_T^{\alpha} P_N^{1-\alpha}}{(E.P_T^{*})^{\alpha}(E.P_N^{*})^{1-\alpha}} = \left[\frac{P_T}{E.P_N^{*}}\right]^{\alpha}\left[\frac{P_N}{E.P_N^{*}}\right]^{1-\alpha} \tag{2}$$

where P_T and P_N are the prices of tradable and nontradable goods respectively. It is then clear from inspection that the REER can appreciate if *(a)* there is a deviation from PPP in the traded sector or *(b)* the price of nontraded goods rises faster in the home country. Either or both of these conditions can hold, irrespective of the relative price of nontradables in the domestic country. In India's case, there is some indication that pre-1991, the first case was applying. From the mid-1980s, an active policy of nominal depreciation produced a real depreciation, correcting an earlier overvaluation. But starting in 1993, the shift to a more flexible exchange rate regime weakens the strong, negative association of the earlier pegged exchange rate regime.

Apart from change in exchange rate regime, an important role is played by trade taxes—when taxes on international trade or administered price effects are significant, the internal and external real exchange rates will diverge. *Ceteris paribus*, a decline in protection will appreciate the internal real exchange rate by lowering the domestic price of tradables. Table 2 presents evidence on the role of trade tariffs in explaining differences in movements of the two exchange rate measures. Tariff rates in India fell sharply after 1991 as trade liberalization gathered momentum and their likely effect upon domestic prices was to reduce the divergence between the two measures of the real exchange rate. In fact, the steepest cuts in tariff rates are during 1992–96, which is coincident with a spurt in the nontradable–tradable price ratio (figure 3). Last of all, different rates of productivity growth in the tradable and nontradable sectors are one of the most important empirical factors affecting the relationship between internal and external real exchange rates. We again observe an empirical regularity in figure 3. The two phases of strong GDP growth, 1994–96 and 2003–06 are associated with a spurt in the nontradable–tradable price ratio; both these periods saw relatively faster productivity growth in the tradable sector, when it exceeded nontradable sector productivity growth by an annual average of 3 percentage points.

The next section discusses the various theoretical explanations offered in the literature.

What Explains the Increase in Relative Price of Nontradables: Theory?

Several theories explain the secular increase in the prices of nontradable goods as an economy develops. Supply-side models (Balassa, 1964; Samuelson, 1964) describe it as part of cross-country convergence in

TABLE 2. Weighted Average Import Duty Rates in India (in percentage)

	All commodities	*Peak customs duty*[1]	*No. of basic duty rates*[2]
1991–92	72.5	150	22
1992–93	60.6	110	20
1993–94	46.8	85	16
1994–95	38.2	65	16
1995–96	25.9	50	12
1996–97	24.6	52*	9
1997–98	25.4	45*	8
1998–99	29.2	45*	7
1999–00	31.4	40	7
2000–01	35.7	38.5	5
2001–02	35.1	35	4
2002–03	29	30	4

Source: Report of the Task Force on Employment Opportunities, Planning Commission, Government of India, July 2001. Estimates for 2002–03 from Ahluwalia, 2002.

Notes: [1] Includes the impact of surcharges in the years indicated by* in 2000–01, duties for many agricultural products were raised above the general peak in anticipation of the removal of quantitative restriction. This explains why the average for all commodities exceeds the peak rate in 2001–02.

[2] Refers to ad valorem duty rates.

productivity levels. Under the assumption of perfect integration of goods and capital markets, which sets tradable goods prices (P_t) and interest rates (R), faster technological progress and productivity growth in the tradable sector leads to an increase in the relative price of nontradables, where productivity growth is slower. Productivity gains in the tradable sector are accompanied by rising wages, and the assumption of labor mobility between the two sectors equalizes nominal wages across the two sectors. The relative price of nontradable goods (P) then rises because the wage increase is not accompanied by matching productivity growth in the nontradable sector. The B–S proposition can be summarized in a two-good (traded and nontraded) framework as follows.[11] The production functions of the two sectors are given by

$$Y_t = Q_t L_t^{\alpha_t} K_t^{1-\alpha_t} \tag{3}$$

and

$$Y_{nt} = Q_{nt} L_{nt}^{\alpha_{nt}} K_{nt}^{1-\alpha_{nt}} \tag{4}$$

where the subscripts t and nt denote tradable and nontradable goods, while Y, L, and K are output, labor, and capital respectively. The prices in the traded and nontraded sectors are

$$P_t = \frac{1}{\theta_t} W^{\alpha_t} R^{1-\alpha_t} \alpha_t^{-\alpha_t} (1-\alpha_t)^{-(1-\alpha_t)} \tag{5}$$

and

$$P_{nt} = \frac{1}{\theta_{nt}} W^{\alpha_{nt}} R^{1-\alpha_{nt}} \alpha_{nt}^{-\alpha_{nt}} (1-\alpha_{nt})^{-(1-\alpha_{nt})} \tag{6}$$

where W is the unit cost of labor and is the rate of return on capital. Since is set by the world interest rate, wages are determined by Equation 5 and with both and given, Equation 6 shows that nontradable prices are solely determined by technology. Log differentiating Equations 5 and 6, solving for the difference and through substitution, the change in the relative price of nontraded goods can be expressed as

$$\hat{P} = \frac{\alpha_{nt}}{\alpha_t} \hat{\theta}_t - \hat{\theta}_{nt} \tag{7}$$

11. This conceptual framework is based from De Gregorio et al. (1994).

where θ is productivity and $\hat{}$ is the rate of change. Equation 7 shows that the relative price of nontradable goods is solely driven by productivity growth in the tradable goods sector. Differential productivity growth rates in the two sectors translate directly into sectoral inflation differentials, which, in turn, correspond to a real exchange rate appreciation.

Demand conditions thus play no role in the determination of relative prices in the B-S framework, which is based upon productivity trends and essentially a long-term phenomenon. However, in conjunction with this supply-side impact, transitory demand disturbances could add to the relative price increase. For example, shocks like a rise in government spending could induce a temporary increase in the relative price of nontradables (Obstfeld and Rogoff, 1996). The role of government spending has also been the focus of recent models of equilibrium exchange rate determination, which show government expenditure falling exclusively (De Gregorio et al., 1994; Rogoff, 1992) or disproportionately (relative to private spending, Froot and Rogoff, 1991) upon nontradable goods.

Demand pressures originating from income growth could also induce an increase in the prices of nontradable goods (Bergstrand, 1991; Kravis and Lipsey, 1983, 1988). Assuming nonhomothetic tastes, that is, income elasticity of demand for services (goods) exceeds (is less than) unity, a rise in per capita income will induce an expenditure shift toward nontradables, as the latter are luxuries in consumption. This expenditure shift translates into a higher relative price of nontradables (particularly services) as resources shift toward the production of nontradable goods. A demand-induced relative price increase will thus be reflected in the rising share of nontradables in aggregate output. Similar demand influences could prevail due to shifts in technologies (Dornbusch, 1988).

Theoretical frameworks combining the supply and demand approaches can be found in several works. Bergstrand (1991) integrates the productivity growth and relative factor endowment (Bhagwati, 1984) models with the demand-oriented hypothesis, real income growth, for a cross-section of 21 countries. De Gregorio et al. (1993) incorporate demand shocks alongside productivity-growth induced supply shocks by relaxing the assumptions of perfect competition in goods and factors markets, law of one price in tradable goods, and perfect capital mobility in the B-S models.[12] Extending the two-good supply-side framework (equations 3–6) the integrated framework is

12. Another strand of literature extends the framework to include terms of trade shocks, identified as a major determinant of the relative price of nontradables (De Gregorio and Wolf, 1994; Edwards, 1989).

formalized by De Gregorio et al. (1993) in the following manner. The utility function of the representative consumer, who maximizes utility on a period-by-period basis is given by

$$u(C_{nt}, C_t) = C_{nt}^{\phi}(C_t - \bar{C})^{1-\phi} \tag{8}$$

where C_{nt} and C_t represent consumption of nontraded and traded goods and $\bar{C}$ is the subsistence level of traded goods consumption. The budget constraint, expressed in terms of traded goods, is given by

$$I = C_t + PC_{nt} + PG \tag{9}$$

where I is total income and G is total government expenditure, all on nontraded goods and financed by lump sum taxation. The demand functions are

$$C_t = \phi\bar{C}(1-\phi)(1-PG) \tag{10}$$

and

$$C_{nt} = \phi/P\,(1-\phi)(I - PG - \bar{C}) \tag{11}$$

Assuming government expenditure to be a constant fraction of total income, $PG = gl$, the total demand of the economy, public and private, is

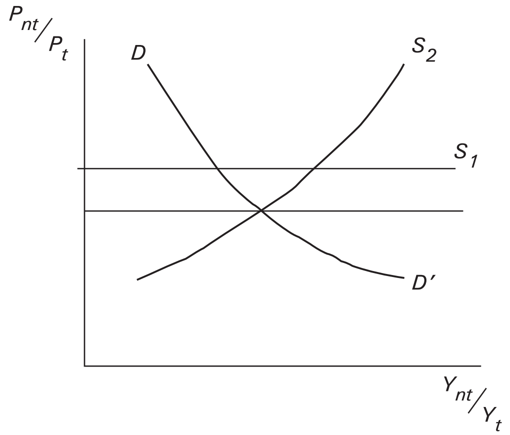
$$C_t = (1-\phi)(1-g)I + \phi\bar{C} \tag{12}$$

and

$$C_{nt} + G = \left[\phi + (1-\phi)g\right] I/P - \phi\bar{C}/P \tag{13}$$

For $\bar{C} > 0$, the income elasticity of demand for tradables is less than unity while that for nontradables is greater than 1. An increase in demand will thus increase the consumption share of nontradables. In the B-S framework, this will be reflected in the shrinking of the tradable sector as resources are directed toward the production of nontradables; however, relative prices are not affected by the demand increase. For demand-side effects upon the relative price of nontradables, Rogoff (1992) and De Gregorio et al. (1994) show that a relaxation of the perfect competition and capital mobility assumptions, which allows an upward sloping relative supply curve, is essential. The accompanying figure 4 illustrates the supply and demand impact upon the relative price and output of nontradables, which are determined at the intersection of a downward sloping demand schedule

FIGURE 4. Determination of Relative Nontradable Price and Output



DD′ and a horizontal relative supply curve S_1 (perfect capital mobility assumption). A rightward shift in the demand curve does not change the equilibrium price but expands the relative production of nontradables, while supply shocks affect both relative prices and production. If however, the supply curve is upward sloping, that is, imperfect capital mobility, then it can be seen that an increase in demand is followed by a rise in the relative price and an expansion of the nontradable sector.

Changes in economic structure due to reforms in economic policies can also be a driving force for divergent inflation rates. This is particularly true for economies in transition, like India where the post-1991 period is characterized by fundamental structural changes in price and production structures. Following the macroeconomic crisis of 1991, liberalization policies were pursued in almost every economic sphere—from trade to prices. Trade liberalization accelerated after 1991: the average effective tariff rate was reduced steadily, non-tariff barriers were eased with removal of licensing restrictions on raw materials, intermediate and capital goods, while a tariff line-wise import policy was introduced in 1996 (table 2). These changes obviously impacted import prices—through lowered input costs, lower prices of tradable goods, and consequently, relatively higher inflation in nontradables. In terms of figure 4, the import liberalization case can be illustrated as a purely supply-side effect: a fall in the domestic price of imports raises the relative price of nontradables, followed by an expansion of the tradable sector as the supply curve shifts upwards.

Deregulation of administered prices and liberalization or the adjustment of regulated prices to cost-recovery levels during transition can also impact relative prices, a process experienced by the European transition economies where initial adjustments of relative prices (specifically in the tradables sector) were associated with rapid price and trade liberalization in the early phase of transition (Backé, 2002). This was followed by a moderation of inflation, a relatively faster increase in nontradables' prices and a trend appreciation of the real exchange rate. Competition and labor market segmentation may also play a role in driving up the relative price of nontraded goods: since the nontradable sector is typically sheltered from competition as opposed to the tradable sector, inflation pressures tend to be higher in the former sector.[13]

In India, price deregulation in the nontradable (services) sector has been fairly recent, confined so far to banking, insurance, and communication sectors, and is yet to reach an advanced stage. Competition and interest rate deregulation were initiated in the banking sector from 1990 onwards and is complete, save for the administered interest rate on savings accounts. The insurance sector was deregulated in 1998–99 although insurance premia are set by the insurance regulatory body. Price liberalization in telecommunications followed the insurance sector in 1999–2000. Between 1998–99 and 1999–2000, the share of services with administered prices fell from 28.4 percent to 13.9 percent. The transition to market-based pricing is thus spread out over many years in India, making it difficult to identify the transition-related price dynamics. As prices still have to be freed in many sectors, it is reasonable to expect that price liberalization will continue to impact relative prices for quite some time.

Empirical evidence endorses both supply and demand side influences upon relative price movements. De Gregorio et al.'s (1994) study reveals income growth and higher productivity growth in the tradable sector as the key sources of the increase in relative nontradables' prices for fourteen Organization for Economic Cooperation and Development (OECD) economies over 1970–85. Canzoneri et al. (1999) confirm that the relative price of nontraded goods reflects the relative labor productivities in their panel study of fourteen OECD countries. These results are reinforced by Chinn and Johnston's (1996) panel estimates for fourteen OECD countries that identify productivity measures, government spending, and terms of trade as significant determinants of real exchange rate movements.

For emerging and developing countries, Chinn (2000) estimates a productivity-based model of relative prices and real exchange rates for nine East Asian economies and finds conflicting results. The hypothesis of

13. Differences in wage bargaining patterns in the two sectors (Canzoneri et al., 1999), or government regulation or support of inefficient firms (De Gregorio et al., 1993) could also give rise to divergent inflation rates.

productivity-driven real exchange rate appreciation is supported for Japan, Malaysia, and Philippines, but not for fast growing countries like China and Thailand in the time series samples; the panel estimates support the productivity effect with government spending and terms of trade emerging as insignificant factors. Ito et al. (1997) find that rapid growth is associated with real exchange rate appreciation only for some Asia-Pacific Economic Cooperation (APEC) and Association of South East Asian Nations (ASEAN) economies, namely, Japan, Korea, Taiwan, and to some extent, Hong Kong and Singapore, while countries like Indonesia, Malaysia, and Thailand did not experience any real appreciation. They point out three factors that might explain the lack of exchange rate appreciation—high productivity growth in service sectors, divergences in domestic–foreign tradable prices, and economic reforms that promote export and growth through nominal depreciation.

Only one study, Choudhri and Khan (2004), focuses solely upon developing countries. In a panel sample of sixteen countries, they find the traded–nontraded sector productivity growth differential to be a significant determinant of the relative price of nontraded goods, which, in turn, exerts a significant influence upon the real exchange rate. Empirical research on sectoral inflation differentials and, more broadly, on factors driving real exchange rate appreciation in the transition and accession countries of the European Union has also grown rapidly in recent years;[14] many cross-section studies establish the Balassa–Samuelson (B–S) phenomenon as a driving force of inflation divergence (De Grauwe and Skudelny, 2000; Halpern and Wyplosz, 2001; Jazbec, 2002, among others), and country studies confirm this feature.[15]

The next two sections explore the relevance of these factors in explaining relative price movements.

What is Driving the Relative Price Increase—Demand or Supply?

Relative Nontradable Prices and Nontradable/Tradable Sectors' Output Shares

How does the relative price of nontradables relate to changes in relative nontradable/tradable output shares? The B-S hypothesis predicts that a rise in relative nontradable prices will be accompanied by falling shares of nontradables in aggregate output as resources are reallocated toward the

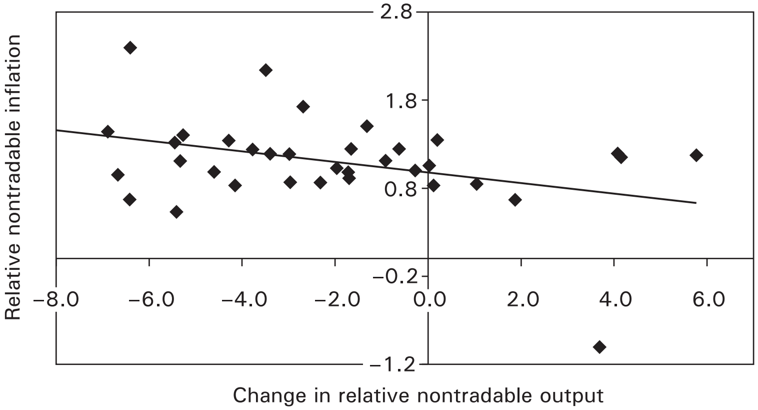
14. Backe (2002) reviews the empirical literature for transition and accession countries of the European Union.

15. Recent work by Altissimo et al. (2005) also identifies the role of productivity shocks affecting the nontradable sector, and to a lesser extent, mark-ups' shocks in driving the euro area inflation differentials.

tradable sector. Preliminary examination shows that the annual increase in the relative price of nontradables is associated with a fall in the share of nontradable output (figure 5).

The expanding share of tradables in the economy, from an average 20.1 percent (1980–89) to 25.1 percent during 1990–2006 undoubtedly reflects the post-reform trade, investment, and price liberalization effects (see the third sectionof this paper). Although resource allocation toward tradables is observed in both manufacturing and services sectors, the traded component of services increased relatively more. Traded services doubled from an average 6 percent share in GDP (1980–89) to an average 12 percent in the current decade (2000–06), while corresponding shares of traded manufacturing rose marginally from 12 percent to 14.2 percent of GDP.[16] The output shares of fast-growing export sectors increased significantly during this period (tables A-5–A-8, appendix 2). Figure A-3 (appendix 2) shows that most subsector inflation rates correlate negatively with respective changes in output.

FIGURE 5. Scatter Plot of Relative Nontradable Inflation and Output Share, 1970–2006



16. There is some suspicion of overstatement of services sector output. Acharya (2006) has suggested that the shift to a new series with 1999–2000 as base might be responsible for the services' output expansion after 1996–97, while Bosworth et al. (2006) suspect underestimation of price trends in services resulting in overstatement of output. Rajaraman (2007) contends that service sector growth in the new series starting 1999–2000 removed the earlier downward bias in measurement of services due to improvements in measurement methodology; the estimation of output in services, for which no formal data collection mechanism exists, was more closely aligned to the growth indicator of the corresponding service in the new GDP series of 1999–2000.

Relative Nontradable Prices and Labor Productivity Growth

Table 3 presents average labor productivity growth differentials between the tradable–nontradable and manufacturing–services sectors (table A-9, appendix 2, gives the disaggregated time series by subsectors). These estimates need to be interpreted with caution due to conceptual, measurement, and data problems. First, since these are partial productivity measures, changes in input proportions can influence these measures (for example, a rise in average productivity of labor due to substitution of capital for labor). The second problem relates to measurement of productivity in services sector; data quality of output measures, including the price deflators necessary for obtaining real output from nominal magnitudes, are key issues here.[17] Third, since the only information on services is confined to numbers employed, productivity measurement is based upon output and input quantities alone.[18] Last, data aggregation constraints prevent strict correspondence between the tradable–nontradable distinction used for computing productivity estimates and prices respectively. Thus the inclusion of tradable services in the nontradable sector biases labor productivity growth estimates for that sector upwards.[19] All these factors render the labor productivity estimates considerably noisy.

These caveats noted, the data shows the tradable–nontradable sector productivity growth gap narrowing steadily after the mid-1980s until 2000 (table 3). Column 2 of the table presents the gap computed with the conventional tradable/nontradable distinction of manufacturing and services.

17. Measurement issues in services' productivity have posed a challenge as changes in the nature of production, that is, increased role of services, have outpaced changes in the statistical system that were traditionally geared toward collection of data on the goods sectors. Real output in most service sector industries is not very well measured and is also difficult to measure. Measurement problems in finance and insurance sectors are particularly severe where the concept of output is unclear, making measurement of its price change and productivity difficult (see Bosworth and Triplett, 2004, for a review of measurement issues in services' productivity).

18. Labor productivity calculated as output per worker and is based upon total employment figures for agriculture, services, and manufacturing sectors, drawn from the CEIC database. These, however, are unadjusted for quality changes over time, and to that extent, pose a limitation.

19. The tradable component of services cannot be extracted from the employment shares data, which is disaggregated across categories different from the subsectors used to classify tradability; nontraded manufacturing employment shares similarly cannot be separated from overall manufacturing employment estimates. Services and agriculture are therefore clubbed together to arrive at productivity estimates of the nontradable sector. Cross-sector biases arising from gaps in formal/informal sector employment estimates are also likely to affect productivity measurement; as the extent of informal employment is larger in services like construction, transport, personal services, and so on, the size of the traded–nontraded productivity differential is likely to be smaller.

TABLE 3. Relative Labor Productivity Growth Differentials: Tradable–Nontradable and Manufacturing–Services, 1982–2004

Year	*Tradable (manufacturing only)–Nontradable (agriculture and services, including tradable services)* *(1)*	*Manufacturing–Services (including tradable services)* *(2)*
1982–86	4.23	2.77
1987–90	3.59	2.84
1992–95	2.71	1.92
1996–99	–1.12	–3.03
1982–90	3.95	2.80
1992–2004	1.58	0.46
2000–04	2.84	2.08

Source: NAS, CSO, and CEIC Database.

Note: Figures are period averages. Labor productivity estimates are confined to 1982–2004 due to data availability constraints. Labor productivity for the tradable sector is proxied by manufacturing sector, while services and agriculture are clubbed together for computing labor productivity in the nontradable sector.

Both definitions indicate that labor productivity growth in the services sector (including tradable services) narrowed the gap vis-à-vis manufacturing in the 1990s. The annual average labor productivity growth of the services sector increased from 4.2 to 7.6 percent between 1982–90 and 1992–2004 while that of manufacturing sector increased only marginally from 7.0 to 8.1 percent. Consequently, the tradable–nontradable labor productivity growth gap shrunk to an average 1.6 percent in 1992–2004 from a wider 4 percent in the previous decade (1982–90). Excluding agriculture, the manufacturing–services productivity growth gap almost disappears in the latter half of the sample (column 2). Disaggregate analysis shows that labor productivity growth in the services sector was significantly driven by the category "Transport, Storage and Communications"; average productivity growth almost trebled to 11.2 percent in 1992–2004 against the 4.3 percent clocked during 1982–90 (table A-9, appendix 2). It is worth noting that communication services were rapidly deregulated in the mid-1990s (see the third section of this paper). Further, transportation and communication services are categorized as tradable in our classification, but the lack of further disaggregation in employment data prevents separation of the tradable/nontradable components thereby biasing labor productivity growth estimates of nontradables upwards. This constrains pinpointing the exact location of the extraordinary labor productivity growth observed in the services, that is, it is not possible to determine whether it originated from the tradable or nontradable component of the sector. For services like communications, insurance, and banking, liberalization and deregulation of administered prices were likely sources of labor productivity growth as communications and information technology prices fell as a consequence.[20]

The virtual disappearance of the relative labor productivity growth differential from almost 3 percentage points in the 1980s to almost zero during 1992–2004 is striking because the relative price of nontradables increased at a faster pace at the same time. Figure 6 depicts this paradox: accelerating productivity growth in nontradables closes the gap vis-à-vis tradable sector productivity growth, while the relative nontradable–tradable price ratio climbs at the same time. Adding to the puzzle is the negative (but weak) association observed between the relative productivity differential and relative nontradables inflation (figure 7), which *prima facie*, neither supports a B-S effect nor is it consistent with the rising share of tradables in aggregate output. What then explains the increase in relative nontradable prices when the relative productivity differential actually narrowed in the 1990s? Did demand factors dominate during this period? We explore this next.

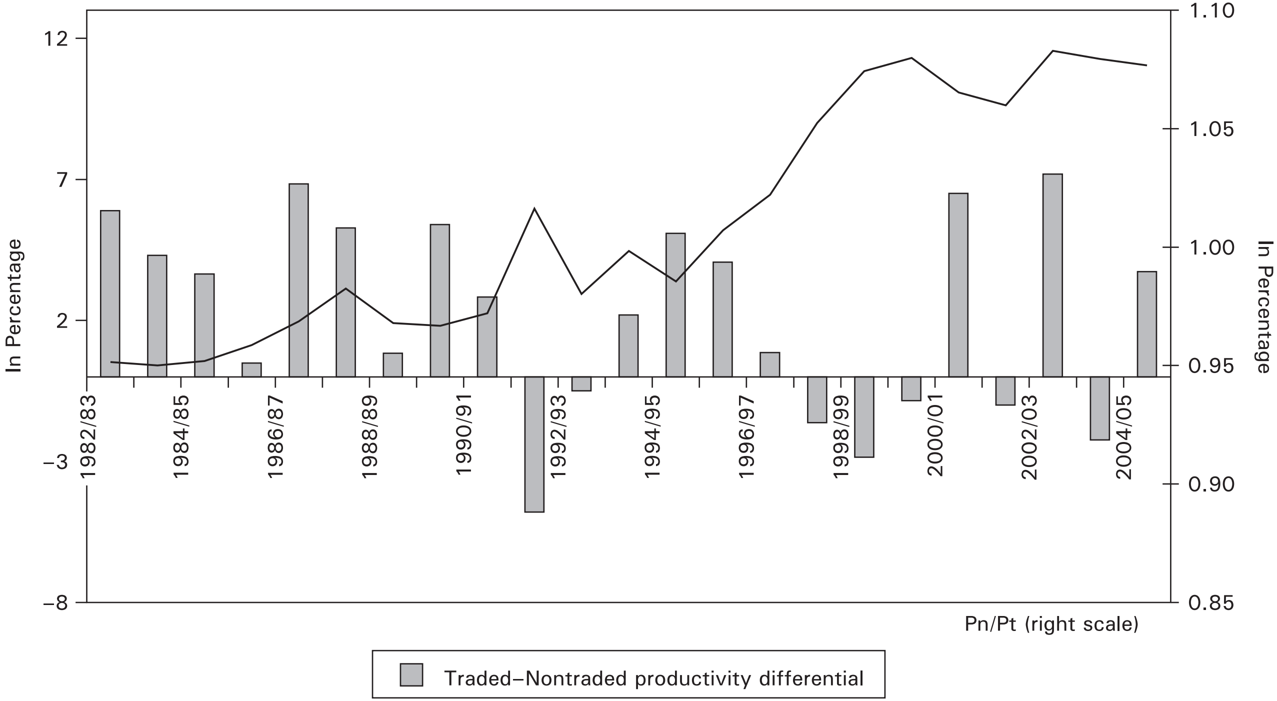
Relative Nontradable Prices and Demand Indicators

Table 4 uncovers a major demand shift, public as well as private, in the 1980s. Real government consumption expenditure growth averaged 6.9 percent of GDP in this decade, an increase of more than 2 percent over the 1970s. At the same time, real per capita income growth jumped to an average 3.7 percent from a minuscule 0.61 percent in the previous decade. The post-reform decade of 1992–2006 shows private demand accelerating further to average 4.6 percent even as fiscal growth slowed to average 5.9 percent in this period. Private demand accelerates further in the current decade, 2000–06, averaging close to 6 percent.

Column 3 shows that growth in the share of services in private final consumption expenditure—a closer indicator of the nonhomothetic preferences hypothesis—spurted to 7.6 percent during 1992–2006 and a further 9 percent between 2000–06. This trend suggests that private consumption growth has been biased toward services/nontradable goods after 1990—a familiar enough trend associated with rising per capita incomes. Bivariate regressions of each of the demand indicators upon the relative nontradables inflation

20. The empirical evidence on productivity growth trends in the post-reform period is inconclusive though trends in recent years show significant increases in productivity (see RBI, 2004; Reddy, 2005 for recent summaries). There is some evidence to show relatively faster total factor productivity growth, particularly in the export-oriented industries. All these studies however, focus on the manufacturing sector, which, as our classification shows, is an incomplete representation of the tradable sector.

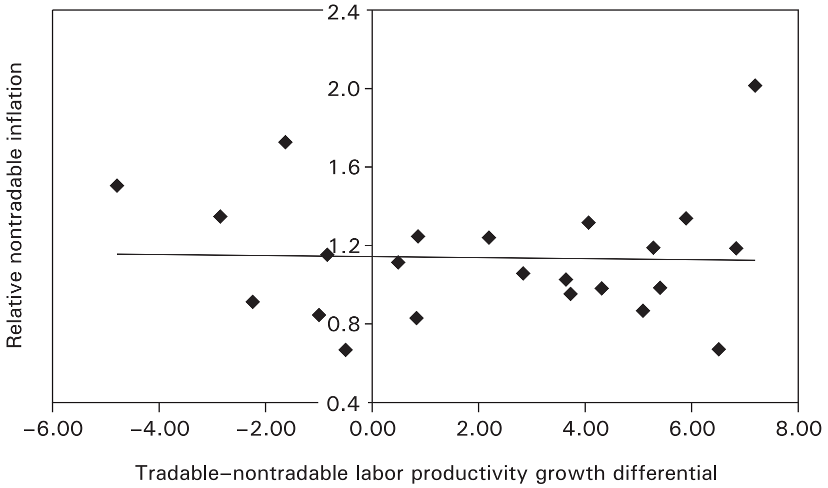
FIGURE 6. Tradable–Nontradable Labor Productivity Growth Differential



Source: Authors' calculations.

Note: Pn/Pt = Price of nontradables by price of tradables.

FIGURE 7. Tradable–Nontradable Productivity Differential and Relative Nontradable Inflation



Source: Author's calculations,

TABLE 4. Evolution of Demand Indicators, 1970–2006 (decade averages, percent)

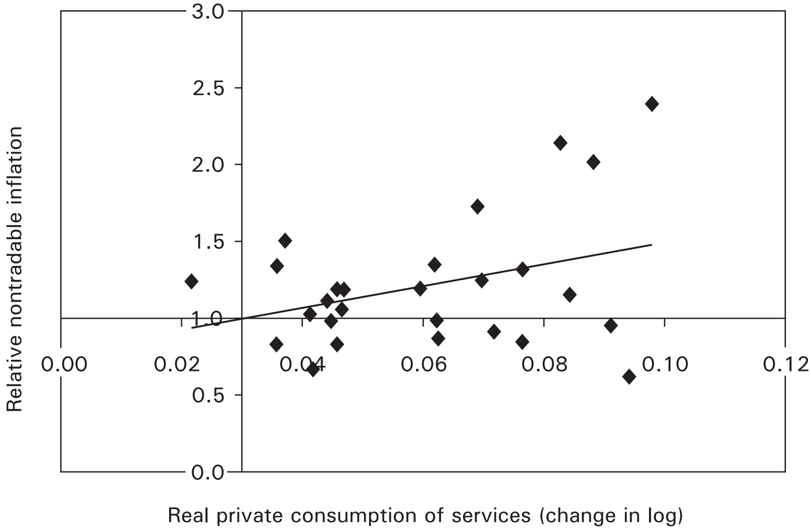
Year range	*Real government consumption expenditure growth*	*Real per capita income growth*	*Growth in private consumption of services*
	1	2	3
1970s	5.04	0.62	3.97
1980s	6.92	3.46	4.73
1990s	6.3	3.57	5.89
2000–06	4.12	5.17	9
1992–06	5.9	4.63	7.56*

Source: Authors' calculations with data from NAS, CSO, and *Handbook of Statistics*, RBI.
Note: *Average for 2000–06.

rate (figures 8–10) reveal that growth in real private consumption of services and government consumption expenditure are positively associated with the change in relative nontradable prices. But the negative association with real per capita income growth contradicts theoretical priors.[21]

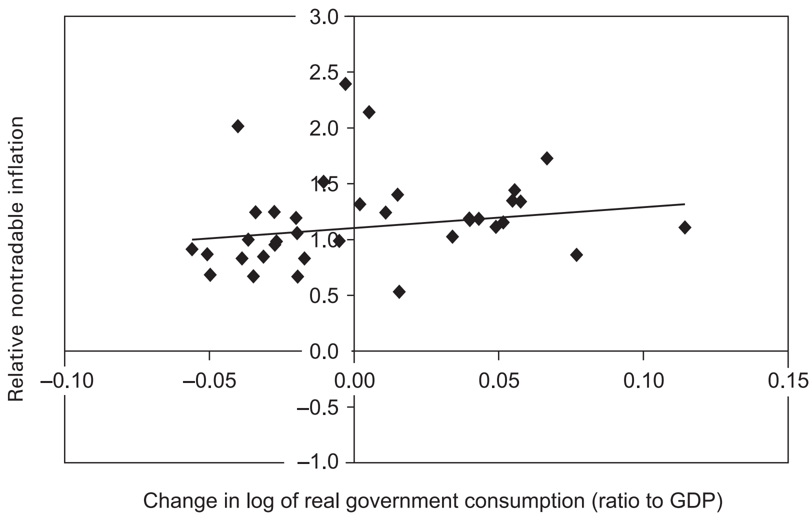
21. 1979 and 1991 are years of oil shock and macroeconomic crisis respectively when per capita income was negatively impacted. Likewise, labor productivity growth was adversely affected during exchange rate depreciation episodes (1991, 1997, 1998, and 2001) through increases in the price of imported inputs.

FIGURE 8. Real Private Consumption of Services and Relative Nontradable Inflation



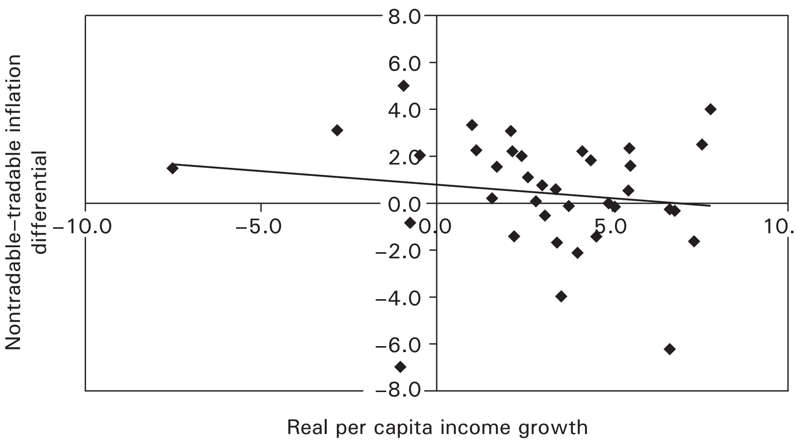
Source: Authors' calculations.

FIGURE 9. Real Government Consumption and Relative Nontradable Inflation



Source: Authors' calculations.

FIGURE 10. Real Per Capita Income and Inflation Differential



Source: Authors' calculations.

Preliminary evidence thus suggests the following:

1. Since the 1980s, there has been a divergence between the prices of nontradables and tradables.
2. Relative to the prices of tradables, nontradable price changes accelerated after 1991, exceeding 1 percentage point per year, on an average, during 1991–2006.
3. The relative nontradable price (with an increase implying a real appreciation) becomes broadly consistent with the 36-country trade weighted real effective exchange rate during the liberalization phase of the economy. In the 1980s, however, the two measures actually move in opposite directions. This indicates that the post-1991 reforms—correction of an overvaluation, which kept the domestic price of tradables unsustainably higher relative to the foreign price, change of exchange rate regime, import liberalization, and faster productivity growth in tradable sector—played a significant role in the alignment of internal and external real exchange rate measures.
4. The share of the tradable sector, defined as those exporting at least 5 percent of their total value of production, rose from an average of 20 percent between 1980 and 1989 to 25 percent during 1990–2006. In the current decade, the tradable sector's share averages 28 percent. This trend is contrary to the commonly held perception that the

share of nontradables in output is rising in India; our disaggregate analysis of changes in respective output shares shows that it is actually the opposite. The confusion arises from equating services with nontradability; close to a quarter percent (23 percent) of services' output was traded in 2006, and the share of traded services in total production, driven by communication and business services, averaged 9 percent in 1990–2006.

5. On average, tradable–nontradable labor productivity growth differentials widened in the 1980–89 period, but narrowed significantly during 1992–2004. Relative nontradable prices, on the other hand, rose throughout the sample period. The narrowing of the tradable–nontradable productivity growth gap in 1992–2004 along with acceleration in relative price of nontradables at the same time is inconsistent with the B-S hypothesis.
6. The increase in the relative price of nontradables is positively associated with change in the share of tradables in total output, suggesting classic B-S effects via widening productivity growth differentials between the tradable and nontradable sectors. However, the labor productivity growth gap narrowed in the 1990s, possibly reflecting liberalization and deregulation effects.
7. Both private and public demand show big increases in the 1980s. Although growth in public demand slows down in the post-reform phase, private demand accelerates. Preliminary trends reveal increased demand for services (nontradable) after 1990, which ought to reflect in an expansion of the nontradable sector. However, the tradable sector actually expands during this period! This suggests a role for liberalization effects in the economy—increased competitiveness via lower import (input) prices, exchange rate correction (overvaluation) that possibly made some individual sectors more tradable, and competition and deregulation effects upon prices. For instance, the emergence of new tradables like services (through improvement in telecommunications), pharmaceuticals, auto components, and so on (internationally competitive at the new prices) would be reflected as a shift in the supply curve in the framework in the previous section (figure 4)—the relative price of nontradables thus rises but the relative composition of output changes with a shrinking of the nontradable sector. Alternately, it could be a case of supply constraints in the nontradable sector, which leads to a relative price increase along with an expansion of the tradable sector.[22]

22. We are grateful to Robert Lawrence for these insights.

Initial evidence thus suggests that both supply and demand factors might play a role in the observed increase in the relative prices of nontradables since the 1980s. The evidence that productivity growth gap between the tradable and nontradable sectors actually narrowed in the 1990s but relative nontradable prices rose throughout the two decades suggests a real appreciation via—B-S effect in the 1980s and through demand channels in the 1990s. The next section examines these aspects econometrically.

Determinants of the Relative Price of Nontradables: Formal Evidence

Based upon the theoretical discussion in the second section, the relative price of nontradables is posited as a function of both supply and demand factors. The estimated equation takes the form of Equation 1, where the dependent variable, ${P_{nt}}/{P_t}$, is the relative price level of nontraded goods. The explanatory variables are g_t, the log of government consumption expenditure as share of GDP (both in real terms); $a_t - an_t$, the labor productivity growth differential between the traded and nontraded sectors; y_t, the real per capita income growth; ε_t is the error term:

$$
{P_{nt}}/{P_t} = \alpha + \beta_0(g_t) + \beta_1(a_t - a_{nt}) + \beta_2(y_t) + \varepsilon_t \tag{14}
$$

Equation 15 augments the standard productivity model to incorporate the impact of import liberalization, allowing additional supply influences upon the relative price of nontradables:

$$
{P_{nt}}/{P_t} = \alpha + \beta_0(g_t) + \beta_1(a_t - a_{nt}) + \beta_2(y_t) + \beta_3(m_t) + \varepsilon_t \tag{15}
$$

where m_t is the average applied tariff rate. The expected values of respective coefficients on these variables, β_0, β_1, β_2 are greater than zero, while that on β_3 is expected to be negative.

The sample length, 1980–2006, is guided solely by data availability on sectoral employment shares. A full description of the data sources and variables is provided in appendix 3. Except for tariff rates, all variables are in logs and the equation is estimated in first differences.[23] Table A-1 in the appendix 2 presents different versions of the benchmark equations 1 and 2 through both ordinary least squares (OLS) and instrument variables

23. All variables were tested for unit roots and found to be level nonstationary in levels and I (1).

(IV) methods to control for possible endogeneity and collinearity of the independent variables.[24]

The estimated regular productivity model (regressions 1 and 2, table A-1, appendix 2), with real government expenditure and per capita income growth capturing the demand influences, shows that only fiscal growth exerts a significant impact in both OLS and IV versions, while both real income and productivity growth enter with a wrong sign. A scan of recursive residuals of the regression reveals 1991, a crisis year, is an influential outlier: the recursive residuals stray outside the two standard error bounds, rejecting the hypothesis of parameter constancy (*p-value* less than 0.05). Regression 2 controls for the 1991 outlier, resulting in overall improvement in the goodness-of-fit measures with all coefficients correctly signed. β_1, the coefficient upon relative labor productivity ($a_t - a_{nt}$) is now significant; in terms of magnitude, a 6 percent increase in the tradable–nontradable labor productivity growth differential results in a 1 percent increase in the relative nontradable inflation rate. Both regressions indicate that *ceteris paribus*, a 1 percentage point rise in fiscal growth, g_t, is matched by a little over a 0.33 percentage point rise in the relative nontradable inflation rate. Thus a 3 percent fiscal expansion in real terms leads to almost 1 percentage point rise in the relative rate of inflation in nontradable goods. Private demand influence (β_2) is equally strong: a 4 percent increase in real per capita income results in a percentage point increase in the relative inflation rate via demand pressures.

Regressions 3 and 4 allow for additional supply shocks to determine relative price changes by including relative price shifts of tradables. The import tariff variable, (m_t), enters with a negative sign and is significant (Regression 3). The coefficients on all other variables increase in magnitude and significance, pointing toward an omitted variables bias in the benchmark specification. In particular, the productivity influence is considerable in size, indicating that a percentage point increase in the tradable–nontradable productivity growth gap is associated with a 0.21 percent increase in the nontradables' inflation rate. The import price coefficient indicates that a price decrease corresponds to a rise in the relative price of nontradable; the coefficient magnitude implies a pass-through between 0.02 and 0.06, suggesting that a very small portion of a positive (negative) external shock is absorbed into the economy through changes in domestic nominal prices.

24. The correlation coefficient between changes in log real per capita income and log import prices is 0.37. Productivity growth is also positively correlated with real per capita income growth, but at 0.10, the correlation coefficient is weak.

Both fiscal growth and relative labor productivity are robust across all specifications and estimation methods.

The estimated magnitude of the B-S impact, 0.21, for India compares favorably with the panel regression estimates obtained for the OECD[25] but are relatively lower in comparison with Chinn's estimates for a panel of East Asian economies.[26] Estimates for the transition and accession countries of the European Union are also generally higher,[27] though these mask wide, within-group variation.[28] The relatively small magnitude of the B-S impact for India could be due to several reasons. First, problems in the measurement and quality of data on labor productivity may be affecting the results. In particular, the—B-S hypothesis also refers to total factor productivity whereas the lack of data on sectoral capital stock limits our relevant measure to labor productivity. Two, the assumption of open capital markets is strained for much of the sample period; capital account restrictions were relaxed only after 1991 and the process has been slow, qualified, and still incomplete. Similarly, rigidities in intersectoral resource allocation question the assumption of labor mobility in the model.[29]

The significant role of demand factors uncovered in the exercise supports the imperfect capital mobility assumption for India.[30] The demand influence originating from a real private income growth lies in the range of 0.15–0.26, which, in conjunction with the coefficient of 0.30 for fiscal

25. These range between 0.10 and 0.76 with the labor productivity measure (see Chinn and Johnston, 1996, for a summary of empirical estimates). De Gregorio et al. (1994) estimates range between 0.10 and 0.26, with the total factor productivity measure. Rogoff (1992) estimates a manufacturing labor productivity shock of –0.6 to –0.7 for the Yen/US Dollar real exchange rate.

26. Chinn's (2000) estimates for a panel of East Asian economies lie between 0.21 and 0.63.

27. Jazbec (2002) panel estimates range from 0.86–1.33 for a panel of nineteen EU transition economies over 1990–1998.

28. Backe (2002) reviews the important empirical literature, pointing out that the annual B–S effects estimated across these studies varies from a low 0.8 percent for the Czech Republic to 3.5 percent for Slovenia, 5.6 percent for Hungary, and 9.4 percent for Poland.

29. Recent empirical work on the impact of trade liberalization on poverty in India finds no evidence of labor reallocation after 1991, confirming a sluggish labor market response (Topalova, 2004). Consistent with low structural reallocation, employment labor shares remained constant with returns to factors (wages and industry premia) responding to the adjustment.

30. De Gregorio et al. (1994) argue that demand-side factors will affect relative prices only if the assumptions of perfect competition in goods and factor markets, purchasing power parity for traded goods, and perfect capital mobility are relaxed.

growth, reveals a pronounced role of demand factors in determining domestic relative price changes. The supply side influences, represented by relative labor productivity growth and change in import prices, are relatively smaller, though it would be reasonable to assume a stronger effect were more accurate productivity growth measures available.

Stability: Accounting for Post-1991 Reforms/Liberalization Effect

The equations fitted here assume that no relevant factors other than public and private demand, productivity growth differentials, and tradable prices were changing over the period considered. But this assumption is violated in the latter half of the sample, which is characterized by changing production and price structures due to economic reforms instituted after the 1991 crisis. The discussion in the third section mentioned trade liberalization, deregulation of prices, and increased competition in some sectors. These reforms possibly impacted relative prices, in which case the non-inclusion of this factor in the estimated equation could possibly overestimate the importance of demand and supply factors.

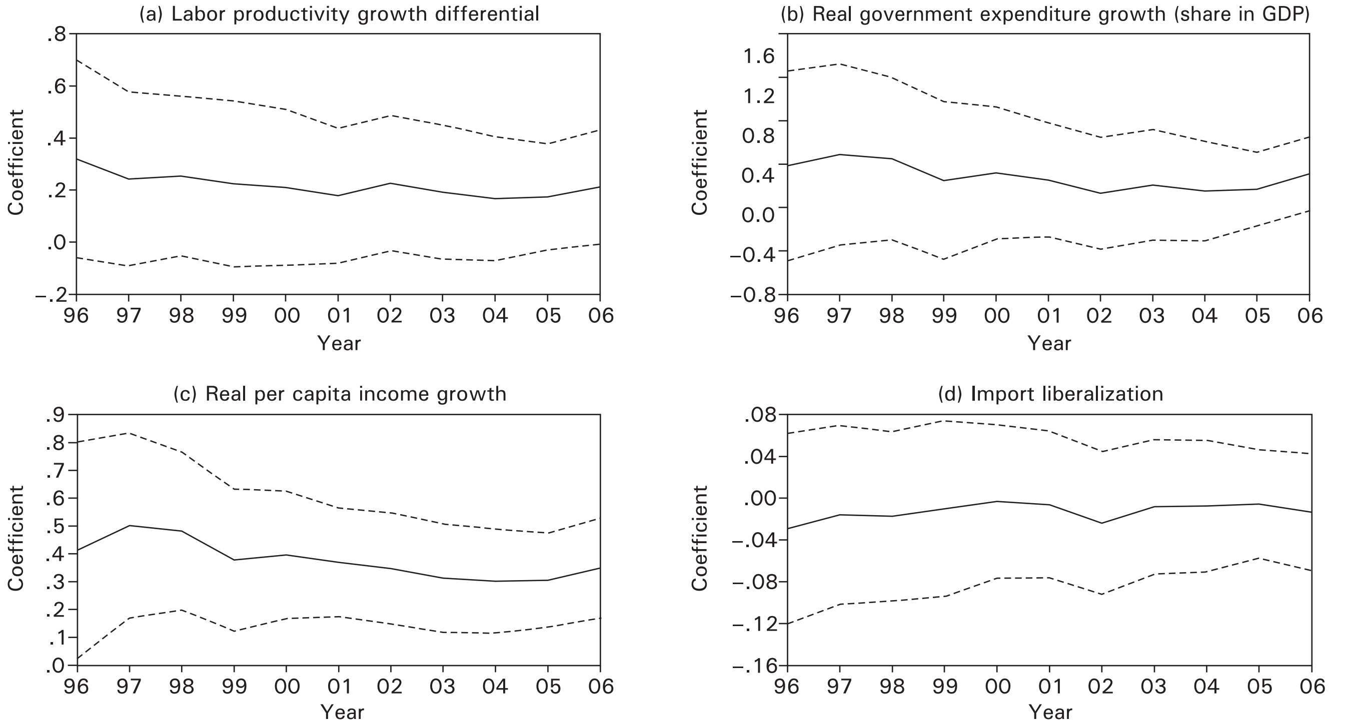
Regression 4 therefore re-runs the augmented productivity specification with a post-reform binary variable to capture structural changes during the transition process. The coefficient on the reforms dummy is, however, negative and statistically insignificant, suggesting that other than import liberalization, the post-1991 changes have not so far contributed toward a higher rate of inflation in nontradables.

To push the stability investigation further, the full specification was re-estimated through recursive least squares, where the equation is estimated repeatedly, using ever larger subsets of the sample data. Figure 11 (a–d)—trace the evolution of coefficient estimates for all feasible recursive estimations of $(a_t - a_{nt})$, g_t, y_t and m_t, along with the two standard error bands. The recursive coefficient estimates indicate no evidence of parameter instability for any of the explanatory variables. However, fiscal growth impact tends to weaken after 1996 and private demand influence acquires greater significance toward the end of the sample period, which is not surprising as per capita income growth has been extraordinarily strong, averaging more than 7 percent annually (2003–06).

Sensitivity Analysis

Apart from robustness to different estimation methods and stability checks, the above regressions were also subjected to sensitivity analysis of the

FIGURE 11. Recursive Coefficient Estimates



Source: Authors' calculations.
Note: Dotted lines are +/–2 standard error (SE) bands.

explanatory variables to substitution with other proxy measures.[31] The following checks were carried out to assess the robustness of the results:

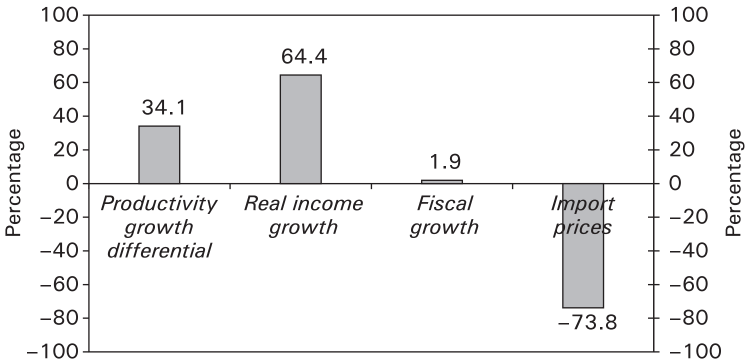
- Productivity growth in the tradable and nontradable sectors was entered as separate variables to test whether productivity gains in nontradable services' categories played a role in inflation divergence. The result confirms that productivity growth in the tradable sector is the source of supply-side influence with a mean point estimate of 0.31. The coefficient on nontradables' productivity growth is correctly signed but insignificant across all estimations. Both fiscal and income growth variables are robust to this substitution.
- Real government consumption was entered as two separate variables—compensation to employees and purchases—to test the proposition that government expenditure falls more heavily on nontradable goods. The results from these regressions are slightly ambiguous: the impact of wages is always significant in all versions of the regression equation with a coefficient size of 0.10, while the coefficient on government purchases is inconsistent. All other explanatory variables are robust to the substitution except the coefficient on real per capita income growth, which turns totally insignificant in this version. The results suggest that the aggregate consumption measure g_t is a better indicator of fiscal growth.
- Real per capita income growth was substituted by the growth in the real share of services in private final consumption expenditure (ratio to GDP), using a closer measure of the 'preferences' hypothesis. Although this definition of "preferences" is upheld in the basic specification, where the significant coefficient is estimated between 0.18 and –0.21, the hypothesis is rejected in the augmented specification with import price changes. All other variables are robust to this definition.
- The import tariff rate was replaced by change in log of unit value of imports. The coefficient size remained unchanged but is somewhat lost in significance, confirming that the import tariff rate captured the trade liberalization impact more accurately.

The Relative Contribution of Demand and Supply Factors

To further disentangle the relative contribution of demand and supply factors, the coefficient estimates from the regression results [(two stage least squares) 2SLS Regression 3] are used to decompose the mean relative price change over the sample period. Figure 12 displays the approximate

31. These regressions are not reported here but obtainable from the authors on request.

FIGURE 12. Percentage Contribution to Relative Nontradable Inflation: Demand and Supply Factors, 1982–2006



Source: Authors' calculations.

contributions of each independent variable to the mean of the dependent variable. The decomposition shows that demand factors—income and fiscal growth—accounted for almost three-fourths of the average relative price increase over the sample period, but for the offsetting impact of lowered import prices. Accounting for 73.8 percent of the average increase in relative prices during the sample period, the role of import prices in widening inflation differentials is not inconsiderable. Noting the rapid decline in import tariffs after 1991, this result underscores the role of convergence in tradable prices and its contribution to the divergence in sectoral inflation rates. In contrast, supply side influences stemming from labor productivity growth in the tradable sector account for only 35 percent of the mean of the dependent variable.

An Application to Macroeconomic Policies

The prominent role of demand factors in driving the relative price of nontradables uncovered in our empirical exercise serves to illuminate the evolution of exchange rate and fiscal policies during much of the sample period. Between 1980 and 1998, the nominal exchange rate depreciated by an average 5 percent annually, including an "active" devaluation phase (1986–90) of an annual average of 9.7 percent, which slowed to 2.8 percent between 1993 and 1998.[32] Fiscal policy, on the other hand, was expansionary throughout this period (figure 13).

32. Joshi and Little, (1994) point out that the rupee was devalued to keep the real exchange rate constant between 1983 and 1985, followed by an active nominal devaluation policy between 1986 and 1990 to produce a real depreciation that helped export growth (Joshi and Little, 1994: 277).

Corresponding to the depreciation episodes, the consolidated fiscal deficit to GDP ratio averaged 9.2 and 7.4 percent for 1993 and 1998 respectively. The extent of internal real appreciation implied by the change in the relative price of nontradables during these nominal depreciation episodes is 1.03 percent (1986–90) and 1.29 percent (1993–98) annually. Our results demonstrate that along with productivity and income growth, this fiscal expansion added considerably to the relative price increase throughout the 1980s and the early 1990s. As fiscal support was absent in correcting relative price distortions, nominal exchange rate policy was actively deployed to recover competitiveness and offset the impact of fiscal expansion during this period. The scrutiny of past macroeconomic policies thus illustrates how the exchange rate regime is determined to adjust the real exchange rate when fiscal imbalances are persistent and reforms are delayed.

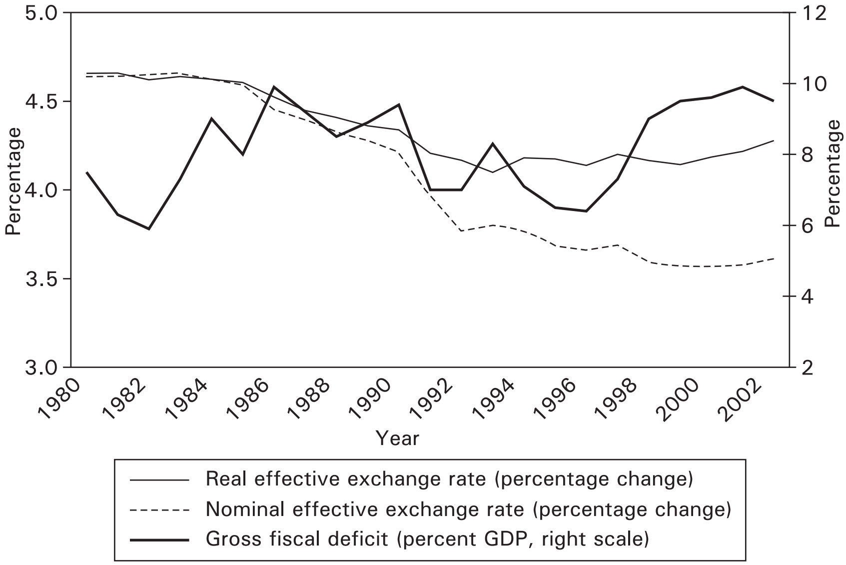
Structural reforms to restore fiscal balance were initiated only after the macroeconomic crisis in 1991; after a brief phase of correction from 1992 to 1996, fiscal reforms were again delayed until 1998–99.[33] Our results can be used further to endorse the role of fiscal policy in correcting relative price changes induced by structural factors in a fast-growing economy. For each year since 2000, the stacked columns (adding up to the fitted values from the regression) in figure 14 trace the dynamics of each variable (column portions) in explaining the relative price level. This shows that on average, private demand and productivity growth have contributed the most to the relative nontradable price level in the recent period of strong GDP growth that averages 8.7 percent during 2003–06. Simultaneous fiscal correction, leading to a decline in the gross fiscal deficit of magnitudes ranging from 0.3–1.1 percentage points every year, restrained relative prices from accelerating more than they might have during this period of rapid growth. Figure 13 traces the dynamic contribution of fiscal reforms in this process, underlining the role of fiscal policy in reducing appreciation pressures.

Policy Implications and Conclusion

This paper examines the evolution of prices in the nontradable and tradable sectors of the Indian economy over 1980–2006 and finds widening inflation differentials between the two sectors. After 1990, the nontradable sector is characterized by acceleration in the rate of inflation that is coincident with

33. Commitment to fiscal reforms has become binding with the rule-based Fiscal Responsibility and Budget Management Act, 2003. Under this, fiscal deficit is to be brought down to 3 per cent of GDP and revenue deficit to be completely eliminated by March 2009.

FIGURE 13. Exchange Rate and Fiscal Policy, 1980–2002



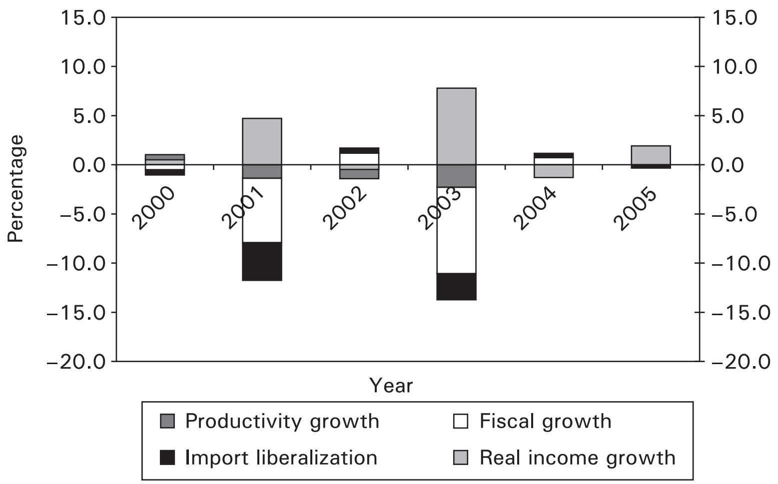
Source: Authors' calculations.

narrowing relative labor productivity growth differentials and expanding tradable sector output. Our results show that both demand and supply factors have contributed to this real appreciation. For the period as a whole, real income growth and fiscal expansion along with a relatively faster labor productivity growth in the tradable sector have been the key drivers of the relative price increase. After 1990, real per capita income growth has been the major source of the higher rate of inflation observed in the nontradable sector. The simultaneous increase in the share of tradables in total output indicates that demand influences did not, however, result in a resource shift away from the tradable sector. By increasing competitiveness and rendering some sectors more tradable through correction of overvaluation, reforms like import liberalization and change in exchange rate regime played an important part in this process.

The research draws particular attention to the importance of relative price shifts within the tradable sector, that is, reduction in import prices, in changing domestic relative prices. As goods and services markets get integrated, structural factors such as convergence in domestic–foreign price levels due to progress in trade reforms will contribute significantly to inflation divergence. So the real appreciation may well continue. In the light of the beneficial impact of import liberalization and an increasing share of imported inputs in domestic production, the necessity of continuing trade reforms deserves emphasis with the use of other policies like fiscal policy, to achieve inflation convergence.[34]

This conclusion is reinforced when the picture is extended beyond our study period. Emerging trends in the economy strongly point toward an acceleration of forces impacting relative price movements. These are, *inter alia*, a strong GDP growth rate averaging 8.8 percent over 2003–07, an average export growth of 24.1 percent during the same period, an above average 7.0 percent real per capita income growth along with sizeable productivity gains in export-oriented industries.[35] A steadily rising inflow of portfolio capital, which averaged US$8.8 billion over 2003–06, adds force to these trends. Although our results do not include the impact of capital inflows, we recognize that the tendency for real appreciation induced by relative price changes is reinforced by capital inflows that impact the real exchange rate via the nominal rate and through the FDI channel. Last of all, an economy

FIGURE 14. Accounting for Relative Price Levels: Role of Fiscal Reforms



Source: Author's calculations.

34. At the firm level, trade liberalization has been particularly beneficial to total factor productivity growth in industries close to the technological frontier (Aghion et al., 2003; Siddharthan and Lal, 2004), firms located in regions or sectors with a more flexible labor environment, and those that were privately managed (Topalova, 2004).

35. Reddy (2005) points out that productivity and per capita income growth-induced pressures have grown considerably since 2000, particularly in manufacturing (also see Dholakia and Kapur, 2001; Unel, 2003).

undergoing structural changes, as India is, will experience relative price shifts due to factors like liberalization, adjustment of regulated prices, and competition, as mentioned earlier in the paper.

What do these trends signify for future macroeconomic policy? To the extent that a real exchange rate appreciation (increase in the relative prices of nontradable goods) is productivity driven, it is an equilibrium phenomenon and reflects a natural evolution of the economy. This trend appreciation will also be reinforced by the associated increases in incomes, particularly if demand is biased toward services as living standards rise to converge toward those in more advanced economies.[36] As these evolutionary processes cannot be restrained and must be absorbed, they bring to the fore the necessity of freeing the exchange rate regime to absorb these effects through a nominal appreciation. In this context, a welcome development in recent times is a more flexible exchange rate regime. From 1998 to 2003, nominal devaluation against the US dollar has been only 0.03 percent; since 2003, both the nominal and real exchange rates have appreciated by 0.8 and 1.6 percent respectively, signifying some absorption of appreciation pressures.

Real appreciation arising from persistent fiscal deficits, however, is not an equilibrium phenomenon. Our results suggest that an approximate 0.25 percent cut in real government expenditure to GDP ratio could result in a 1 percent real depreciation through a decline in the inflation rate in the nontradable goods sector. In addition, fiscal consolidation that reorients spending toward education and infrastructure would boost the productivity of the nontradable sector, further reducing the relative gap vis-à-vis the tradable sector. Thus, continuing fiscal reforms could significantly facilitate absorption of equilibrium shifts induced by productivity and income growth.

Finally, our research contributes by providing a tradable/nontradable characterization of the economy, which, to the best of our knowledge, has not been attempted so far. With the growing openness of the economy in every sphere, this distinction provides a useful framework of analysis. In addition, our paper raises a number of critical data issues, not the least of which is the absence of a services' price index in India. Our implicit price series strongly suggest an understatement of generalized inflation through

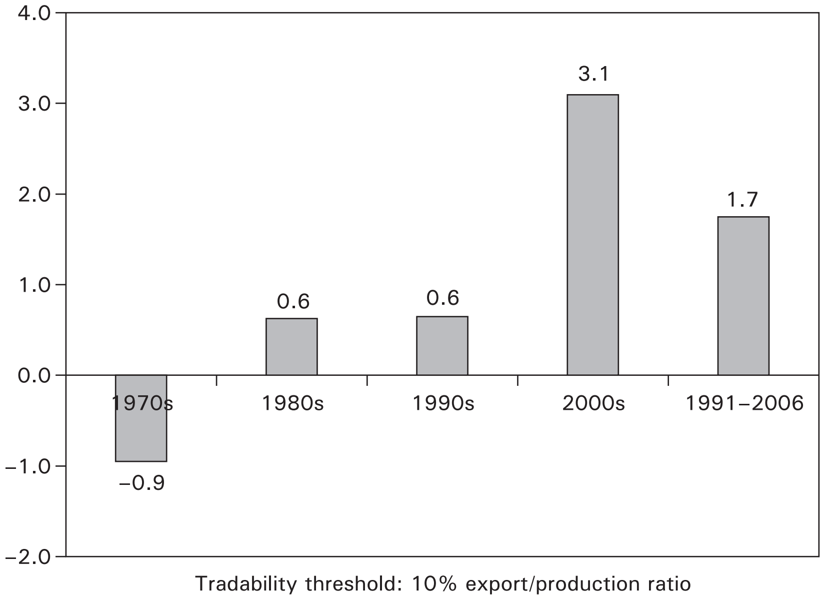
36. Illustratively, strong demand pressures originating from rapid income growth could affect competitiveness if it leads to wage pressures in the tradable sector. In a competitive environment, a strong and persistent demand bias toward nontradable goods (many services) could induce productivity growth and consequent wage increases in the nontradable sector.

the current inflation indicator, the wholesale price index (WPI), which can be misleading. It also identifies gaps in data on sectoral employment shares, emphasizing the need for sufficiently disaggregated information to enable fruitful analysis and informed policy-making.

APPENDICES

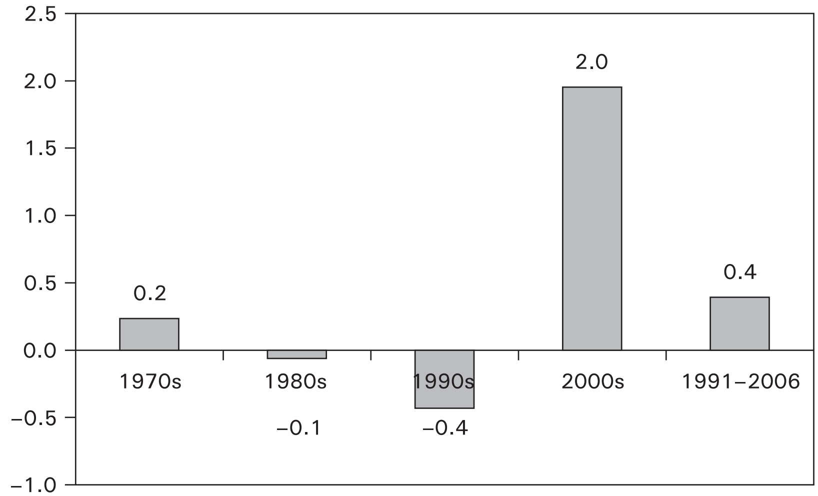
Appendix 1

FIGURE A-1. Nontradables–Tradables Inflation Differential (decade means)



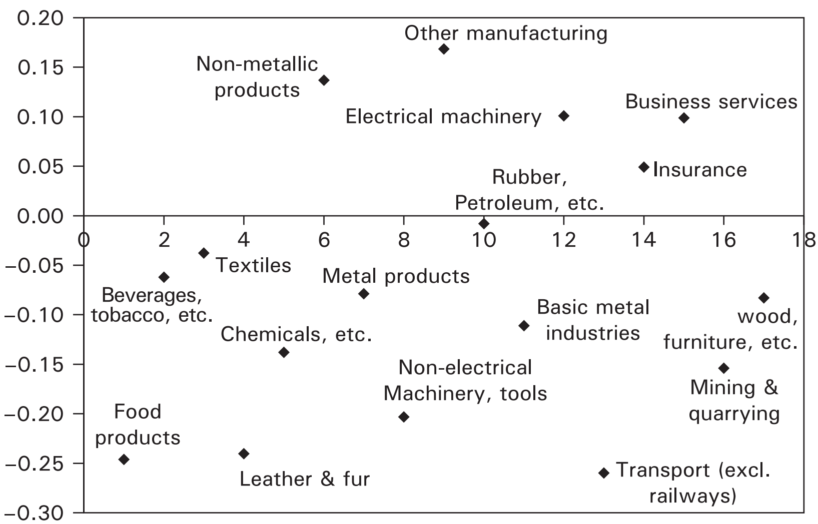
Source: Authors' calculations.

FIGURE A-2. Nontradables–Tradables Inflation Differential Including Agriculture (decade means)



Source: Authors' calculations.

FIGURE A-3. Correlations: Change in Output and Inflation Rates



Source: Authors' calculations.

Appendix 2

TABLE A-1. Basic and Augmented Productivity Model Estimates, 1981–2006

	Basic productivity model				*Augmented productivity model*			
	(1)		*(2)*		*(3)*		*(4) With reforms*	
Dependent variable $\Delta P_{nt}/\Delta P_t$	*OLS*	*IV*	*OLS*	*IV*	*OLS*	*IV*	*OLS*	*IV*
Productivity growth differential	−0.07	−0.07	0.15*	0.06*	0.21*	0.21*	0.18*	0.19*
	(0.67)	(0.67)	(1.67)	(1.92)	(1.88)	(2.10)	(2.01)	(1.79)
Real government consumption	0.18***	0.22**	0.30***	0.25***	0.34***	0.32***	0.31***	0.317***
(share of GDP)	(2.57)	(1.81)	(3.30)	(3.83)	(3.82)	(4.10)	(4.22)	(3.62)
Real per capita income (share	−0.03	0.21	0.35**	0.15*	0.26	0.24**	0.20	0.17*
of GDP)	(0.12)	(0.43)	(1.90)	(1.70)	(1.40)	(2.44)	(1.22)	(0.95)
Terms of trade								
Price of imports					−0.03	−0.02**	−0.06	−0.04
					(2.95)	(2.21)	(1.88)	(1.43)
1991 dummy			4.74***	5.76***	8.33***	8.67***	9.30***	9.30***
			(4.73)	(16.1)	(4.63)	(4.81)	(3.97)	(3.94)
Reforms dummy							−2.10*	−1.54*
							(1.16)	(0.83)
Adjusted R-square	0.17	−0.04	0.52	0.38	0.54	0.54	0.56	0.51
Durbin-Watson Statistic	2.30	2.71	1.85	1.72	2.11	2.04	2.04	1.93
Standard Error	1.81	1.92	1.41	1.47	1.27	1.19	1.24	1.23
Observations	25	23	25	23	25	23	25	23

Source: Authors' calculations.

Notes: OLS and IV specifications with heteroskedasticity consistent errors. ***, **, and * indicate 1, 5, and 10 percent significance levels respectively.

TABLE A-2. Implicit Inflation Rates—Tradable Manufacturing Subsectors

	Food products	*Beverages, tobacco, etc.*	*Textile products*	*Leather and fur products*	*Rubber, petroleum, etc.*	*Chemicals, etc.*	*Non-metallic products*	*Basic metal industries*	*Metal products and machinery*	*Electrical machinery*	*Other manu-facturing*	*Total traded manu-facturing*
1980–81	10.5	–5.4	5.7	–3.0	27.3	19.7	24.8	5.5	18.4	8.2	20.5	12.3
1981–82	–1.4	3.6	1.9	–3.7	22.0	13.5	13.0	19.7	11.8	6.1	3.7	8.0
1982–83	–7.9	0.4	4.4	–1.5	5.0	0.1	22.6	12.3	6.8	5.3	0.4	4.7
1983–84	27.2	16.4	8.4	6.7	5.5	5.6	9.0	8.1	7.3	4.3	2.9	8.5
1984–85	3.6	3.0	9.9	8.2	3.5	3.9	7.2	5.9	5.2	7.0	6.0	6.9
1985–86	5.7	14.5	1.9	17.6	10.0	6.8	5.0	14.8	11.2	7.7	6.5	8.1
1986–87	8.6	19.7	0.7	4.7	2.8	5.9	–0.7	1.3	2.8	5.6	5.2	4.7
1987–88	6.4	3.4	12.8	5.1	7.4	8.0	2.3	12.7	6.6	2.7	3.0	8.2
1988–89	2.9	6.8	7.3	14.0	0.8	6.9	4.0	21.5	13.8	14.6	2.3	7.6
1989–90	13.8	14.2	16.3	13.0	1.1	3.7	10.9	11.9	18.9	9.7	7.0	11.8
1990–91	14.0	17.7	8.3	20.2	11.6	6.3	12.2	6.9	10.6	7.4	4.3	9.9
1991–92	13.2	10.5	9.7	4.2	9.7	14.4	17.2	6.5	12.0	13.5	8.8	10.9
1992–93	6.9	11.0	9.9	–3.1	12.5	16.4	7.1	9.6	13.2	6.7	13.6	10.4
1993–94	9.3	4.5	9.6	8.7	6.3	8.6	9.7	8.3	1.6	9.8	1.7	6.9
1994–95	13.4	19.4	15.6	8.1	6.5	17.2	12.0	10.2	7.6	6.1	12.3	12.8
1995–96	3.8	8.3	13.0	9.3	9.0	10.9	17.3	12.9	9.0	4.5	10.2	9.8
1996–97	5.7	6.6	–1.2	1.7	9.4	3.8	3.0	5.1	7.1	–0.4	2.6	4.1
1997–98	10.4	12.5	–0.7	7.0	5.6	4.5	–1.7	3.8	1.8	–3.8	3.2	3.0
1998–99	17.4	11.8	3.5	3.7	1.2	7.5	2.4	1.7	2.4	–1.5	4.8	5.1
1999–00	1.3	5.1	–0.7	17.1	5.9	6.6	–2.9	1.8	1.4	–1.3	3.8	2.6

(*Table A-2 continued*)

(*Table A-2 continued*)

	Food products	*Beverages, tobacco, etc.*	*Textile products*	*Leather and fur products*	*Rubber, petroleum, etc.*	*Chemicals, etc.*	*Non-metallic products*	*Basic metal industries*	*Metal products and machinery*	*Electrical machinery*	*Other manu-facturing*	*Total traded manu-facturing*
2000–01	–4.0	2.0	4.6	–3.5	37.1	6.4	5.0	4.0	4.2	8.7	3.5	5.9
2001–02	–0.8	5.4	–0.5	–6.1	5.6	2.9	7.6	0.5	5.1	3.6	1.9	2.7
2002–03	7.4	5.2	2.6	–7.4	6.5	3.0	–0.4	3.7	3.0	–0.9	2.8	3.1
2003–04	11.3	–0.7	7.6	12.3	7.1	2.1	3.5	18.3	3.5	0.2	6.1	6.6
2004–05	4.6	8.9	3.5	6.5	13.2	2.9	6.4	23.1	8.9	4.4	7.1	7.9
2005–06	0.4	8.7	–5.0	6.9	13.2	3.9	8.7	8.6	7.7	3.3	3.7	4.8
2006–07	7.3	11.8	2.4	–4.4	8.7	3.3	14.4	8.6	4.0	9.0	4.9	6.8
Means												
1980–89	6.9	7.7	6.9	6.1	8.5	7.4	9.8	11.4	10.3	7.1	5.7	8.1
1990–2006	7.1	8.8	4.8	4.8	9.9	7.1	7.1	7.8	6.1	4.1	5.6	6.7

Source: Authors' calculations.

TABLE A-3. Implicit Inflation Rates—Tradable Services Subsectors

	Transport (excluding railways)	*Insurance*	*Communication services*	*Legal services*	*Business services*
1980–81	1.0	21.8	–2.1	12.3	11.8
1981–82	12.5	5.3	7.0	14.0	7.8
1982–83	13.2	2.8	17.2	14.4	9.7
1983–84	12.3	10.8	12.3	15.9	18.1
1984–85	10.5	19.2	3.4	9.0	11.8
1985–86	9.8	–2.6	7.9	7.8	10.1
1986–87	11.4	15.7	17.4	9.2	11.6
1987–88	10.8	10.6	36.2	9.9	10.3
1988–89	13.9	19.5	23.0	10.0	10.7
1989–90	10.5	–11.1	6.0	7.9	9.8
1990–91	13.6	25.7	13.7	12.1	12.6
1991–92	12.4	–0.7	15.7	15.0	13.2
1992–93	14.4	22.7	16.6	11.9	12.0
1993–94	11.1	9.8	14.8	8.0	8.2
1994–95	8.1	32.3	10.9	11.0	11.3
1995–96	5.4	–7.1	3.4	10.1	11.7
1996–97	14.1	15.1	9.3	9.2	10.7
1997–98	12.6	–33.5	–2.0	6.3	8.7
1998–99	13.5	4.0	1.0	11.8	15.0
1999–00	6.4	18.7	–16.6	4.8	2.9

(*Table A-3 continued*)

(*Table A-3 continued*)

	Transport (excluding railways)	*Insurance*	*Communication services*	*Legal services*	*Business services*
2000–01	5.3	10.8	−15.1	3.0	5.6
2001–02	4.4	34.3	−0.4	3.8	5.2
2002–03	3.4	−7.3	−28.9	4.1	4.8
2003–04	6.3	8.6	−6.6	3.9	4.7
2004–05	5.3	−10.8	−5.3	3.9	5.0
2005–06	3.7	−3.2	−8.6	4.3	5.3
2006–07	3.2	−2.4	−6.7	7.2	8.3
Means					
1980–89	10.6	9.2	12.9	11.0	11.2
1990–2006	8.4	6.9	−0.3	7.7	8.5

Source: Authors' calculations.

TABLE A-4. Implicit Inflation Rates—Nontradable Subsectors

	Mining and quarrying	*Agriculture and allied sector*	*Wood, furniture, etc.*	*Paper, printing, etc.*	*Transport equipment*	*Electricity, gas, and water supply*	*Construction*	*Trade, hotels, and restaurant*	*Railways, transport, and storage*	*Banking, insurance, real estate, etc.*	*Community, social & personal services*
1980–81	12.5	12.9	21.6	–36.4	14.0	9.9	16.9	17.9	0.4	8.5	13.0
1981–82	64.6	8.1	14.6	8.3	15.0	6.7	8.8	16.5	29.0	10.3	11.5
1982–83	11.5	8.1	4.7	6.1	4.1	11.7	20.4	5.3	23.7	4.9	8.4
1983–84	9.1	9.2	11.7	9.9	–0.5	11.2	9.6	10.4	14.5	4.5	10.1
1984–85	11.3	6.3	4.0	13.7	5.7	10.1	13.9	11.8	3.3	6.1	8.1
1985–86	1.5	6.9	3.9	3.9	13.7	12.9	11.0	8.2	11.2	5.1	7.4
1986–87	4.3	7.7	–0.1	4.7	5.4	3.4	12.7	5.1	9.1	3.1	7.5
1987–88	1.0	12.8	4.0	3.5	5.8	4.5	12.8	7.0	10.7	5.8	8.7
1988–89	14.6	7.9	11.5	6.9	14.7	6.6	9.6	11.4	10.1	5.2	9.9
1989–90	2.8	9.3	0.7	17.9	11.5	9.9	9.0	9.4	12.4	6.8	6.7
1990–91	2.8	12.7	0.9	7.3	11.3	13.5	9.7	11.7	9.9	8.4	10.9
1991–92	6.2	18.8	1.6	18.5	11.6	12.7	10.3	13.3	6.7	12.1	13.6
1992–93	14.4	5.5	94.6	16.0	7.2	19.3	10.6	10.6	16.5	3.3	10.2
1993–94	14.9	12.7	20.2	6.3	2.9	10.4	9.9	10.4	15.0	9.8	7.8
1994–95	3.5	10.4	10.8	6.7	8.8	16.1	9.5	9.3	12.4	7.2	9.6
1995–96	5.6	9.4	8.8	25.3	11.9	9.7	11.6	8.2	4.2	13.1	10.8
1996–97	9.1	10.3	2.9	–0.1	6.0	2.5	12.0	9.8	3.3	3.0	10.7
1997–98	10.8	8.7	24.2	–3.1	3.7	9.9	13.7	5.7	10.8	3.1	7.7
1998–99	3.9	8.5	29.2	3.5	2.5	16.7	12.1	5.9	–0.4	8.3	12.5

(*Table A-4 continued*)

(*Table A-4 continued*)

	Mining and quarrying	*Agriculture and allied sector*	*Wood, furniture, etc.*	*Paper, printing, etc.*	*Transport equipment*	*Electricity, gas, and water supply*	*Construction*	*Trade, hotels, and restaurant*	*Railways, transport, and storage*	*Banking, insurance, real estate, etc.*	*Community, social & personal services*
1999–00	12.5	3.5	−2.2	14.3	3.8	−8.6	6.5	4.2	2.4	11.3	3.7
2000–01	7.5	0.9	−7.4	9.8	5.8	1.3	3.6	5.4	−2.2	4.7	3.2
2001–02	3.0	2.0	−2.8	4.6	2.5	1.4	3.9	1.8	−2.1	6.4	3.8
2002–03	22.2	4.3	2.2	0.7	0.5	10.1	3.9	4.0	4.7	5.2	3.7
2003–04	−1.3	2.8	0.2	−0.5	−0.1	−0.8	4.0	3.8	3.1	7.1	3.4
2004–05	24.6	3.8	0.1	0.8	4.9	−2.2	19.6	9.0	3.0	0.7	3.9
2005–06	6.2	5.6	7.9	2.2	4.1	2.9	7.9	7.3	4.0	−0.4	4.2
2006–07	2.4	9.2	7.8	7.4	1.8	3.6	8.8	8.6	7.9	1.1	6.4
Means											
1980–89	13.3	8.9	7.7	3.9	9.0	8.7	12.5	10.3	12.4	6.0	9.1
1990–2006	8.7	7.6	11.7	7.0	5.3	7.0	9.3	7.6	5.8	6.1	7.4

Source: Authors’ calculations.

TABLE A-5. Tradable Manufacturing—Within-sector Output Shares (% Total Output)

	Food products	*Beverages, tobacco, etc.*	*Textile products*	*Leather, fur products*	*Rubber, petroleum, etc.*	*Chemicals, etc.*	*Non-metallic products*	*Basic metal industries*	*Metal products and machinery*	*Electrical machinery*	*Other manu-facturing*	*Total traded manu-facturing*
1980–81	1.47	0.48	2.34	0.30	0.50	1.19	0.53	1.31	1.73	0.38	0.48	10.71
1981–82	1.62	0.50	2.19	0.31	0.54	1.32	0.55	1.33	1.77	0.37	0.61	11.12
1982–83	1.73	0.49	2.15	0.31	0.63	1.33	0.61	1.21	1.87	0.45	0.67	11.45
1983–84	1.82	0.60	2.12	0.31	0.65	1.50	0.62	1.19	1.89	0.45	0.55	11.71
1984–85	1.74	0.54	2.13	0.31	0.74	1.51	0.67	1.19	2.01	0.53	0.63	12.00
1985–86	1.74	0.46	2.18	0.28	0.69	1.52	0.67	1.24	1.92	0.47	0.75	11.93
1986–87	1.70	0.49	2.22	0.28	0.88	1.49	0.66	1.12	1.86	0.50	0.91	12.10
1987–88	1.70	0.44	2.09	0.29	0.95	1.59	0.69	1.14	2.06	0.63	0.98	12.58
1988–89	1.93	0.53	1.91	0.27	0.98	1.63	0.70	1.36	1.93	0.61	0.82	12.68
1989–90	1.96	0.48	2.06	0.26	1.00	1.81	0.75	1.21	1.95	0.69	0.89	13.06
1990–91	1.76	0.48	2.12	0.27	1.07	1.92	0.78	1.38	1.87	0.72	0.80	13.16
1991–92	1.72	0.51	2.04	0.27	1.04	1.95	0.81	1.44	1.78	0.62	0.67	12.86
1992–93	1.61	0.51	2.02	0.33	1.03	2.16	0.69	1.30	1.72	0.63	0.72	12.73
1993–94	1.79	0.49	2.33	0.37	1.07	2.21	0.66	1.31	1.66	0.60	0.78	13.26
1994–95	1.99	0.49	2.31	0.29	1.05	2.15	0.68	1.50	1.71	0.82	0.77	13.76
1995–96	1.90	0.46	2.12	0.29	1.11	2.51	0.79	1.65	1.94	0.77	0.84	14.36
1996–97	1.74	0.53	2.35	0.27	1.28	2.57	0.91	1.65	1.93	0.73	0.83	14.79
1997–98	1.87	0.55	2.38	0.29	1.11	2.40	0.81	1.57	1.74	0.82	0.92	14.44
1998–99	1.74	0.57	2.08	0.30	1.05	2.66	0.73	1.51	1.81	0.84	0.90	14.18
1999–00	1.64	0.61	2.08	0.29	0.95	2.56	0.92	1.51	1.76	0.76	0.85	13.92

(*Table A-5 continued*)

(*Table A-5 continued*)

	Food products	*Beverages, tobacco, etc.*	*Textile products*	*Leather, fur products*	*Rubber, petroleum, etc.*	*Chemicals, etc.*	*Non-metallic products*	*Basic metal industries*	*Metal products and machinery*	*Electrical machinery*	*Other manu-facturing*	*Total traded manu-facturing*
2000–01	1.75	0.57	2.17	0.31	1.03	2.64	0.87	1.47	1.75	0.84	0.88	14.29
2001–02	1.66	0.52	1.97	0.31	1.08	2.62	0.83	1.46	1.49	0.92	0.89	13.74
2002–03	1.80	0.56	2.04	0.29	1.10	2.62	0.84	1.53	1.61	0.79	0.89	14.08
2003–04	1.73	0.53	1.85	0.25	1.06	2.61	0.81	1.54	1.60	0.87	0.87	13.72
2004–05	1.62	0.54	1.94	0.26	1.00	2.79	0.76	1.51	1.65	1.03	0.90	14.00
2005–06	1.51	0.61	1.95	0.22	0.96	2.76	0.77	1.60	1.61	1.06	1.02	14.07
2006–07	1.49	0.62	1.98	0.20	0.99	2.76	0.79	1.79	1.63	1.12	0.99	14.36
Means												
1980–89	1.74	0.50	2.14	0.29	0.76	1.49	0.64	1.23	1.90	0.51	0.73	11.93
1990–2006	1.72	0.54	2.10	0.28	1.06	2.46	0.79	1.51	1.72	0.82	0.85	13.87

Source: Authors' calculations.

TABLE A-6. Tradable Services—Within-sector Output Shares (% Total Output)

	Transport (excluding railways)	*Insurance*	*Communication services*	*Legal services*	*Business services*	*Total traded services*
1980–81	3.59	0.55	0.66	0.13	0.42	5.35
1981–82	3.60	0.59	0.68	0.14	0.43	5.43
1982–83	3.68	0.63	0.69	0.14	0.45	5.59
1983–84	3.66	0.67	0.67	0.15	0.55	5.71
1984–85	3.76	0.59	0.70	0.17	0.58	5.80
1985–86	3.85	0.66	0.68	0.17	0.62	5.98
1986–87	3.90	0.70	0.70	0.17	0.67	6.14
1987–88	4.09	0.62	0.71	0.18	0.63	6.23
1988–89	3.96	0.57	0.68	0.17	0.60	5.98
1989–90	4.00	0.90	0.69	0.17	0.61	6.37
1990–91	3.97	0.62	0.70	0.17	0.68	6.14
1991–92	4.14	0.86	0.75	0.18	0.70	6.62
1992–93	4.16	0.68	0.81	0.18	0.71	6.54
1993–94	4.24	0.74	0.88	0.18	0.74	6.79
1994–95	4.39	0.42	0.96	0.18	0.80	6.75
1995–96	4.49	0.56	1.03	0.19	0.92	7.19
1996–97	4.52	0.49	1.05	0.18	0.99	7.24
1997–98	4.58	0.77	1.21	0.17	1.24	7.98
1998–99	4.55	0.77	1.36	0.17	1.44	8.29
1999–00	4.55	0.64	1.57	0.17	0.95	7.87

(*Table A-6 continued*)

(*Table A-6 continued*)

	Transport (excluding railways)	*Insurance*	*Communication services*	*Legal services*	*Business services*	*Total traded services*
2000–01	4.71	0.61	1.91	0.17	1.38	8.77
2001–02	4.64	0.66	2.18	0.17	1.57	9.21
2002–03	4.93	0.96	2.68	0.17	1.78	10.52
2003–04	5.08	0.88	3.12	0.16	2.09	11.33
2004–05	5.30	0.94	3.61	0.15	2.42	12.43
2005–06	5.24	0.89	4.17	0.14	2.75	13.18
2006–07	5.22	1.09	4.86	0.14	3.05	14.36
Means						
1980–89	3.8	0.6	0.7	0.2	0.6	5.9
1990–2006	4.6	0.7	1.9	0.2	1.4	8.9

Source: Authors' calculations.

TABLE A-7. Nontraded Manufacturing/Agriculture—Within-sector Output Shares (% Total Output)

	Mining and quarrying	*Agriculture and allied sector*	*Wood, furniture, etc.*	*Paper and printing, etc.*	*Transport equipments*	*Total nontraded manufacturing*
1980–81	2.01	37.80	2.21	0.52	0.66	3.39
1981–82	2.16	37.41	2.14	0.52	0.70	3.36
1982–83	2.35	36.23	1.87	0.48	0.76	3.11
1983–84	2.24	36.99	1.87	0.52	0.77	3.17
1984–85	2.18	36.14	1.53	0.58	0.82	2.93
1985–86	2.20	34.80	1.62	0.56	0.71	2.88
1986–87	2.37	33.21	1.48	0.63	0.80	2.91
1987–88	2.37	31.54	1.44	0.61	0.73	2.78
1988–89	2.50	33.12	1.13	0.60	0.71	2.44
1989–90	2.54	31.55	1.10	0.67	0.74	2.51
1990–91	2.66	31.12	1.01	0.68	0.78	2.47
1991–92	2.70	30.01	0.93	0.71	0.76	2.40
1992–93	2.59	30.42	0.87	0.56	0.68	2.11
1993–94	2.48	29.67	0.84	0.62	0.71	2.16
1994–95	2.55	29.22	0.78	0.64	0.79	2.21
1995–96	2.52	27.08	0.89	0.63	1.11	2.64
1996–97	2.34	27.54	0.90	0.61	1.00	2.51
1997–98	2.46	25.70	0.82	0.54	0.93	2.30
1998–99	2.37	25.60	0.75	0.55	0.76	2.06
1999–00	2.30	24.65	0.60	0.53	0.90	2.03
2000–01	2.26	23.63	0.59	0.46	0.85	1.90

(*Table A-7 continued*)

(*Table A-7 continued*)

	Mining and quarrying	*Agriculture and allied sector*	*Wood, furniture, etc.*	*Paper and printing, etc.*	*Transport equipments*	*Total nontraded manufacturing*
2001–02	2.18	23.78	0.50	0.45	0.86	1.81
2002–03	2.28	21.26	0.40	0.46	0.95	1.81
2003–04	2.17	21.54	0.39	0.49	1.02	1.91
2004–05	2.18	20.03	0.33	0.51	0.99	1.83
2005–06	2.09	19.38	0.29	0.46	1.02	1.76
2006–07	2.02	18.33	0.34	0.45	1.07	1.86
Means						
1980–89	2.3	34.9	1.6	0.6	0.7	2.9
1990–2006	2.4	25.2	0.7	0.5	0.9	2.1

Source: Authors' calculations.

TABLE A-8. Nontraded Services—Within-sector Output Shares (% Total Output)

	Electricity, gas and water supply	*Construction*	*Trade, hotels and restaurant*	*Railway transport and storage*	*Banking, real estate, dwellings and business services*	*Community, social and personal services*	*Total nontraded services*
1980–81	1.61	6.57	11.41	1.73	6.36	13.06	39.14
1981–82	1.66	6.56	11.41	1.79	6.48	12.62	38.85
1982–83	1.72	5.93	11.75	1.77	6.90	13.20	39.55
1983–84	1.71	5.79	11.46	1.63	6.90	12.70	38.48
1984–85	1.82	5.76	11.50	1.60	7.21	13.06	39.14
1985–86	1.88	5.84	11.94	1.72	7.56	13.25	40.32
1986–87	1.99	5.73	12.10	1.79	8.00	13.65	41.28
1987–88	2.07	5.85	12.19	1.80	8.46	14.13	42.42
1988–89	2.06	5.69	11.80	1.61	8.51	13.61	41.21
1989–90	2.13	5.73	11.99	1.58	8.74	13.82	41.85
1990–91	2.16	6.07	11.96	1.56	9.03	13.67	42.30
1991–92	2.33	6.10	11.84	1.64	9.71	13.80	43.08
1992–93	2.37	6.00	11.92	1.52	9.90	13.90	43.24
1993–94	2.40	5.69	12.05	1.42	10.38	13.71	43.24
1994–95	2.47	5.64	12.50	1.36	10.35	13.18	43.04
1995–96	2.46	5.58	13.40	1.38	10.20	13.21	43.76
1996–97	2.40	5.26	13.40	1.32	9.99	13.20	43.18
1997–98	2.48	5.56	13.82	1.28	10.29	13.69	44.65
1998–99	2.48	5.54	13.95	1.22	10.22	14.08	45.01
1999–00	2.46	5.63	14.03	1.24	11.14	14.72	46.77

(*Table A-8 continued*)

(*Table A-8 continued*)

	Electricity, gas and water supply	*Construction*	*Trade, hotels and restaurant*	*Railway transport and storage*	*Banking, real estate, dwellings and business services*	*Community, social and personal services*	*Total nontraded services*
2000–01	2.41	5.75	14.18	1.25	10.74	14.81	46.73
2001–02	2.32	5.66	14.73	1.26	10.71	14.61	46.96
2002–03	2.35	5.89	15.17	1.27	10.73	14.64	47.70
2003–04	2.26	6.08	15.39	1.24	10.14	14.22	47.06
2004–05	2.27	6.57	15.41	1.24	9.90	14.13	47.26
2005–06	2.17	6.99	15.41	1.24	9.87	13.84	47.34
2006–07	2.10	7.13	15.23	1.23	9.90	13.48	46.98
Means							
1980–89	1.9	5.9	11.8	1.7	7.5	13.3	40.2
1990–2006	2.3	5.9	13.8	1.3	10.2	13.9	45.2

Source: Authors' calculations.

TABLE A-9. Labor Productivity Growth in Agriculture, Mining, Manufacturing, and Services, 1982–2006

						Services				
	Agriculture	*Mining and quarrying*	*Manufacturing*	*Electricity, gas and water*	*Services*	*Construction*	*Wholesale and retail trade, etc.*	*Transport, storage and communication*	*Finance, insurance, real estate etc.*	*Community, social and personal services*
1982–83	−0.83	5.27	2.52	1.04	−1.15	−9.14	5.70	−1.15	−3.43	0.95
1983–84	10.81	−0.88	11.87	5.11	3.57	5.58	3.43	2.84	5.21	1.70
1984–85	1.71	−2.96	6.70	7.94	3.14	0.91	2.27	5.82	1.84	2.27
1985–86	−2.47	6.50	2.59	4.93	6.36	2.78	8.20	6.01	5.90	8.06
1986–87	−4.68	18.36	6.81	10.00	4.71	2.97	5.00	4.84	8.35	4.48
1987–88	−0.84	1.85	7.48	0.28	4.67	3.98	1.62	5.64	4.47	5.65
1988–89	13.68	14.67	9.12	8.74	5.71	11.35	3.35	5.31	9.43	3.58
1989–90	1.13	6.00	10.16	8.03	7.06	8.19	6.55	5.23	9.70	6.54
1990–91	2.52	7.26	6.10	6.48	4.06	10.05	2.95	4.42	3.65	1.88
1991–92	−4.07	4.15	−5.06	9.12	3.35	1.40	0.02	4.97	9.58	1.59
1992–93	6.29	1.25	4.64	5.59	4.24	3.65	7.23	4.91	2.47	3.50
1993–94	7.77	−0.62	8.19	−1.74	5.58	1.40	3.86	6.15	11.22	2.19
1994–95	4.64	8.90	11.12	9.75	6.32	5.51	8.79	8.99	4.15	2.84
1995–96	−2.63	7.76	9.41	5.37	9.55	6.66	12.28	11.40	7.48	7.20
1996–97	10.67	3.29	7.85	4.38	5.33	4.08	7.22	8.12	4.90	4.30
1997–98	−1.68	14.32	2.27	8.09	9.70	10.80	6.75	8.42	10.80	11.47
1998–99	9.88	4.34	4.27	6.25	7.52	6.66	7.34	7.95	5.92	9.60
1999–00	−1.95	4.15	6.04	6.94	10.02	10.73	5.70	11.27	10.46	12.24
2000–01	−1.29	7.86	10.32	4.33	5.39	7.69	2.14	13.28	3.65	4.57
2001–02	13.98	5.23	7.40	6.02	7.79	9.39	11.30	10.39	6.47	5.86
2002–03	−11.17	10.92	10.31	3.18	8.07	17.02	−1.98	15.10	−2.28	4.92

(*Table A-8 continued*)

(*Table A-9 continued*)

						Services				
	Agriculture	*Mining and quarrying*	*Manufacturing*	*Electricity, gas and water*	*Services*	*Construction*	*Wholesale and retail trade, etc.*	*Transport, storage and communication*	*Finance, insurance, real estate etc.*	*Community, social and personal services*
2003–04	8.90	–11.65	13.02	8.65	11.32	8.33	11.23	21.73	3.31	8.85
2004–05	–3.64	5.49	10.33	6.63	8.41	7.41	3.16	17.57	3.80	5.76
Means										
1982–90	2.34	6.23	7.04	5.84	4.24	4.07	4.34	4.33	5.01	3.90
1992–2004	3.06	4.71	8.09	5.65	7.63	7.64	6.54	11.17	5.57	6.41

Source: Authors' calculations.

Appendix 3: Data Sources

Variable name	*Definition/Construction of variable*	*Source*
P_{nt}/P_t	Sectoral gross value added deflator, classified as described in the text	CSO, National Accounts Statistics
g_t	Government Final Consumption Expenditure/GDP at Constant prices	CSO, National Accounts Statistics
y_t	Per capita Income	World Development Indicators (WDI)
$a_t - a_{nt}$	Relative Labor Productivity growth in Manufacturing and services (plus agricultural sector)	CSO, National Accounts Statistics & CEIC data base
m_t	Average Applied Tariff Rate	World Bank

Comments and Discussion

Robert Lawrence: This paper seeks to account for the trend appreciation of India's internal real exchange rate—the ratio of the prices of nontraded to traded goods. This variable is of particular interest in price-taking economies because it affects both macroeconomic and microeconomic adjustments. It has implications for inflation: If India is to accommodate a trend real appreciation, it must allow its nominal exchange rate to appreciate over time to maintain price stability. Alternatively, if it had a fixed exchange rate, it would have to live with a higher trend inflation rate. It also has implications for maintaining external balance: real appreciation in excess of productivity differentials, for example, can present problems for the profitability of traded goods production.

The source of India's real exchange rate appreciation is puzzling. Samuelson and Balassa pointed out long ago that real appreciation is generally to be expected when a country develops rapidly and productivity growth in tradables exceeds that of nontradables. But the authors find, surprisingly, that since 1991 such productivity differentials are not the explanation for real appreciation in India's case. Indeed, by some of their measures, productivity growth was actually similar in both the traded and nontraded sectors, and by other measures the difference actually narrowed during the period of real appreciation. Instead, they argue that the most important drivers of the real appreciation were increases in both private and public demand for services. Another anomalous finding from this perspective is that the period of real appreciation was associated with a relative increase in the output share in tradables. The authors argue that supply side shifts and other reforms that increased the tradability of services were responsible for this. Finally, the authors argue that their findings point to the need for nominal exchange rate, flexibility, and increased discipline over government expenditure.

I must confess to not being entirely persuaded by the paper. I had particular problems with the way the real exchange rate (RER) was measured. I am still not sure that the conclusion that the Indian real exchange rate has had a strong upward trend since the early 1990s is warranted. Indeed, one could make the case that there has actually been little or no change in the internal real exchange rate since the early 1990s—a result that would then square with the finding that differentials in productivity growth between tradables and nontradables have not been large.

To measure the real exchange rate it is necessary to define precisely which prices will be used to represent tradable and nontradable goods and services. The authors, unwisely in my view, follow others in the literature and define tradability on the basis of a threshold share of exports in output. This approach confuses tradability and exportability and neglects imports and importables. By this definition, in India's case, the agricultural sector is classified as part of the nontraded sector. This is a serious deficiency in light of why we care about the internal real exchange rate in the first place. It implicitly neglects the roles that prices of import-competing goods could play in inflation and that import substitution plays in adjustments to maintain external balance.

In fact, using the prices of the goods and services that actually enter into international trade gives a very different picture of the real exchange rate's behavior. I constructed an alternative measure of the internal real exchange rate using the ratio of the Indian GDP deflator to the sum of Indian export and import price deflators for goods and services. I found that this variable does not have an upward trend after 1991. Indeed, it looks much more like the (external) real exchange rate measure based on Indian and foreign prices reported in figure 3, which shows very little change after 1991.

The paper suggests that while the real exchange rate has risen within India, the conventional real exchange rate, as captured by Indian and foreign inflation rates measured in a common currency, has remained constant. It is certainly possible that with changes in tariffs and productivity growth, the two measures of the real exchange rate can give different results, but if they are correct, it implies that the changes in the relative price of tradables to nontradables in India has been the same as the changes in the relative price of tradables to nontradables in the rest of the world. This is certainly possible, but it seems like a remarkable coincidence.

The authors conclude that productivity growth differentials between traded and nontraded goods cannot explain the real exchange rate appreciation. But they have problems in precisely matching the sectors included in their measures of prices with those in their measures of productivity. This is another serious measurement weakness.

At the end of the day, though, there is another puzzle—the rising share of tradables in output. In the face of a real appreciation in excess of productivity growth, we might have expected resources to be drawn away from the tradables sector since production in tradables should have become relatively less profitable. Indeed, trade liberalization might have added to the pressures on profits. And yet, the share of tradables in Indian output appears to have expanded dramatically. This is not what we might expect, particularly if the authors are right that demand—and thus the relative price of nontradables—has been rising rapidly because of strong income elasticity of demand and public expenditures. On this issue, I agree with the authors that supply-side improvements, some which are not captured in product prices (such as improvements in telecommunications), are likely to be an important part of the story. An innovation such as the internet which dramatically reduced the transactions costs for exports—of call centers and business process outsourcing firms—could make it possible to export more without actually reducing export prices. Similarly, access to imported inputs and equipments at reduced prices could stimulate exports even though measures of the internal real exchange rate might show an appreciation. These improvements in tradables' profitability would not be easily captured in traditional sectoral productivity measures, but they could imply a larger tradables sector associated with any given real exchange rate. As such, the paper performs a useful service in reminding us of the need to integrate both demand and supply considerations when accounting for real exchange rate changes.

Sisira Jayasuriya: This paper analyzes the behavior of the real exchange rate in India and its determinants using the tradables/nontradables framework, following renewed interest in applying this so-called "Australian model" or the "Swan-Salter model" to analyze exchange rate policy issues in India. Kohli and Mohapatra have clearly done some very detailed and careful work to develop measures of relative sectoral price movements and to assess if there has been any real exchange rate appreciation in recent years in India by looking at the relative price of nontradables to tradables. They have also attempted to assess if any observed appreciation can be attributed to policy measures, rather than to price changes reflecting differential sectoral productivity changes associated with opening up of the Indian economy [Balassa–Samuelson (B–S) effects]. They argue that B–S effects cannot explain the real appreciation in the post-1990 period as the productivity differential between the tradables (T) and nontradables (NT) sectors virtually disappeared, rather than widened, during this time. The real appreciation during the post-reform period, according to the authors, was largely due to services biased demand from income growth in the 1990s, falling import prices, and an expansion in tradable output; as these represent an equilibrium phenomenon reflecting a natural evolution of the economy, they must be absorbed by a nominal appreciation. In this context a more flexible exchange rate policy is welcome.

I agree with the main policy conclusion that a more flexible exchange rate policy is a good thing. But I am not entirely persuaded of the strength of the empirical analysis itself for several reasons. However, before getting to specific issues, I want to congratulate the authors for the effort that has gone into constructing the detailed data base to generate sectoral price indices. This is not a trivial task.

First, consider the problem of classification. While conceptually simple, the tradables/nontradables classification is not easy to implement in practice. It used to be the case that a simple classification of "goods" as tradables and "services" as nontradables provided a reasonable first cut approximation. But this is no longer the case today. Many services are traded or (in principle) tradable. And, opening up of an economy through trade policy reforms brings several sectors that were previously nontradable into the tradable category. The problems are magnified when the classification has to be assumed valid for a fairly long period as required to conduct an econometric analysis of medium-term developments based on time series data in a country that is undergoing major structural changes. In the case of India, as documented in the paper, industries that used to be nontradable have increasingly become tradable. For example, in the services sector new tradable services have emerged and expanded while others have become increasingly tradable. Sectors such as agriculture—previously largely nontraded because of administrative measures—have also tended to become more tradable (though actual trade volumes have not been large). Hence it is important to explore how robust results are to changing definitions of tradability; the authors have recognized this issue by, for example, testing the robustness of results to the inclusion of agriculture in the tradables category. However, the extent to which a particular classification was valid for the entire duration of the study—a period that has seen major reforms and hence changes in tradability— remains an issue.

Second, the underlying assumption of the standard tradables/nontradables model that commodities are produced only using domestically sourced primary factors has never been strictly correct but is much less so in today's world. Indeed tradables and nontradables not only require imported intermediate inputs but are also increasingly important as inputs into each other. Policy changes affecting imported intermediates affect both sectors while productivity changes can be interdependent with changes in one sector impacting on the other. How important are these in India? It seems very likely that import liberalization that has reduced prices and increased availability of better equipment has had a strong positive effect on some of the major nontradables, including some of the nontraded services. Improved communications would undoubtedly have enhanced tradable sector productivity. To what extent are these possible explanatory factors for the finding that productivity differentials between tradables and nontradables have not followed the hypothesized B–S path?

From an empirical point of view, it is also pertinent to point to the fact that the analysis of productivity differentials uses "labor productivity" as the measure rather than total factor productivity (TFP). Measurement of sectoral productivity is not an easy task and it is easy to be critical of empirical estimates. However, it is at least important to recognize that the implications of using labor productivity as a substitute for TFP are non-trivial and may strongly bias the results. In a recent review, Lee and Tang (2007: p. 183) point out:

> Whether productivity growth leads to appreciation or depreciation of the real exchange rate depends on the measure of productivity used. When labor productivity is used to measure productivity, the classical positive association between productivity and the real exchange rate shows up in the data…. When total factor productivity (TFP) is used to measure productivity, the classical positive association between productivity and the real exchange rate dissipates. Higher productivity in the tradable sector, if any, tends to lead to depreciation of the real exchange rate…

In this context, it is not advisable to place much reliance on (admittedly noisy) estimates of labor productivity to draw strong conclusions.

Third, markets in India continue to be imperfectly competitive in many cases and the law of one price is widely violated. Intersectoral factor mobility is limited and costly. These too have non-trivial implications for model implications. [See, for example, Lee and Tang (2007) and MacDonald and Ricci (2007).]

The analytical rigor of the paper would be much improved and the discussions of the paper will be richer if these issues—so clearly important in the Indian context—are recognized, acknowledged, and brought into the interpretation of results and policy conclusions drawn from them. These would, in my view, seriously limit the usefulness of this framework for analyzing real exchange rate issues over the fairly long period covered in the study.

I am also concerned that the analysis, even using a somewhat hybrid specification, finds no explicit role for capital flows as a factor influencing real exchange rate appreciation. Clearly the issue of capital inflows is an important one in the Indian context, certainly during the later years of the study period; it is widely considered to be an important driver of nominal exchange rate changes. It does seem rather strange for a paper on Indian real exchange rate issues not to pay greater attention to the role of capital flows. (In any case, the statement that portfolio capital inflows reinforce "the tendency for real appreciation induced by relative price changes" should be rephrased; in fact, capital inflows induce relative price changes between tradables and nontradables.)

While I broadly agree with the major policy conclusions of the paper, I am not quite sure that several of them are strictly implied by the results. In this situation, why should fiscal deficits be a concern? Of course fiscal deficits and government expenditure are related but one should not advocate lower fiscal deficits simply because cuts in government expenditure produce real depreciations. Note that there is no evidence provided in the paper that the real exchange rate has been or is overvalued. Is there something intrinsically bad about intersectoral relative price or productivity differentials? While greater investment in education and infrastructure are certainly welcome, surely that is not because such investment will reduce the productivity gap between tradables and nontradables (it may or may not!). If real appreciation occurs due to factors such as import liberalization, why should fiscal or other policies aim to achieve "inflation convergence" between sectors?

General Discussion

T. N. Srinivasan opened the general discussion by making three points. First, he agreed with Lawrence that it is important to take into account imports as well as exports in drawing a line between tradable and nontradable products. The second point was in regard to the data. The way the services sector is measured in the Indian national accounts varies according to the type of services. In some service-producing industries for example, they project the employment, multiply it by a base-year estimate of value added, and then inflate it to obtain a nominal value. So some service industries inflate the output numbers rather than deflating them. Therefore, the prices that are used are value-added prices, not the gross output prices that are desired to measure the supply–demand response. Lastly, he expressed a word of caution on the use of the term inflation to refer to an increase in relative prices. He argued that if the relative prices of nontradables increases it is not inflation though it could become inflation if other things happen.

John Williamson also expressed concern over what seemed like some semantic confusion in parts of the discussion. He pointed out that the term "bilateral real effective exchange rate" is a contradiction. If an exchange rate is bilateral, it is not effective, and if it is effective, then it is not bilateral. He went on to highlight a more general point: there are basically two concepts of the real exchange rate. One is an external measure based on export prices relative to import prices, and the other is an internal concept of the price of exportables relative to import-competing goods. Both are relative price concepts, but they are distinct and do not always move together. In countries that export primary products, the relative price of nontradables to tradables can be thought of as a measure of the real exchange rate. However in a country like India, where this is not the case, it is quite misleading to think of the relative price as a measure of the real exchange rate. He found the paper useful in showing the importance of demand factors in driving up the relative price of nontradables in India, but did not believe that it had anything to do with the real exchange rate.

Anne Krueger agreed with the distinction between the two different concepts of the real exchange rate, but she also did not think the two would necessarily move together over a period in which India has substantially altered its trade regime and eliminated many quantitative restrictions.

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The Cost of Holding Excess Reserves: Evidence from India

Introduction

With the collapse of the Bretton Woods system, the pressure on industrial countries to accumulate reserves eased as they moved to flexible exchange rate regimes and overcame the problem of original sin. Emerging markets, however, have been struggling to define adequate reserve levels, and have been typically motivated by the principle of "non-satiability" while dealing with international reserves. Over the last decade, developing countries, particularly those in East and South Asia, have accumulated massive stockpiles of international reserves with economies like China, South Korea, Russia, and India holding reserves in excess of US$2.85 trillion by middle of 2008.[1] The massive scale of reserve accumulation has raised questions about the cost of holding large volume of reserves since most of it is held as low-yield government bonds. Such costs are extremely important for a country like India as scarce resources are being diverted to reserve accumulation, which has increased over five-fold since 2001–02.

In India, holdings of international reserves has increased substantially from less than US$5 billion in July 1991 to more than US$316 billion by middle of August 2008, before falling in recent months owing to the ongoing financial turmoil. As described subsequently in this paper, the bulk of the reserve accumulation in India can be identified taking place over three main episodes that lasted from July 1993 to October 1994, November 2001 to May 2004, and November 2006 to February 2008. Moreover, strong capital

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1. These reserves do not include gold.

inflows were the principal source of reserve accumulation during most of these episodes, except for the early period in the second episode, when India witnessed a current account surplus. The current levels of reserve holdings are well in excess of the traditional debt- and trade-based reserve adequacy indicators.

However, international reserves are held for a number of reasons apart from just financing current account deficit and covering short-term debt obligations. These include defusing a speculative run on currencies and preventing excessive volatility in the exchange rate, among others. Reserve accumulation can also be a byproduct of maintaining an undervalued exchange rate to promote export-led growth. In this paper, we employ empirical methods to generate an international norm of reserve holding, incorporating the various objectives of holding reserves. We then compare the actual reserve holdings with the international norm for emerging markets and the difference is deemed as excess reserves. Next, we calculate the cost of holding these excess reserves in India by looking at three alternate uses of the resources employed in building up the stockpile of reserves.

The rest of the paper is structured as follows. The second section undertakes a brief review of the existing literature. The next section introduces the empirical model to identify the principle determinants of reserve holding. Using the results of the empirical model, we create an international norm of reserve holding and calculate the extent of excess reserves. The fourth section discusses the reserve management in India, identifying the principle episodes of reserve accumulation. The following section outlines the cost of holding excess reserves in India focusing on alternative uses of resources. Finally, the sixth section lists out the main conclusions of the study.

Selected Review of the Existing Literature

In one of the earliest papers on reserve holdings, Heller (1966) argued that countries should add reserves till the marginal utility of holding additional reserves equals the marginal cost. The precautionary motive for holding reserves stems from the ability to smoothen consumption and production during a balance of payments deficit. A measure of opportunity cost was employed by assuming that the return on reserves had to be compared with the rate of capital. Subsequent studies focused on the extent of external payments variability, the propensity to import, a scale variable like population, and an opportunity cost as influencing the demand for reserves. The impact of import propensity was a subject of considerable debate. High trade openness reflected greater vulnerability and implied a positive relationship with reserves. However, high reserves level could be achieved by generating a current account surplus through reduction in imports, implying an inverse relationship. While Cooper (1968), Iyoha (1976), and Frenkel (1978) found evidence for the positive relationship, Heller (1966) argued for a negative relationship.

Several studies in the late 1960s looked at the demand for reserves during the Bretton Woods period. Kenen and Yudin (1965) argue that the demand for reserves in industrialized countries depends on the extent and duration of balance of payments disturbances, per capita income, central bank's liquid liabilities, and overall money supply. Other papers like Thorn (1967) and Courchene and Youssef (1967) conclude that the level of imports, money supply, and long-term interest rate play an important role in determining the level of reserve holdings in developed economies.

Most studies in the 1970s and 1980s focused on the impact of import propensity, import volume, and balance of payments variability. The impact of the scale variable has been particularly ambiguous in the literature. While studies like Frenkel (1974a), Frenkel (1974b), Frenkel and Jovanovic (1981), and Bahamani-Oskoee (1987), found scale economies in reserve holdings, others including Heller and Kahn (1978), Frenkel (1983), Edwards (1983), Lizondo and Mathieson (1987), and Islam et al. (1994) do not.

While early studies considered that reserves were largely held to mitigate the current account disturbances, the collapse of the Bretton Woods system in 1973 altered the factors influencing the demand for reserves. Haberler (1977) speculated that a move toward more flexible exchange rate regimes would reduce the demand for reserves as exchange rates would fluctuate in response to changes in trade. However in reality, governments showed high concern about exchange rate variability, and an open capital account was seen as a source of instability. Thus despite an announced move toward more flexible exchange rates, the reserve to GDP ratio did not decline in most countries. Calvo and Reinhart (2000) argue that some countries, which identified themselves as floaters, look akin to peggers in terms of the probability that the monthly percentage change in their exchange rate will fall within a narrow band. Hausman et al. (2001) find that countries with limited ability to borrow abroad in domestic currency would seek reduced exchange rate volatility to limit the damage from currency mismatches of their liabilities.

Consequently, a key question in the post-1973 period was the stability of reserve demand across exchange rate regimes. Frenkel (1980; 1983) tested for change in the demand for reserves across exchange rate regimes and found a leftward shift in reserve demand in the post-1973 period, concluding that floating-rate regimes require fewer reserves. Edwards (1983) finds that balance of payments variability is a significant determinant of reserves for fixed-rate developing countries, but not for countries preferring devaluations. Employing a dummy to distinguish between fixed-rate and devaluing countries, Edwards conclude that the devaluing countries hold fewer reserves than fixed-rate countries.

A spate of crises in emerging markets during 1980s and 1990s compelled researchers to revisit the issue of reserve adequacy. This period also witnessed gradual opening up of the capital account in the developed countries followed by emerging markets. Increased capital flows have a dual impact on demand for reserves. While studies like Heller and Khan (1978) and Eichengreen and Frenkel (1996) argue that capital mobility allows countries to finance part of the external deficit by borrowing abroad, greater capital mobility can be a source of external vulnerability as it raises exchange rate volatility.

These crises resulted in a spurt of literature looking at the importance of holding reserves to meet short-term obligations. Reserves provide self-insurance against sudden stops and adverse fiscal shocks. Ben-Bassat and Gottlieb (1992a) argue that international reserves reduce the probability and the intensity of an output drop due to a sudden stop. Greenspan (1999) pointed out the ratio of short-term external debt to reserves is the single most relevant indicator of reserves for countries borrowing in international markets. Bussiere and Mulder (1999), using a methodology developed by Sachs et al. (1996), concluded that higher liquidity can significantly decrease countries' vulnerability to external shocks in the face of weak domestic fundamentals. They argue for complete coverage of total short-term external debt as a rule for reserve adequacy for emerging markets.

The pattern of reserve holding has changed considerably in Asian economies in the aftermath of the Asian crisis with economies exhibiting increased demand for reserves for self-insurance. Focusing on Korea, Aizenman et al. (2004) find a structural break in the pattern of reserve holding post-Asian crisis with financial openness and external indebtedness becoming significant predictors of reserve holdings. Aizenman and Marion (2004) find that the size of international transactions, their volatility, exchange rate arrangements, and political stability are the key determinants of international reserve holdings in East Asia. Countries characterized by sovereign risk, costly tax collection, and large inelastic fiscal liabilities exhibit greater precautionary demand for reserves.

Feldstein (1999) points out that emerging markets must protect themselves from crises like the one that occurred in 1997, and the key to self-protection is liquidity in the form of large foreign exchange reserves. Reserves also lower the real exchange rate volatility, induced by terms of trade shocks. Aghion et al. (2006) show that in countries characterized by limited financial development, exchange rate volatility negatively impacts the growth rate. Thus, any mechanism reducing exchange rate volatility will enhance the growth performance. Edison (2003) also shows that along with real GDP per capita, population level, and ratio of imports to GDP, exchange rate volatility influences the demand for reserves.

Obstfeld et al. (2008) argue that one of the reasons for countries to hold reserves above the traditional trade- and debt-based adequacy measures is to ensure domestic financial stability and prevent a run on the domestic banking system. With financial globalization, residents can withdraw domestic assets to exchange for foreign ones if there are concerns about the future economic health of the country. Such a run on the financial system can lead to a currency crisis unless the central bank has enough foreign reserves to exchange for domestic assets. Burke and Lane (2001) conclude that apart from trade openness and external indebtedness, financial depth is a principal determinant of international reserves. This could also explain why some emerging markets like India and China are holding reserves well above the traditional reserve adequacy measures. The central banks of these countries might expect further financial integration and monetization in the near future.

Dooley et al. (2003) argue that the growing stockpiles of international reserves in some emerging markets like China could be attributed to a deliberate strategy of facilitating growth by maintaining an undervalued real exchange rate to promote exports.

Thus it is evident that countries are accumulating reserves to meet a wide range of objectives. The ongoing financial turmoil has also highlighted the various uses of international reserves. A number of countries like Russia, South Korea, and Mexico have used their reserves to counter capital's "flight to safety" and defend their currency. Consequently, a number of these countries have witnessed a decline in reserve holdings in recent months.

Despite the above varied objectives of accumulating international reserves, the existing literature looking at the cost of holding reserves implicitly assumes that holding international reserves does not generate any benefits or the reserves are held only to meet a single objective like current account financing. Consequently, it either takes into account the entire stockpile of reserves or reserves in excess of a single adequacy measure (import cover).

Such a perspective fitted well in a world where financial markets were not integrated and trade openness reflected countries' vulnerability to external shocks, that is, the Bretton Woods period. However, with increased financial integration in recent years, the emerging markets have increased their exposure to volatile short-term inflows of capital that are subject to frequent sudden stops and reversals.

Early papers looking at the cost of holding reserves like Iyoha (1976) and Frenkel and Jovanovic (1981) treat the opportunity cost as the inverse of the discount rate and find that the demand for reserves varies inversely with the opportunity cost. However, Shinkai (1979) points out that since most the reserves are held in dollar-denominated assets, it makes more sense to use the difference between returns on such assets and a country-specific interest rate, which measures the net gain (inverse cost) of holding reserves instead of investing the equivalent sum within the country.

Another measure usually employed to capture the cost of holding reserves is the return on investment in physical capital. Neely (2000), Ben-Bassat and Gottlieb (1992a), and Baker and Walentin (2001) assume that if assets were not held as reserves they would be available to fund domestic investment in physical capital. Thus an increase in reserves represents an enormous cost to the developing nations as they forego domestic investment in either physical or human capital. Baker and Walentin (2001) point out that these costs exceed 1 percent of GDP and possibly 2 percent of GDP for many developing economies.

In a recent paper Rodrik (2006) terms excess reserves as reserves held over and above what is required to meet three months of imports. Using this rule Rodrik (2006) finds that by investing resources in accumulation of reserves instead of reducing private sector's short-term borrowing, the developing nations are losing about 1 percent of their GDP.

Determinants of Reserves

In this section, we use empirical methods across 167 countries over the period of 1980–2005 to identify the principal determinants of cross-country variation in the level of international reserves. The dependent variable is the ratio of reserves minus gold to GDP. The reserves include special drawing rights, reserves of the International Monetary Fund (IMF) members held by the IMF, and holdings of foreign exchange under the control of monetary authorities. Data on reserve holdings and GDP are taken from the World Development Indicators (WDI). Both reserve holdings and GDP are measured in current US dollars.

As discussed already, a wide range of variables have been found in the literature to influence the reserve holding behavior of an economy. In the subsequent analysis, we draw on that literature to identify the principal determinants of reserve holding. The first variable is a measure of real income per capita, which acts as a measure of the overall development of the economy and captures a wide range of factors affecting reserve holdings. Owing to the large variation in this variable across the countries, we use the log of real per capita GDP instead of level.

There is a close association between domestic financial development and exposure to external crises. To the extent that the liabilities of the domestic sector are partly denominated in foreign currency, financial deepening should be matched by an increase in international reserves. We measure financial depth with the ratio of money and quasi money (M2) to GDP. Data on M2 and per capita GDP are also taken from the WDI.

The volume of reserves is also crucially affected by the exchange rate regime. A country with a currency peg is likely to hold more reserves either to defend against attacks on the exchange rate or as a consequence of resisting an appreciation of the domestic currency. On the other hand, in a flexible exchange rate regime, the exchange rate can freely float to reflect market reality and hence such a country is likely to hold fewer reserves. To control for exchange rate regime, we use the exchange rate index formulated by Levy-Yeyati and Sturzenegger (2005), which is a *de facto* classification based on data on exchange rates. The index ranges from 1 to 5 with a lower number implying a more flexible exchange rate regime.

The extent of capital account liberalization is another variable influencing the precautionary motive for reserve accumulation. As a country opens up to greater capital flows, it needs to ensure adequate safeguards to protect itself against sudden stops. Thus greater capital account openness tends to be associated with higher reserves. We measure capital account openness using Chinn–Ito index developed in Chinn and Ito (2006). The index ranges from 1.79 to 2.54 with a higher value indicating greater financial openness.

Aizenman and Marion (2004) point out that political uncertainty will also influence a country's strategy regarding holding of reserves. Suppose alternatively the government in a country has a "tough" administration that ensures responsible fiscal behavior and a "soft" administration that behaves opportunistically in appropriating and allocating resources with high discount rates to special interest groups. A "soft" administration would want to increase the consumption of special interest groups and reduce international reserve holdings, and accumulate international debt to achieve that. On the other hand, a "tough" administration would be reluctant to hold lot of reserves if there is a high probability that it will lose power in the near future and the future administration will be "soft" and grab the rewards for the special interest rate groups. Thus, political instability can reduce the level of reserve holdings below the level supported by efficiency considerations. We use the political stability index developed by *International Country Risk Guide*. The index is made up of variables like government stability, socio-economic conditions, conflicts, law and order, and so on. The index ranges from 0 to 100 with a higher number indicating a more politically stable regime.

As pointed out in Dooley et al. (2003) reserve accumulation can also be treated as a byproduct of maintaining an undervalued exchange rate with a desire to promote exports and provide employment in the traditional sectors. Consequently, countries with an undervalued exchange rate will accumulate reserves to facilitate export growth by resisting currency appreciation. To account for this possibility we control for exchange rate overvaluation. The measure of exchange rate overvaluation is taken from Johnson et al. (2007), and a positive number implies an overvalued exchange rate.

Finally, we also include a series of dummy variables that indicate the behavior of the Asian and the Latin American economies after the crises of 1994 and 1997. These dummies intend to capture the change in the reserve-holding behavior of these economies after they were hit by these crises.

The empirical model is given by following equation:

$$\begin{aligned} Y_{it} = \alpha_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} \\ + \beta_6 X_{6it} + \beta_7 X_{7it} + \beta_8 X_{8it} + \upsilon_i + \varepsilon_{it} \end{aligned} \tag{1}$$

where i refers to the country and t represents the time period. Here Y is the dependent variable, measured as ratio of reserves (minus gold) to GDP. Among the explanatory variables, X_1 is log of per capita GDP, X_2 is a measure of trade openness, X_3 is a measure of exchange rate regime, X_4 measures capital account openness, X_5 measures financial depth, X_6 is a measure of political stability, X_7 is the ratio of short-term debt to GDP, and X_8 measures the extent of currency overestimation.

In our sample of countries, a Woolridge test for autocorrelation suggests the presence of first-order serial correlation. Thus the error term in Equation 1 can be written as

$$\varepsilon_{it} = \rho_i \varepsilon_{it-1} + \mu_{it} \tag{2}$$

In the literature, there are several ways to estimate the model in the presence of serial correlation. One can use a feasible generalized least squares

(FGLS) with AR(1) correlation. However, this procedure has been criticized for underestimating the standard errors. The panel-corrected standard error estimates, which uses Prais–Winstein regression, address this problem. It assumes that the disturbances are heteroskedastic and contemporaneously correlated across panels. The panel-corrected standard error estimates allow for first order correlation, AR(1), with a common coefficient of the AR(1) process across all the panels ($\rho_i = \rho, \forall i$), as well as a specific coefficient of the AR(1) process for each panel ($\rho_i \neq \rho, i \neq j$).

Table 1 displays the results of the Prais–Winstein regression with panel specific autocorrelation coefficients. We focus on all the countries in our sample as well as just the emerging market economies. Across the entire sample, log of per capita GDP has a positive and significant impact on reserve holdings. Richer countries tend to have higher reserve holdings. Trade openness, measured as the ratio of imports to GDP, also exerts a strong positive and significant impact on reserve holdings, thereby highlighting the precautionary motive in which countries having a higher share of imports want to hold enough resources to be able to finance their imports.

Across all specifications for the full sample, the exchange rate regime has a significant positive impact on reserves. According to the exchange rate regime measure used, a higher number indicates a less flexible regime. Thus countries with relatively fixed exchange rate regimes tend to accumulate greater reserves. Like trade openness, capital account openness also positively affects international reserve holdings. That is, countries that have opened up their capital account tend to hold greater reserves to protect themselves against episodes of sudden stops. We find that greater financial depth tends to have a positive association with reserve holdings. In many countries, the liabilities of the financial sector are denominated in foreign currencies and this is reflected in higher reserves. Political stability also has the expected positive impact on reserve holdings, but the impact is not significant across all specifications. Finally, external indebtedness has no significant correlation with reserve holdings. Among the categorical variables, only the measure for Asian economies after the Asian crisis has a strong positive and significant effect on reserves suggesting that after the crisis, the Asian economies made a deliberate attempt to bolster their reserve holdings to prevent another such attack.

When we focus only on emerging markets, we find that political stability along with exchange rate regime are no longer significant predictors of the volume of reserves. However, both trade and capital account openness along with per capita GDP, short-term indebtedness, and financial depth continue to be the major determinants of reserve accumulation. We also find strong

TABLE 1. Principal Determinants of Reserve Accumulation, 1980–2005

	Full sample of countries						*Emerging markets*					
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*	*VIII*	*IX*	*X*	*XI*	*XII*
Per capita GDP (Log)	0.917***	0.682***	0.335	1.480***	1.303***	2.973***	0.694	0.09	0.485	3.637***	4.170***	4.179***
	[3.82]	[2.83]	[0.97]	[3.34]	[2.93]	[6.36]	[1.21]	[0.13]	[0.69]	[3.81]	[3.95]	[4.44]
Import share	0.119***	0.148***	0.187***	0.153***	0.148***	0.171***	0.256***	0.263***	0.175***	0.139***	0.124***	0.120***
	[12.69]	[15.01]	[11.21]	[8.05]	[6.82]	[7.10]	[8.44]	[8.44]	[4.35]	[3.09]	[3.04]	[3.32]
Exchange rate regimes		0.151***	0.283***	0.269***	0.224**			0.119	0.161	0.198	0.206	
		[2.62]	[3.51]	[3.05]	[2.57]			[0.94]	[1.08]	[1.16]	[1.21]	
Capital account openness		0.513***	0.557***	0.535**	0.527**	0.596***		0.534**	0.420*	0.477*	0.499*	0.466*
		[3.96]	[3.23]	[2.53]	[2.48]	[2.80]		[2.11]	[1.66]	[1.76]	[1.91]	[1.82]
Share of M2 in GDP			0.084***	0.110***	0.116***	0.001			0.104***	0.115***	0.121***	0.129***
			[5.58]	[5.34]	[6.30]	[0.01]			[3.99]	[4.09]	[4.72]	[6.09]
Political stability			0.024	0.054**	0.046**	0.042**			0.017	0.012	0.011	–0.003
			[1.41]	[2.50]	[2.21]	[2.05]			[0.55]	[0.32]	[0.30]	[0.09]
Ratio of short-term debt to GDP				0.004	0.006	0.005				0.026	0.02	0.02
				[1.01]	[1.43]	[1.29]				[1.60]	[1.06]	[1.12]
Exchange rate overvaluation					0.003	0.009					–0.032**	–0.030**
					[0.52]	[1.64]					[2.16]	[2.23]
Observations	3,633	2,836	1,737	1,375	1,298	1,418	573	465	394	344	336	375
Number of countries	167	158	112	89	89	90	25	24	23	21	21	22

Source: Author's calculations.
Note: Robust z statistics in parentheses.
*** indicates significant at 1 percent, ** indicates significant at 5 percent, and * indicates significant at 10 percent.

evidence for the mercantilist motive with currency undervaluation being associated with increased reserve accumulation.

Several papers like Gosselin and Parent (2005) and Edison (2003) have pointed out a structural break in the volume of reserves in 1997 due to the emergence of financial crisis in several countries in Asia. Consequently, in table 2 we focus on post-1998 period. Following Aizenman and Lee (2006), we also include two-period lagged export growth (based on a three-year moving average) to capture the mercantilist motive. Reserve hoardings due to mercantilist concerns should be associated with higher export growth rate and an undervalued currency. However, we find that the effect is not significant.[2]

Next, we use the above empirical model to predict the demand for international reserves for various emerging countries. In particular, we use the

TABLE 2. Principal Determinants of Reserve Accumulation, 1998–2005

	I	*II*
Per capita GDP (log)	3.972***	4.000***
	[4.40]	[4.39]
Import share	0.077***	0.081***
	[2.78]	[2.84]
Capital account openness	0.683**	0.648**
	[2.22]	[2.09]
Share of M2 in GDP	0.175***	0.173***
	[8.69]	[8.39]
Political stability	−0.037	−0.03
	[0.94]	[0.77]
Ratio of short-term debt to GDP	0.035***	0.037***
	[2.68]	[2.63]
Exchange rate overvaluation	−0.032**	−0.030**
	[2.29]	[2.09]
Export growth		0.006
		[0.28]
Observations	132	132
Number of countries	20	20

Source: Author's calculations.

Notes: Robust z statistics in parentheses.

*** indicates significant at 1 percent, ** indicates significant at 5 percent, and *indicates significant at 10 percent.

2. The robustness of the results reported in tables 1 and 2 was checked using alternative explanatory variables. For financial depth, variables such as share of credit allocated to the private sector and ratio of liquid liabilities to GDP were used. Trade openness was measured using total trade as a percentage of GDP, while capital account openness was measured by looking at the volume of capital flows to GDP. Political stability was proxied by government stability, law and order, and corruption. The results were broadly similar to the ones reported.

regression in column II of table 2 to calculate the volume of reserves predicted by our model.

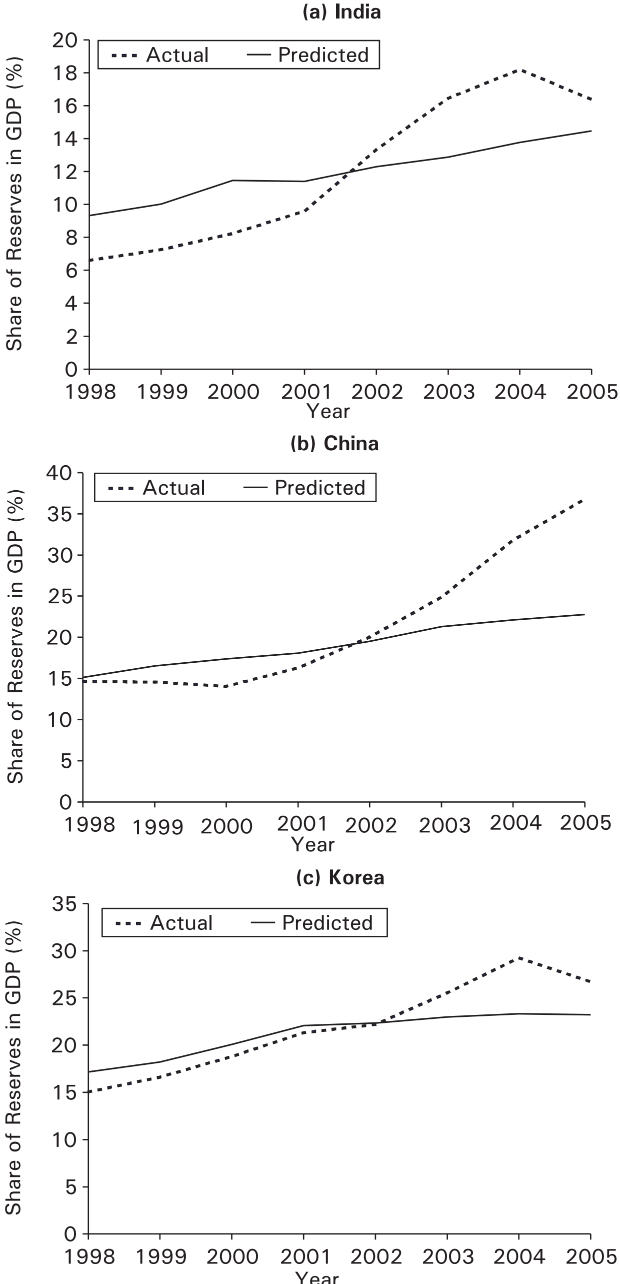
In figure 1, we look at the reserve accumulation performance of some selected emerging markets in Asia and Latin America. There are five countries whose actual reserve accumulations (as a percentage of GDP) were significantly higher than what our model predicted. These include India, China, Korea, Russia, and Malaysia. By 2005, the excess reserve accumulation in these countries stood at US$16 billion, US$312 billion, US$24 billion, US$72 billion, and US$12 billion respectively. On the other hand, by 2005, Indonesia, Philippines, and Argentina had accumulated reserves close to the amount predicted by our model. Finally, only in Brazil the actual reserve accumulation was less than the international norm predicted by our model.

Reserve Accumulation in India

Prior to the time of financial globalization, countries used to hold reserves mainly to manage foreign exchange demand and supply arising from current account transactions. India was no exception to this rule, and for a number of years after Independence, India largely followed an inward-looking and interventionist strategy that was characterized by licensing requirements, financial repression, state ownership in most industries, and protection from imports. During the early 1980s, the current account deficit was kept within check and in most years it was below 1.5 percent of GDP. However, as India reoriented its development strategy toward greater exports and introduced a host of measures to promote exports and liberalize exports for importers, the situation underwent a change. Steps taken to deregulate the economy along with increased competitiveness due to a real depreciation of the rupee boosted exports rapidly. However, there was also a sharp spurt in imports as domestic petroleum production slowed down. Widening of the current account deficit was exacerbated by rising expenditure and increased defence spending.

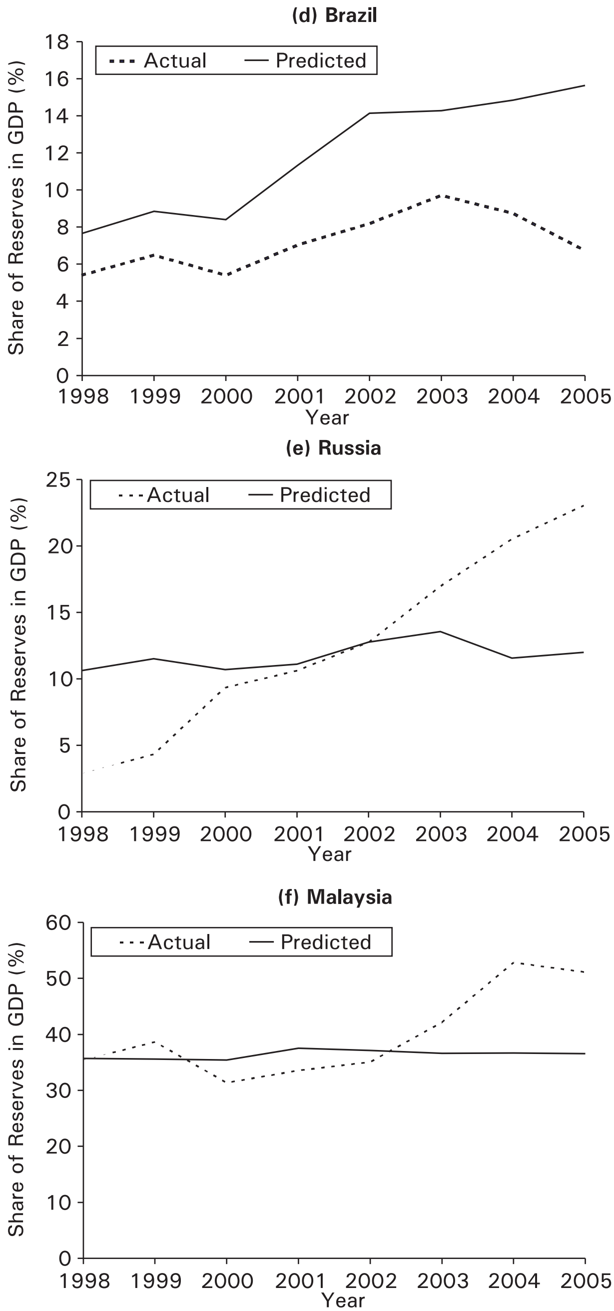
The quantum of the current account deficit in the late 1980s became higher than funds available through aid financing on concessional terms and consequently, the current account deficit started being financed by non-resident remittances and borrowings at commercial terms. Thus within a short span, there was a significant increase in the reliance on high-cost short-term financing. Medium- and long-term debts more than quadrupled during this period and stood at US$13 billion in 1990–91 compared to only

FIGURE 1. Reserve Accumulation (as a Percentage of GDP) in Selected Emerging Markets



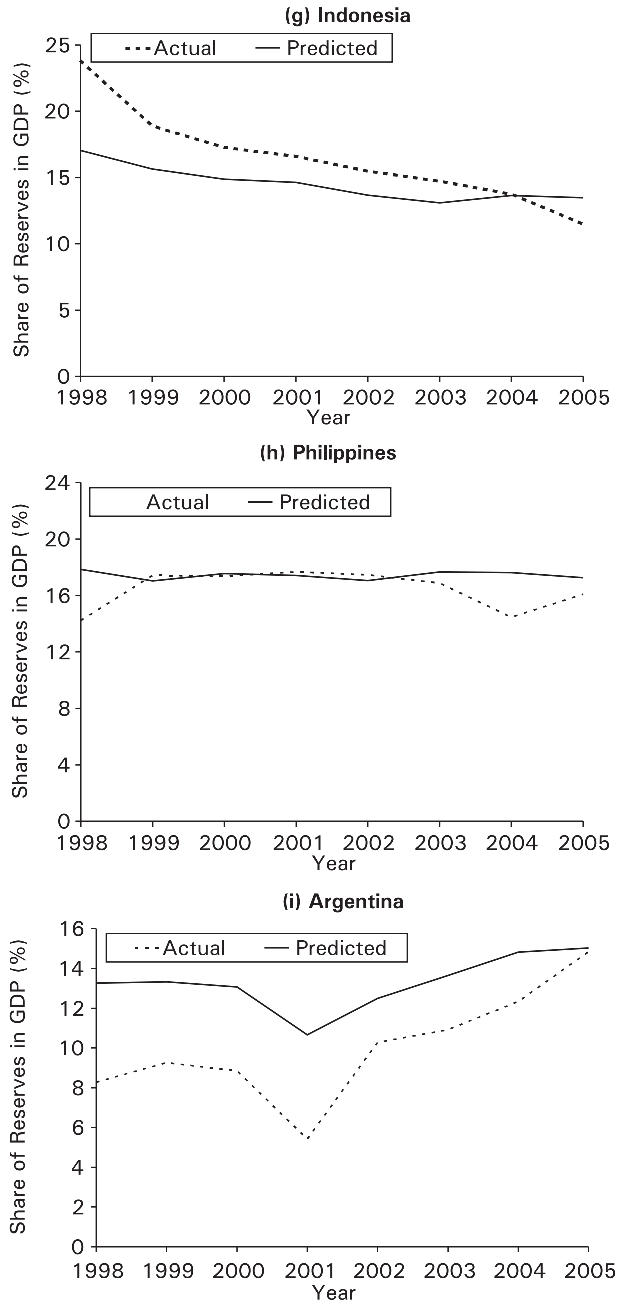
(*Figure 1 continued*)

(*Figure 1 continued*)



(*Figure 1 continued*)

(*Figure 1 continued*)



Source: World Development Indicators 2008.

US$3 billion in 1984–85. Short-term external debt increased by US$6 billion during this period and the ratio of debt service payments to current receipts widened to nearly 30 percent. Thus India became increasingly vulnerable to external shocks and shifts in creditor confidence.

Cerra and Saxena (2002) point to two external shocks that contributed to the large current account deficit in 1990–91. The first one came from the then ongoing Middle East crisis, which resulted in a sharp increase in oil prices. Petroleum imports increased by more than US$2 billion in 1990–91 compared to the previous year. This rise was due to a sharp spike in global prices of crude oil as well as a sharp increase in the volume of imports as domestic crude oil production became impaired by supply difficulties.

The current account deficit also widened due to slow growth in India's major export markets. While the Middle East crisis adversely affected these markets, the erstwhile Soviet Union was also impacted by the crisis. Global growth halved from 4.5 percent in 1988 to 2.25 percent in 1991. The US, which was a major destination for Indian exports, witnessed an even sharper decline with growth declining from a healthy 3.9 percent in 1988 to less than 1 percent in 1990, and negative 1 percent in 1991. As a result, there was a sharp deceleration in the growth of Indian exports, with export volumes growing by only 4 percent in 1990–91.

Along with a growing current account deficit, India's balance of payments also started encountering difficulties on capital account. Investor confidence, which had already begun to erode, declined significantly as international credit rating agencies downgraded India below investment grade to speculative level. Commercial bank finances became difficult to obtain while capital outflow started taking place as creditors refused to roll over the short-term debts. The Middle East crisis also had a negative impact on the remittance earnings of the workers, and strong inflows of non-resident deposits soon turned into net outflows.

The economic downturn was aggravated by growing political uncertainty during this period. The election in 1989 did not give the mandate to any single party, and a number of political parties formed a coalition government headed by V. P. Singh. However, soon the coalition became unstable as it became involved in a number of caste- and religion-based conflicts. The government fell in November 1990 as it lost a confidence motion in the Parliament. The V. P. Singh government was succeeded by another coalition government headed by Chandra Shekhar, which lasted only four months before it lost the majority of the house and fresh elections were called. The political uncertainty came to a head when Rajiv Gandhi, a former prime minister and the leader of the Indian National Congress, was assassinated in May 1991 while campaigning for elections. Even after fresh elections, no political party was able to get an absolute majority, and a minority government under P. V. Narasimha Rao came into power.

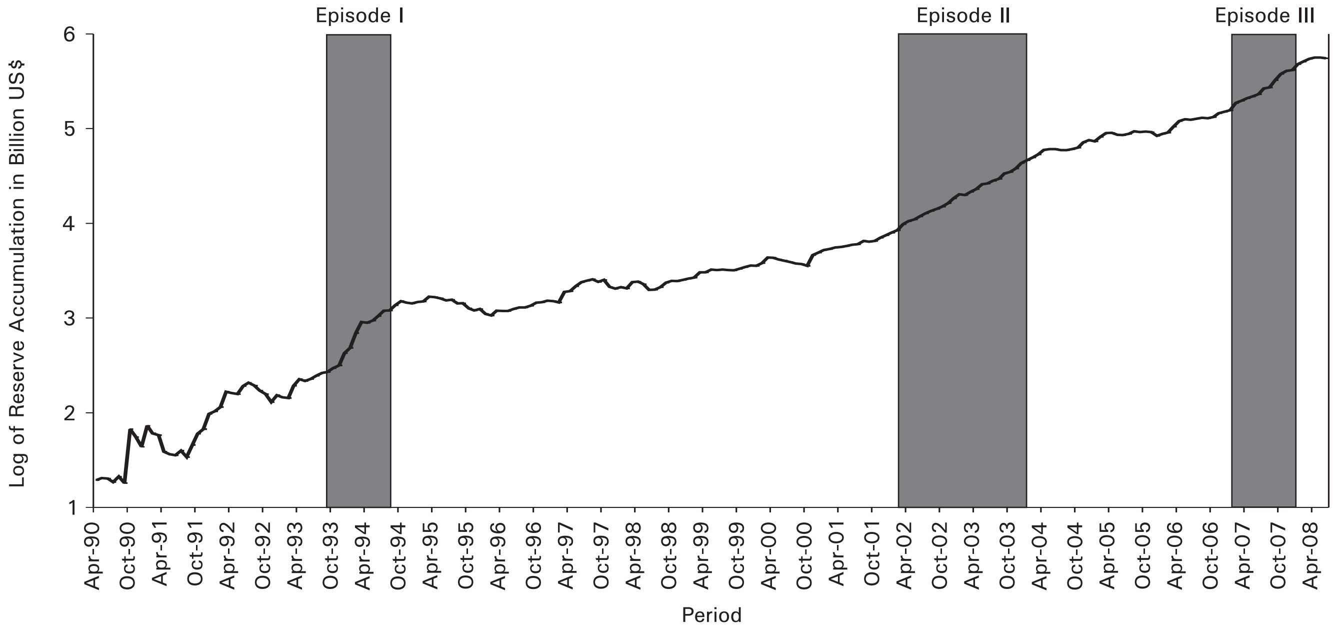
In a move to contain the economic crisis and restore economic health, the new government undertook a wide range of reforms. Some of the major reforms in the external sector involved devaluation of the exchange rate and a move toward market-determined rate, reduction of tariffs, elimination of quantitative restrictions to facilitate imports, and a greater emphasis on import liberalization. It was also decided to encourage direct and portfolio investment, reduce short-term borrowings, and to put annual caps and minimum maturity requirements on commercial borrowing. Finally, a strong emphasis was placed on the build up of foreign exchange reserves to provide insurance against future external shocks.

The last objective has been admirably achieved as India's reserve holdings increased from US$5.8 billion in 1991 to over US$315 billion in May 2008. Indian policymakers have followed a conscious policy of accumulating reserves to prevent excess pressure on the rupee to appreciate in response to current account surpluses or a surge in capital flow. As can be seen in the figure 2, three main episodes of reserve accumulation can be identified over the last 18 years.

The first episode of reserve accumulation began in July 1993 and went on till October 1994 (figure 3). Patnaik (2005) points out that owing to the various reforms undertaken in the external, fiscal, financial, and monetary sectors of the economy in the aftermath of the 1991 crisis, there was a steady decline in the current account deficit and it remained below 2 percent through most of the 1990s. Foreign Institutional Investor inflows more than trebled from US$307 million in July–September 1993 to US$935 million in October–December 1993. It doubled again to US$2.3 billion during January–March 1994. Net capital inflow of over US$9 billion during 1993–94 and 1994–95 was three times that of previous years.

Studies, including Acharya (2002), have argued that sustained capital flow should be met by partial sterilization, productive absorption of these flows through greater liberalization of the current account, and a policy of allowing the capital flows to increase the capital in the economy, reduce real interest rate, and stimulate investment. However, a policy of accumulating reserves by buying up the capital flowing into the country to prevent the rupee from appreciating was pursued. Throughout the interval of April 1993 to July 1995, the exchange rate remained steady at Rs. 31.4 per dollar. India's reserve holdings more than doubled from less than US$12 billion in July 1993 to US$24 billion in October 1994.

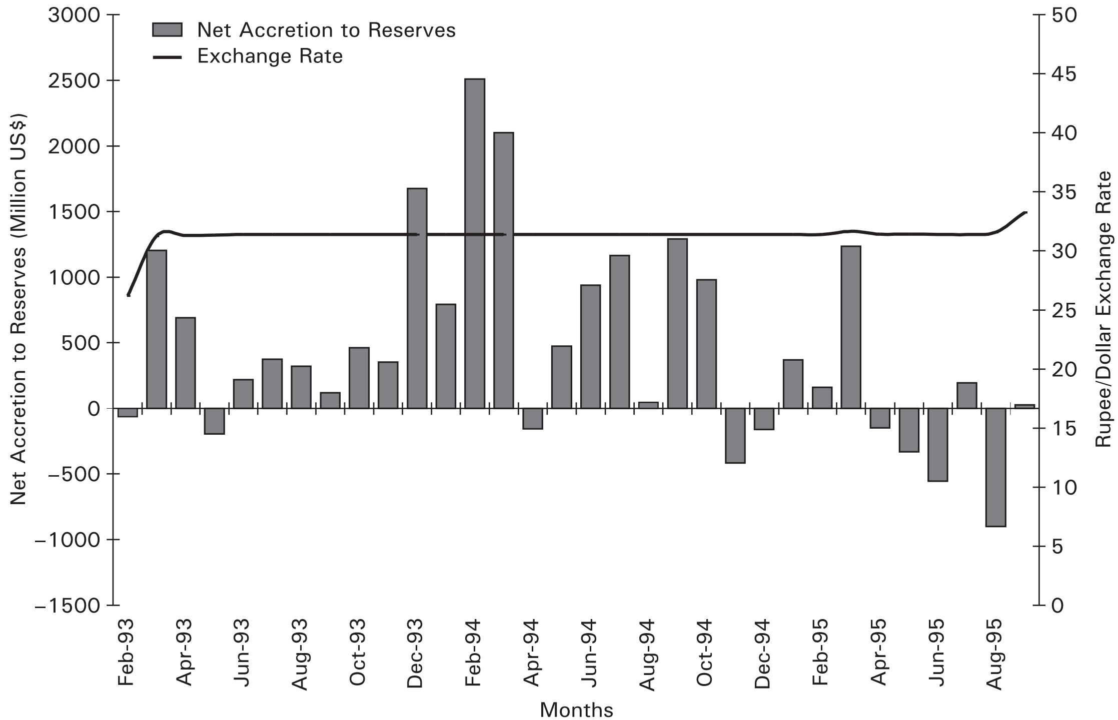
FIGURE 2. Episodes of Reserve Accumulation



Source: Author's calculations based on RBI's database on Indian economy.

Note: We identify an episode of reserve accumulation as a contiguous period of more than eight months when the 3-month average monthly growth rate in reserves is in excess of 2 percent. According to this definition, Episode I lasted from July 1993 to October 1994, Episode II ran from November 2001 to May 2004, and Episode III began in November 2006 and lasted till February 2007.

FIGURE 3. Reserve Accumulation and Policy Response in Episode I



Source: RBI’s database on Indian economy.

The Reserve Bank of India (RBI) chose not to sterilize these interventions, as a result of which there was a sharp increase in money supply.[3] The money supply growth rate surged to 20 percent in late 1994 and contributed to a rapid rise in inflation. In an attempt to control the monetary expansion, the cash reserve ratio (CRR) was raised a number of times in 1994–95. While the ordinary CRR was raised from 14 percent to 15 percent, CRR applicable to Foreign Currency Non-Resident (FCNR) accounts was raised from 0 percent to 15 percent, while that for non-resident accounts was hiked from 0 percent to 7.5 percent.

The second episode of reserve accumulation started in November 2001 when reserve holdings jumped by US$1.6 billion compared to the previous month. The episode continued till May 2004, by when international reserve holdings had increased by US$73 billion compared to the start of the episode. Beginning from a deficit of US$4.7 billion (1999–2000), the current account registered a surplus of US$3.4 billion in 2001–02, which progressively increased to US$14.1 billion in 2003–04. The turnaround in the current account was achieved through a reduction in the merchandize trade deficit as well as a significant improvement in the invisibles surplus, primarily due to a jump in the exports of software services. This change of over US$19 billion in the current account deficit over a period of four years added significantly to the reserves. Net capital flows during the early part of the episode were largely stable and increased marginally from US$8.4 billion in 1998–99 to US$8.8 billion in 2000–01 before falling back to US$8.5 billion in 2001–02. Net capital inflows started to accelerate since October 2002 and increased to US$10.8 billion in 2002–03, and further to US$29 billion in 2004–05. However, the rising current account deficit since 2004–05 meant that the pace of reserve accumulation had slowed down after April 2004.

Unlike the earlier episode, the central bank resorted to sterilization in a significant way. To keep the reserve money growing at a stable rate, the increase in the net non-foreign assets of the RBI were largely matched by a decrease in RBI credit to the government. As a percentage of RBI's asset components of the reserve money, the share of RBI credit to the government decreased from 39.6 percent in November 2001 to 2.4 percent in April 2004.[4]

3. The decision to not sterilize the capital inflows could have been necessitated by the illiquid bond markets prevailing at that time.

4. The asset components include RBI's claims on government (net), commercial, and co-operative banks, National Bank for Agriculture and Rural Development (NABARD), and the commercial sector. It also includes net foreign exchange assets of the RBI and government's currency liabilities to the public. Deducting the net non-monetary liabilities of the RBI from the asset components would yield the reserve money.

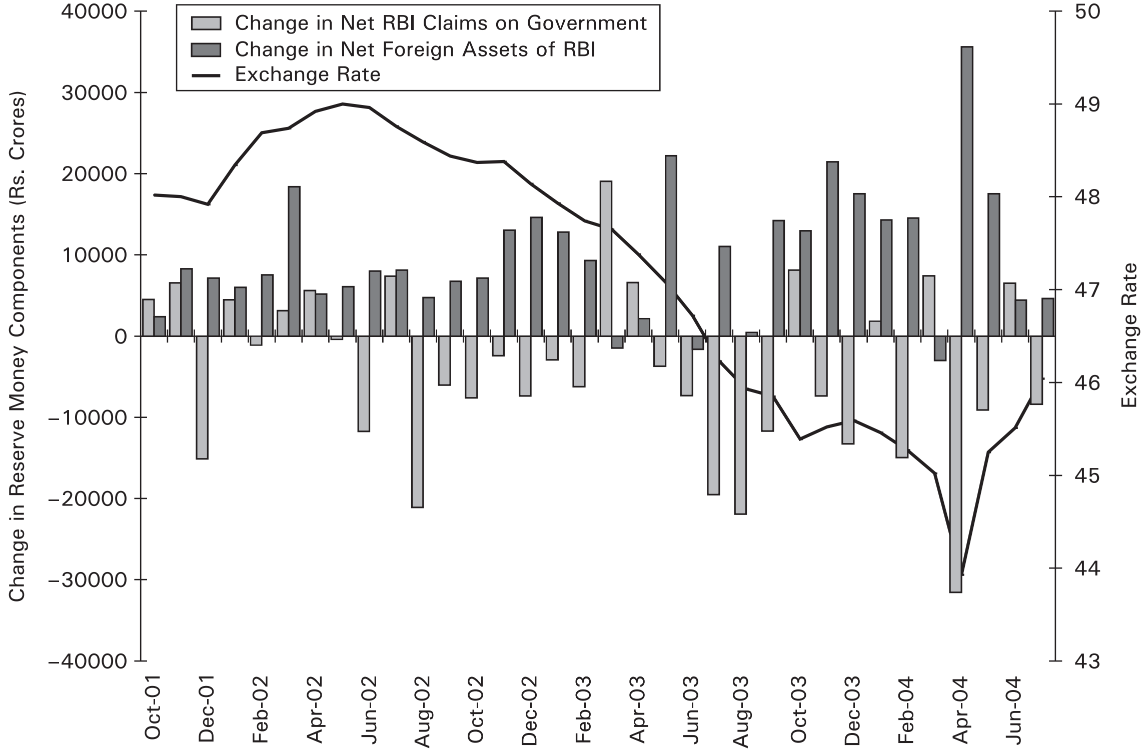
Over the period, the share of net foreign assets increased from 54.4 percent to 95.2 percent. Moreover, as can be seen from figure 4, there was a clear inverse relationship between the foreign and domestic asset accumulation: months with high foreign asset accumulation also witnessed a significant sale of government bonds.

As pointed out in Patnaik (2005), unlike Episode I, there was no increase in CRR during this episode. Instead, the CRR was steadily decreased from 5.75 percent in November 2001 to 4.5 percent in April 2004. In the early part of the episode, the rupee was allowed to depreciate and it weakened to nearly Rs. 49 per US dollar in May 2002. Given the prolonged downturn in the global market prevailing at that point, it was decided to keep the exchange rate competitive to boost exports. However, subsequently, it was allowed to appreciate to Rs. 44 per US dollar as reserves attained a comfortable level and the dollar weakened against several other currencies.

The most recent episode of reserve accumulation began in November 2006 when reserve holdings jumped by US$7.25 billion compared to the previous month (figure 5). This episode continued till February 2008, by when India had added more than US$126 billion as international reserves. This reserve accumulation was largely the result of an increase in foreign capital flowing into the country. While in 2004–05 India witnessed net foreign investment of US$13 billion, by 2007–08 this had jumped more than three times to US$45 billion. While foreign direct investment rose from US$3.7 billion to nearly US$16 billion during this period, portfolio investment increased from US$9.3 billion to US$29 billion. There was also a significant increase in the medium-term and long-term external commercial borrowings as Indian business sought out cheap credit from abroad.

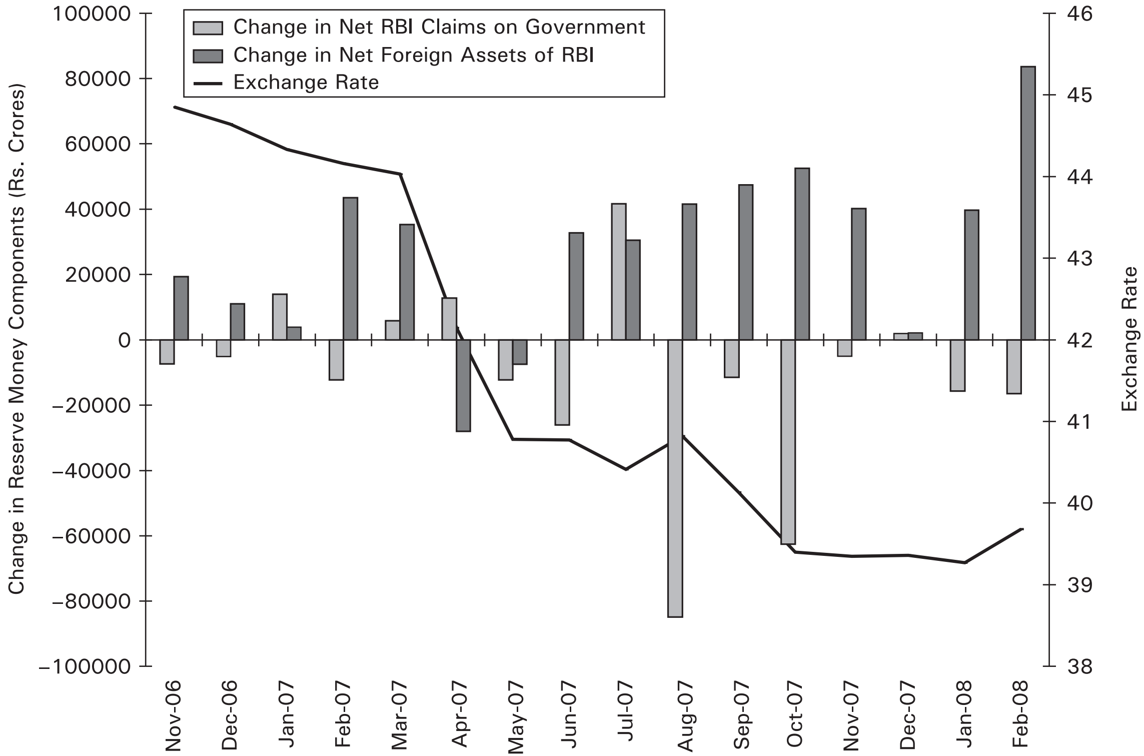
Toward the end of Episode II, the central bank started facing shortages of bonds for the purpose of sterilization. To overcome this constrain, a new mechanism was initiated in February 2004—Market Stabilization Scheme (MSS). Under this scheme, the Government of India authorized the RBI to issue bills and securities exclusively for the purpose of sterilizing foreign capital inflows. The outstanding obligations of the government by way of these bills and securities under the MSS were originally capped at Rs. 600 billion. To ensure that these issues do not have a significant impact on the monetary and fiscal system, it was decided that the proceeds of the sale would be kept in an escrow account. The balance in this account is used to redeem the securities on maturity while the interest cost is borne by the government. The ceiling was revised upwards to Rs. 800 billion in August 2004 and remained at that level till April 2007. However, owing to heavy capital coming into the economy, the ceiling was revised five times

FIGURE 4. Reserve Accumulation and Policy Response in Episode II



Source: RBI's database on Indian economy.

FIGURE 5. Reserve Accumulation and Policy Response in Episode III



Source: RBI's database on Indian economy.

in 2007–08 and currently stands at Rs. 2.5 trillion. In mid-August 2008, total outstanding MSS bonds stood at Rs. 1.71 trillion.

A number of measures aimed at restraining flow of capital into India were also introduced during this episode. In August 2007, restrictions were imposed on External Commercial Borrowings (ECBs) with allowing only foreign currency expenditures for permissible end uses ECBs of more than US$20 million per borrowing company. Companies raising ECBs of more than US$20 million had to park the proceeds overseas. Moreover, even in the case of companies undertaking ECB up to US$20 million to be used as foreign currency expenditure for specified end uses under the Automatic Route, the funds would have to be parked overseas and not remitted to India. In October 2007, Securities and Exchange Board of India (SEBI) approved new trading norms for foreign institutional investor (FII) investment by allowing only "regulated" entities to invest in India through the Participatory Notes (PN) route. According to these new guidelines, entities with notional value of PNs constituting over 40 percent of Assets Under Custody (AUC) were able to issue new PNs only on redemption or cancellation or closing out of existing PNs of equivalent amount. Entities with PNs of less than 40 percent of their AUC were to be allowed incremental issuance of only 5 percent per year till they reach the 40 percent ceiling.

Measures were also undertaken to encourage foreign exchange outflow. The limit on investment in overseas Joint Ventures (JV)/Wholly Owned Subsidiaries (WOS) by Indian companies was increased to 400 percent of the net worth of the Indian company under the Automatic Route. The limit for existing listed companies to undertake portfolio investment abroad was increased from 35 percent of the net worth to 50 percent. The existing limit for prepayment of ECBs without RBI approval was increased from US$400 million to US$500 million while the aggregate ceiling for overseas investments by mutual funds, registered with SEBI was increased from US$4 billion to US$5 billion. Finally, the INR was allowed to appreciate by more than 14 percent over this period and stood at INR 39.36 per US dollar in October 2007 compared to INR 46.45 in August 2006.

The three episodes outlined above account for more than US$220 billion worth of reserve accumulation out of the current stock of nearly US-$300 billion. It is also evident that bulk of this reserve accumulation has been on the back of strong capital inflows, except for the early part of Episode II, when India experienced a current account surplus due to declining merchandise imports and rising services exports and remittances.

The current level of reserve accumulation has meant that India is in a relatively comfortable position according to the various popular reserve adequacy indicators. The current stock of reserves is able to finance more than a year's imports, providing a comfortable cushion in the case of a terms-of-trade shock or a sudden reversal of capital flow. The ratio of short-term debt to international reserves has also witnessed a steep decline from nearly 150 percent in 1990–91 to below 7 percent in 2006–07.[5] This ratio is well below the Greenspan–Guidotti rule, which stresses that sufficient international reserves must be maintained to meet external obligations for about a year, without any external assistance. The ratio of short-term debt and portfolio stocks to reserves declined from 146.6 percent in end-March 1991 to 44.4 percent as in end-March 2008.

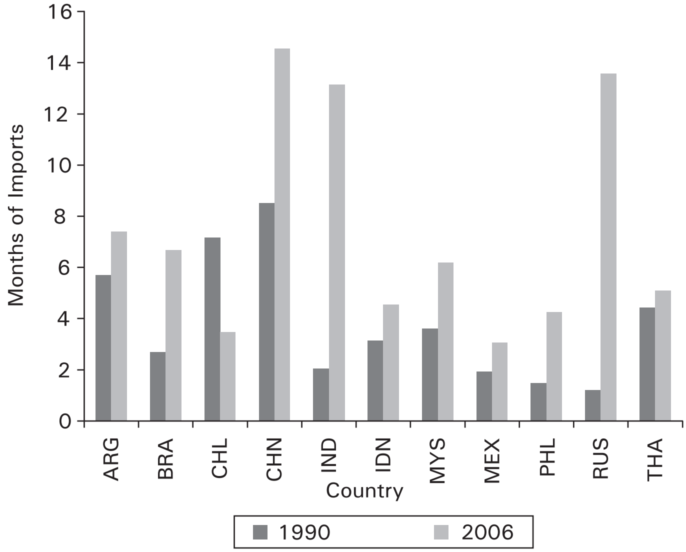
India has not been the only country engaging in reserve accumulation. Several East Asian and Latin American economies have also been indulging in this kind of a behavior. This has been the primary response to currency crises these economies faced in the 1990s. Looking across some of the key reserve adequacy indicators in figure 6, it can be clearly seen that barring Chile, most of the emerging economies have witnessed a significant increase in their import cover of international reserves as well as the ratio of reserves to M2. Again, Chile was the only major developing country that did not experience an increase in the ratio of international reserves to GDP. All the major developing countries also witnessed a fall in the ratio of short-term debt to reserves. The fall was again smallest for Argentina and Chile.

A cross country comparison shows that India has clearly outperformed several other emerging markets in terms of reserve accumulation. Looking at import cover of international reserves, we find India to be better covered than most other major emerging markets, barring China. Similarly, India is well placed in terms of ratio of short-term debt to international reserves. At 7 percent, this ratio is also smaller than most other developing countries. Even with the other two indicators, India is relatively comfortably placed. In terms of ratio of international reserves to GDP, India is behind economies like China, Thailand, Russia, and Malaysia but ahead of most Latin American economies. On the other hand, at 25.53 percent, the ratio of international reserves to M2 in India is higher than China and Brazil but lower than most of the Latin American economies and Korea.

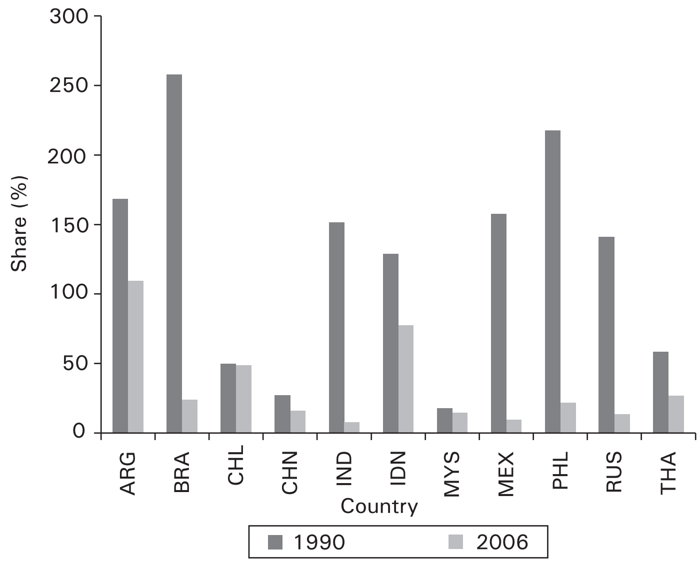
5. Short-term debt has been redefined since 2005–06 to include suppliers' credit up to 180 days. However, to maintain consistency we stick to the original definition. As per the new definition, the ratio of short-term debt to the foreign exchange reserves stood at 12.5 percent as in end-March 2005, but increased slightly to 12.9 percent as in end-March 2006 and further to 13.2 percent in end-March 2007, but declined to 12.4 percent in end-September 2007.

FIGURE 6. Cross-Country Comparison of Reserve Adequacy Measures

(a) Import Cover of International Reserves



(b) Ratio of Short-term Debt to Reserves



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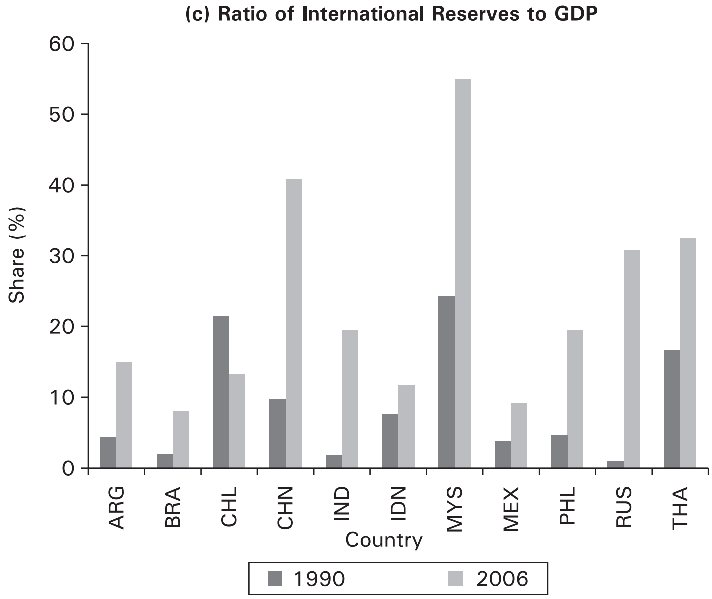
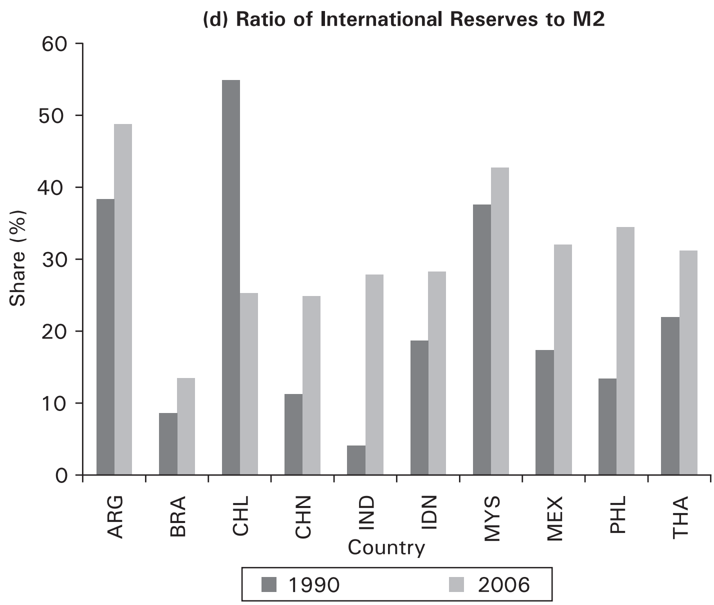




Source: World Development Indicators 2008.

Comparing figure 6 with figure 1, it can be seen that countries that have significantly improved on reserve adequacy indicators like China, Malaysia, India, and Russia are also the ones that have accumulated reserves in excess of the international norm predicted by the empirical model. On the other hand, some of the Latin American economies like Brazil and Argentina, which have performed more modestly on these measures, have accumulated reserves that have been lower than the international norm for most of the period under study.

Cost of Excess Reserve Accumulation

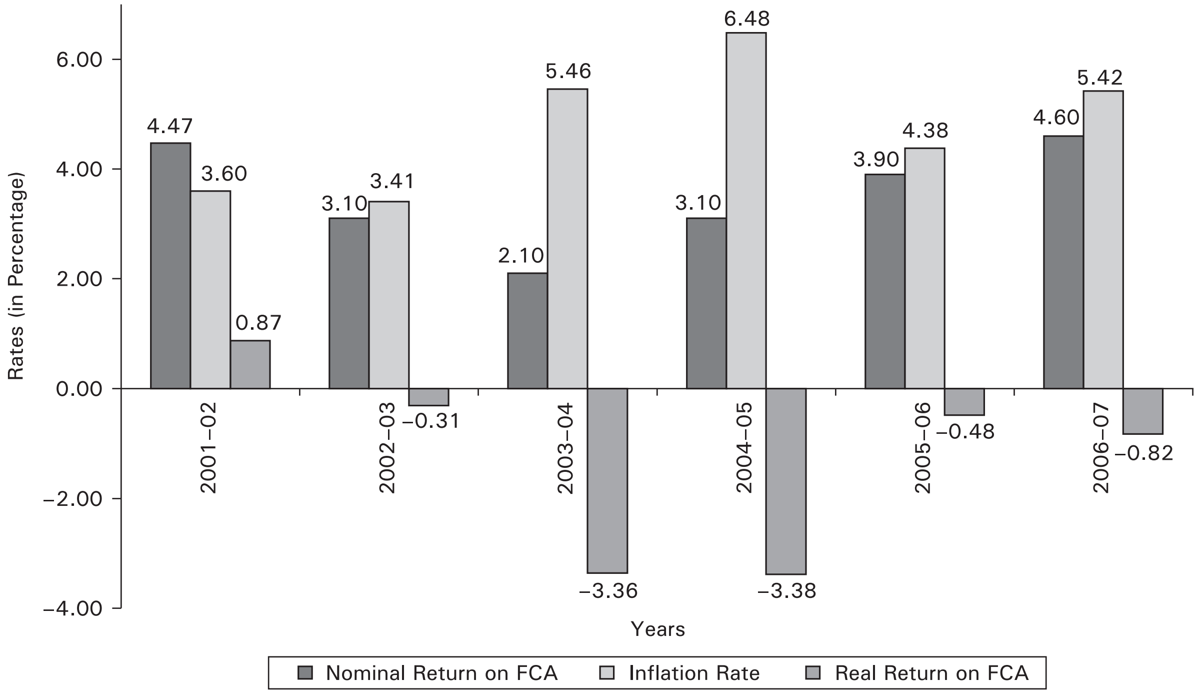
Given the comfortable reserve position enjoyed by India, one has to look at the deployment pattern of these reserves. In India, the stated objectives of reserve management are liquidity and safety with due attention being paid to the currency composition and duration of investment, so that a substantial part can be converted to liquid form at a short notice. Consequently, the bulk of these reserves are being held in the form of securities or deposits with foreign central banks and international organizations.

The strategy to focus on safety and liquidity at the expense of return has had implications for the rate of returns on investment of the international reserves. Given the low interest rate prevailing in most of industrialized countries, the direct financial return on holdings of international reserves has been low. RBI (2007) points out that the rate of earning on foreign currency assets (FCA) and gold, after accounting for depreciation, was only 4.6 percent in 2006–07 and 3.9 percent in 2005–06. The inflation rates during these two years were around 5.42 percent and 4.38 percent respectively, implying a real rate of return of –0.82 percent in 2006–07 and –0.48 percent in 2005–06. Indeed as shown in figure 7, in recent years, the real rates of return on foreign currency assets have been largely negative.

While undoubtedly holding reserves in liquid assets is prudent from the point of view of precautionary motive, some questions remain about Indian reserve management strategy. Specifically, one might be tempted to ask if there are ways to increase the returns on these reserves significantly without unduly raising risk to the country's ability to service its external debt and sustain current account deficits required for investment purposes.

The reserve management strategy of India has been extensively questioned in Lal et al. (2003), who argue that with current reserves being able to finance more than a year's import and India doing exceptionally well on all reserve adequacy measures, continuation of such a policy is highly

FIGURE 7. Rates of Return on Foreign Currency Assets



Source: Reserve Bank of India, *Handbook of Statistics*.

questionable given the high costs associated with such a policy. Lal et al. (2003, 2005) conclude that if capital flows were fully absorbed and invested instead of being neutralized by building up of foreign reserves, growth could have been significantly higher. Similarly, Summers (2006) argued that by investing excess national reserves in global assets India could earn extra returns to the tune of 1 to 1.5 percent of GDP each year. Bhagwati (2006) also claims that it should be possible to earn an additional 5 percent, compared to current reserve earnings by investing excess Indian reserves through a dedicated investment platform set up by the RBI/Ministry of Finance. Thus by investing US$100 billion with such an investment platform, it is possible to earn an additional 0.6 percent of Indian GDP.

In contrast, Joshi (2004, 2006) and Joshi and Sanyal (2004) have pointed out that the strategy of absorbing capital flows in the form of reserves has let to marginal sacrifice of growth, if any. Bhalla (2007) has argued that the strategy of having an undervalued exchange rate and consequent reserve accumulation has provided huge benefits to the economy. Bhalla points out that in India, the benefits in terms of additional GDP growth outweighed the costs due to sterilization by six times.

As shown in the third section, India is one of the countries that have accumulated reserves in excess of the international norm predicted by our model. As a percentage of GDP, by 2005 India's actual reserve holding was 16.37 percent as opposed to the 14.46 percent predicted by our model, implying excess reserves of around US$16 billion. The rapid rate of reserve accumulation during the next two years meant that the gap between actual reserves and predicted reserves based on an international norm widened significantly in 2006 and 2007.[6] By 2007 India had excess reserves of nearly US$58 billion compared to the international norm predicted by our model.

Next, we compute the cost of holding reserves in excess of the international norm predicted by our model in low yielding foreign bonds, instead of utilizing these excess reserves to increase the productive capacity of the economy. The costs are reported in terms of income foregone as well as loss in terms of percentage of GDP. In the literature, different measures have been used to calculate the cost of hoarding reserves. We look at three different measures and calculate the costs of holding excess reserves in India.

6. We extend the data on India for 2006 and 2007 by looking at various publications of the RBI and Ministry of Finance, Government of India. We re-estimated our model using the additional information. However, there were only marginal changes in the coefficients and their significance levels (changes were only at the second decimal point).

Cost in Terms of Physical Investment Foregone

Several papers like Ben-Bassat and Gottlieb (1992b) and Neely (2000) have pointed out that the opportunity cost of reserve holdings can be equated to the marginal product of capital. The underlying rationale being that resources that could have been used to increase the domestic capital have been employed in hoarding reserves. In such cases, the cost of holding reserves is given by the interest rate spread between the return on foreign currency assets and marginal product of capital, which is a proxy for the return on physical investment. We look at the opportunity cost in terms of actual income foregone as well as a percentage of the GDP.

Typically, the marginal product of capital is seen as the inverse of the incremental capital output ratio (ICOR), with the latter reflecting the amount of additional capital required to generate a unit increase in output. The growth rate of the real output y can be stated as

$$y = \frac{1}{Y}\frac{\Delta Y}{\Delta T}, \tag{3}$$

where Y is the real output, T is time, and Δ is the first difference operator. Multiplying the numerator and the denominator $\frac{\Delta K}{\Delta Y}$ by we obtain

$$y = \frac{1}{Y}\frac{\frac{\Delta K}{\Delta T}}{\frac{\Delta K}{\Delta Y}}, \tag{4}$$

where K is the capital stock of the economy. In the above equation $\frac{\Delta K}{\Delta T}$ refers to the change in capital stock from one period to next and is equal to the investment undertaken (I). Similarly, $\frac{\Delta K}{\Delta Y}$ reflects the amount of capital required to raise output by one unit and can be approximated by the ICOR. Thus the above equation can be rewritten as

$$y = \frac{1}{Y}\frac{I}{ICOR} \tag{5}$$

Thus the marginal product of capital, which is the inverse of the ICOR, is given by

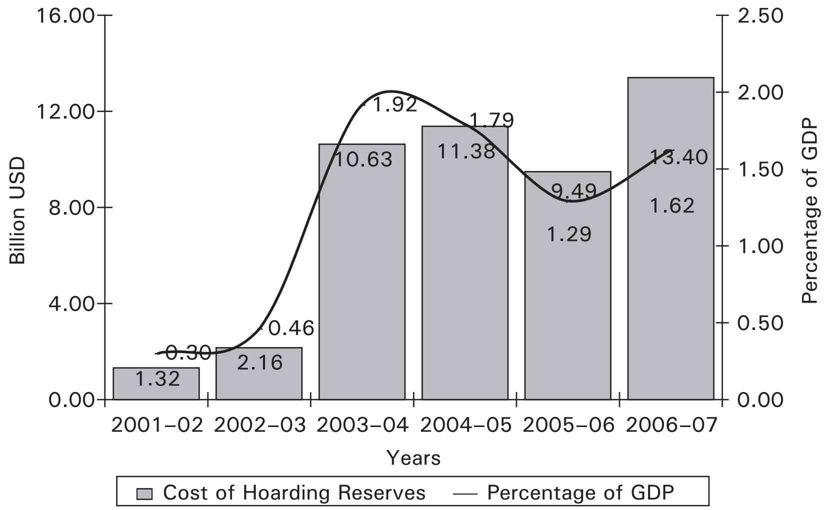
$$MP_K = \frac{y}{\frac{I}{Y}} \tag{6}$$

Data on investment and output is obtained from Central Statistical Organisation (CSO). While the model calculates the gross rate of return on physical capital, an important issue must be kept in mind: The benefits of diverting resources away from reserve accumulation, and toward creation of a stock of capital, will decline over a period of time as the value of capital gets eroded through depreciation.

The opportunity cost of holding reserves in excess of the international norm predicted by our model in low yielding assets is shown in figure 8. We find that the cost based on this measure showed a rise from 2003–04 onwards, and has continued to remain high till 2006–07. India lost more than US$11 billion or 1.79 percent of the GDP in 2004–05, which declined to 1.29 percent of GDP in the next year. In 2006–07, the sharp increase in excess reserves resulted in the cost rising to US$13.4 billion or 1.6 percent of GDP.

The proposal to use reserves for physical investment continues to be a sensitive issue with the Planning Commission's proposal to divert reserves to address the infrastructure deficit being aggressively debated. Critics of the proposal have pointed out that use of reserves to finance the infrastructure will overheat the economy due to additional domestic liquidity, and the country may lose hard-currency cover in the event of a run on the rupee. Moreover, such

FIGURE 8. Cost in Terms of Physical Investment Foregone



Source: Author's calculations.

a move involves the Government of India borrowing from the RBI thereby increasing the fiscal deficit as well as overall stock of liabilities held by India. The current account deficit could also rise if much of the spending on infrastructure is on imported goods to alleviate domestic liquidity pressures.

While some of these concerns are legitimate, it must be recognized that after growing at around 9 percent for four consecutive years, the excess capacity created during the turn of the century has largely been exhausted. Government of India (2007) has estimated that to sustain faster, broad-based, and inclusive growth, investment of about US$500 billion in infrastructure is warranted before the end of the Eleventh Five Year Plan in March 2012.

While India continues to invest an average of 4.5 percent of GDP every year in infrastructure, to attain the GOI objective, infrastructure investment will have to be raised by nearly 1 percent of GDP every year over the Plan period. Global recession, financial turmoil, and worsening economic outlook make it improbable that the private saving (corporate and household) will be able to provide the additional resources. While the public sector has reversed the trend of dissaving during the past few years, the outlays of the Sixth Pay Commission, commodity subsidies, and farm loan waiver has meant that the public sector is unlikely to have resources available that could be diverted toward infrastructure investment.

Thus diverting some of the excess reserves toward such investment will address the financing deficit to some extent. Moreover, as pointed out in Mohan (2008), capital has been typically employed productively in India. The ICOR has largely stayed around four since Independence, barring the decade of 1970s. During the post-reform period, the ICOR had significantly improved in the period 2003–04 to 2006–07 compared to earlier periods 1991–92 to 1996–97 and 1997–98 to 2002–03. Using cross-country data, Mohan (2008) argues that ICOR has been one of the lowest in the world, especially since the 1980s. Thus diverting resources toward physical investment is likely to yield much higher dividends than holding them in low-yield foreign government bonds.

Cost in Terms of Excess External Commercial Borrowings

Another opportunity cost of holding reserves can be formulated in terms of short-term borrowings that the private sector has to undertake. A country living by the Greenspan–Guidotti–IMF rule will increase reserves by the same amount by which the private sector increases its external short-term liabilities. In a recent paper, Rodrik (2006) calculates the social cost of holding reserves based on this idea.

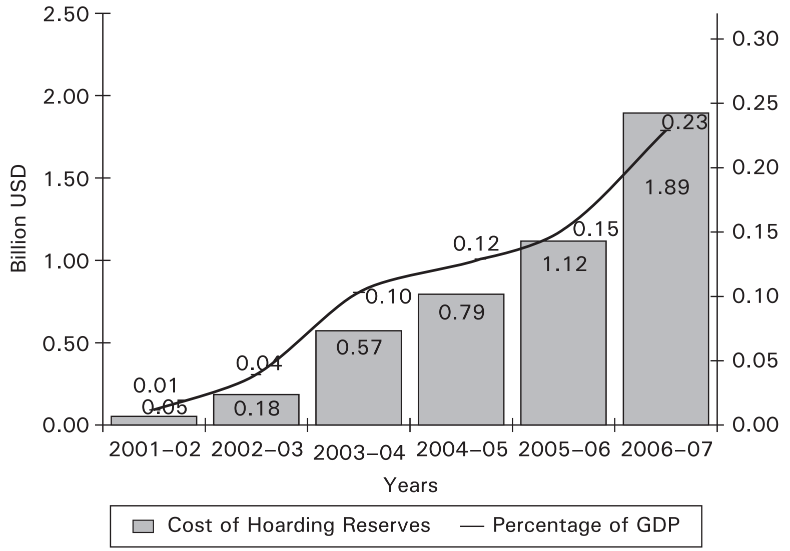
Consider an economy that is made up of the central bank and the private sector. Now suppose that this country is abiding by the Greenspan–Guidotti–IMF rule. The private sector takes a short-term loan from abroad of X dollars. The central bank has to increase its reserves by an equivalent amount. The central bank will purchase foreign currency worth this amount in the domestic market to invest in short-term foreign securities. Thus its stock of international reserves will go up by X dollars. By selling domestic currency worth X dollars to the private sector, the overall money supply has gone up by X dollars. To sterilize the effect of this intervention on the money supply, the central bank will sell some of the private sector domestic bonds it holds back to the private sector. Thus as it sells back X dollars worth of domestic bonds issued by the private sector, its stock of domestic bonds decreases by X dollars. Similarly, due to this sell back, the value of domestic bonds outstanding for the private sector decreases by X dollars.

Rodrik (2006) points out three consequences of such transactions. First, there is no net resource transfer from abroad as the increase in private sector's liability is matched by an increase in central bank's international reserves. Second, the short-term borrowing does not increase the availability of liquid resources available to the private sector for investment. The decline in total amount of debt issued by the private sector through domestic bonds is equivalent to the rise in short-term foreign debt. Finally, aggregating the balance sheets of the various sectors, it can be seen that the economy has borrowed short-term abroad (at the domestic private sector's cost of foreign borrowing) and has invested the proceeds in short-term foreign assets.

In such a setting, the cost of holding reserves would be measured by the interest rate spread between the private sectors' cost of short-term borrowing abroad and the yield that the central bank earns on its liquid assets. Generally, there is no direct source of information on costs of short-term borrowing. Most of the short-term borrowing takes the form of commercial bank lending, information on which is generally not publicly available. In a recent article, Bhagwati (2006) pointed out that the average cost of short-term external commercial borrowings for the India private sector is roughly about 3-month LIBOR +2.5 percent. Figure 9 shows the cost of hoarding excess reserves using this measure.

It can be seen that the cost of excess reserves has been increasing steadily and in 2006–07 it stood close to US$1.9 billion or 0.23 percent of the GDP.

FIGURE 9. Cost in Terms of Excess External Commercial Borrowings



Source: Author's calculations.

The sharp increase in the cost in 2003–04, compared to previous years, is largely because of the low return on foreign currency assets that year. On the other hand, the increase in cost in 2005–06 and 2006–07 is largely explained by a sharp rise in the average 3-month LIBOR rate to 4.11 percent and 5.36 percent respectively. As a result of monetary tightening in several industrialized countries, there was a sharp increase in the cost of borrowing. On the other hand, during this period the dollar had become marginally stronger thereby providing some boost to the returns on international reserves.

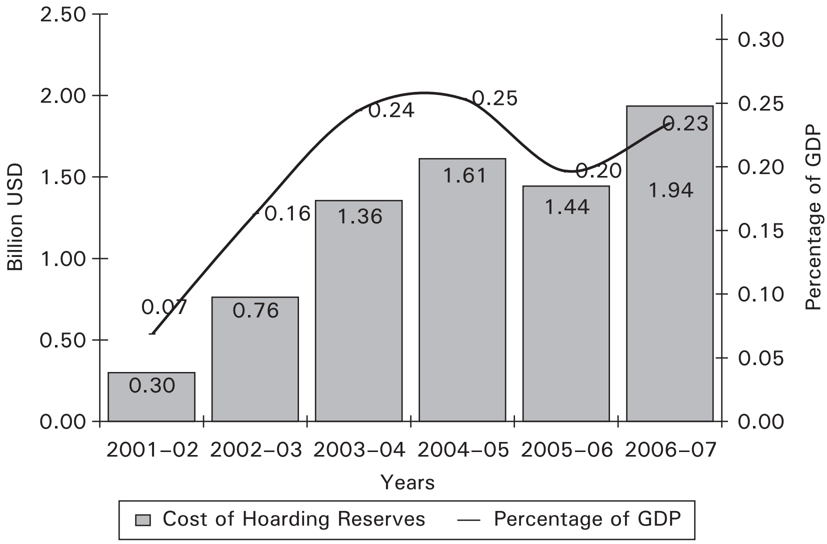
This opportunity cost measure is particularly important for India as recent years have witnessed an upsurge in short-term debt in absolute terms. The stock of outstanding short-term debt has increased from US$17.7 billion in 2005 to US$19.6 billion in 2006 and further to US$30.8 billion in 2007. With much of this short-term debt being accessed at rates much higher than the returns on reserves, India is paying a big cost for excess re-serve accumulation.

Cost in Terms of Public Sector Borrowing

The rising burden of public debt and gross fiscal deficit should be an issue of serious concern for the Indian economy. The combined domestic liabilities of the Center and the states have increased from 40.52 percent of GDP in 1980–81 to 77.25 percent in 2006–07. Ahluwalia (2002) points out that the growth of public debt in India has equaled or exceeded that in Russia, Turkey, and Argentina before these countries hit a crisis. Using yields on public debt issued domestically to evaluate debt sustainability, Kletzer (2004) provides a strong argument for a fiscal adjustment. Following Kletzer (2004) and Mohan (2002), we use the weighted average yield on Central and state government securities to calculate the opportunity cost of hoarding reserves. The results are shown in figure 10.

It can be clearly seen that using the spread between interest rate on domestic government bonds and the yield on reserves, the cost is again quite significant and in excess of US$1.9 billion or 0.23 percent of GDP in 2006–07. Again, the sharp increase in the cost in 2003–04 is explained by the low yield on foreign assets. In contrast, the increase in cost by US$0.5 billion between 2005–06 and 2006–07 is largely explained by significant increase in the volume of excess reserves as well as an increase in the cost of borrowing for the public sector. The extent of this cost has been mitigated to an extent by the ability of the government to borrow at concessional rates. Since 1995–96, there has been a steady decline in the yield of Central Government

FIGURE 10. Cost in Terms of Public Sector Borrowing



Source: Author's calculations.

securities along with a rise in maturity. However, this trend was reversed in 2004–05 and 2005–06, when there was a sharp increase in interest rates. With global hardening of monetary policy and opening up of the Indian economy to capital flows, domestic interest rates will have to align themselves with international rates. This would imply that the government's ability to borrow at concessional terms might get severely eroded in recent years, thereby increasing the cost of hoarding reserves.

As discussed in the fourth section, one of the ways to counter the rapid flow of foreign capital into the country during episodes II and III was to sterilize the capital flows by the use of government bonds, especially the MSS bonds. With an increase in these bonds, there is also a rise in the interest burden. The interest payments on MSS bonds stood at Rs. 30.88 billion in 2005–06. It declined to Rs. 26.08 billion in 2006–07, but since then has increased at a rapid pace. While Rs. 83.51 billion was paid as net interest on these bonds in 2007–08, the government has budgeted nearly Rs. 140 billion to be paid out in 2008–09. The rising interest burden could well have been one of the reasons why issuance of MSS bonds was checked at around Rs. 1.7 trillion even though the ceiling had been hiked to Rs. 2.5 trillion.

Conclusion

The primary objective of this paper is to evaluate the cost of holding excessive reserves. We employ empirical methods to identify the major determinants of international reserve holdings. Using the results of our empirical model we create an international norm of reserve holdings based on the primary objectives of reserve accumulation. This is in contrast to most of the existing literature, which generally use a single measure to calculate excess reserves.

Using this international norm we find that Indonesia, Argentina, and Philippines have accumulated reserves close to the amount predicted by our model. On the other hand, Brazil's reserve accumulation efforts have fallen short of our model's prediction. Finally, China, India, Korea, Russia, and Malaysia have accumulated significantly more reserves than the international norm.

Next, focusing on India, we find that by end of 2007, India had accumulated more than US$58 billion of excess reserves. We impute the costs of holding these reserves by considering various alternative uses of the resources employed in building up reserves. The cost is substantial across all specifications, both in terms of actual income foregone as well as loss in terms of percentage of GDP. India could gain as much as 1.6 percent of its GDP by diverting resources invested in low yield foreign bonds toward physical investment. Even by utilizing these resources to reduce private or public sector borrowings, the gain could be around 0.23 percent of the GDP.

While the cost of holding excess reserves in low yield securities is significant, it is very important to calculate the volume of excess reserves periodically due to changing fundamentals of the economy. As a country opens up to foreign trade and capital flows, increases extent of monetization and exposure to short term flows, and so on, the volume of excess reserves will change. For example according to our analysis, Korea was one of the countries that had accumulated excess reserves to the tune of US$24 billion by 2005. However since then, Korea's short-term debt had increased by more than three times to over US$175 billion in 2008. Consequently, the international norm of reserve holding for Korea would be much higher in 2008 than it was in 2005.

Appendix 1: Correlation Matrices

TABLE A-1. Correlation Matrix of Key Explanatory Variables (Full Sample)

	pol_stab	*exch_regime*	*pcgdp*	*imp_share*	*m2_gdp*	*overval*	*stdebt_gdp*	*kaopen*
Political Stability (pol_stab)	1.00							
Exchange Rate Regime (exch_regime)	−0.04	1.00						
Per Capita GDP (pcgdp)	0.37	−0.06	1.00					
Import Share (imp_share)	0.20	0.28	0.06	1.00				
Financial Depth (m2_gdp)	0.01	−0.02	0.02	0.00	1.00			
Exchange Rate Overvaluation (overval)	0.12	0.11	0.29	−0.10	0.00	1.00		
Short-term Debt/GDP (stdebt_gdp)	0.13	−0.06	0.27	0.05	0.00	−0.03	1.00	
Capital Account Openness (kaopen)	0.51	−0.01	0.39	0.15	0.05	0.17	0.07	1.00

Source: Author's calculation.

TABLE A-2. Correlation Matrix of Key Explanatory Variables (Emerging Markets)

	pol_stab	*exch_regime*	*pcgdp*	*imp_share*	*m2_gdp*	*overval*	*stdebt_gdp*	*kaopen*
Political Stability (pol_stab)	1.00							
Exchange Rate Regime (exch_regime)	0.02	1.00						
Per Capita GDP (pcgdp)	0.39	−0.08	1.00					
Import Share (imp_share)	0.30	0.04	0.21	1.00				
Financial Depth (m2_gdp)	0.21	0.15	0.10	0.67	1.00			
Exchange Rate Overvaluation (overval)	0.10	0.08	0.30	−0.04	0.00	1.00		
Short-term Debt/GDP (stdebt_gdp)	0.22	−0.05	0.47	0.22	0.09	−0.05	1.00	
Capital Account Openness (kaopen)	0.23	0.08	0.15	0.31	0.20	0.13	0.17	1.00

Source: Author's calculation.

Comments and Discussion

Kenneth Kletzer: The accumulation of official reserves by the central banks of emerging market economies over the last several years is a bit of a puzzle for international economists. The spate of currency and financial crises in emerging markets between 1997 and 2001 focused attention on the importance of capital flows and financial exposure for determining international reserve stocks. However, the growth of reserves in several countries, including China and India, is difficult to explain in terms of protection against possible capital account crises, and have drawn attention to the motives and costs of holding such high levels of net foreign assets on the balance sheets of central banks.

In this paper, Abhijit Sen Gupta estimates the opportunity cost to India of the Reserve Bank of India's (RBI's) holdings of foreign reserves. The approach is to first estimate a benchmark for reserve holdings derived from an empirical model of reserve holdings by a large sample of emerging market economies. The level of reserves held by the RBI in the last few years of the sample exceeds the prediction of the model and this difference is used by the author as an estimate of reserve hoarding. The cost is derived by comparing the return on reserve assets to three estimates of the opportunity cost of public investment. These are the average marginal return to capital in India, the interest cost of public debt, and the interest rate on private foreign portfolio borrowing.

In this comment, let me begin with the specifics of the paper and then move on to the policy question posed by the RBI's reserve accumulation. The essential elements of the paper are the explanation of reserve holding in the econometric model and implicit assumptions about the returns to alternative assets. The regression equation is a contemporary model of precautionary motives for reserve holding by central banks. It incorporates the objectives of holding reserves against a sudden need for international liquidity arising in either current account or capital account transactions conditional on the exchange rate regime. Comparing the predicted and actual time series of reserves using this model indicates how well the model explains reserve accumulation across a cross-section of countries. The predicted value should not be interpreted as a target for a hypothetical central bank with a precautionary reserve-holding motive. Even the caution of stating that the estimate of excess reserves for India is calculated relative to an "international norm" implicitly assumes that the regression estimates an optimizing rule around which central banks deviate by holding too few or too many reserves given a prior or exogenous choice of exchange rate regime.

The second part of the estimation is the comparison of rates of return on central bank assets and assets held by the public. Investments in domestic capital or portfolio loans to enterprises carry different risks for investors than do US treasury bills and notes. We expect domestic equity or bonds to pay a risk premium over conventional international reserve assets in equilibrium. Risk premiums equate the expected marginal utilities of holding alternative risky assets. For example, recently UK residents earned higher interest on bank deposits in Iceland and some US mortgage securities than on UK treasuries. These holdings have not worked very well for investors.

Similarly, the interest rates on public debt issued by developing countries exceed the interest rates on advanced industrialized country public debt due to the risk of default or, when denominated in domestic currency, depreciation. The calculation of the interest differential on Government of India bonds and US treasury bills is a measure of the quasi-fiscal costs of sterilization (as named by Guillermo Calvo) by the RBI. In the absence of a history of government default, we still need to correct the interest rates for exchange rate risk. Under the managed float, interest rates on rupee-denominated debt should incorporate a premium reflecting the possibility of unanticipated depreciation or appreciation of the rupee. Any data series includes periods of a stable exchange rate and typically end in the midst of such a period. Therefore, estimates of the expected return to rupee debt need to account for the "peso problem"—the return is systematically overestimated. The comparison of rates of return to GOI debt and US treasury debt in this paper is subject to this problem.

A prior question to estimating the cost of the reserve holdings of the RBI is—why the RBI has accumulated reserves so rapidly since 2001? Over this period, India ran a current account deficit and progressively liberalized capital inflows. The natural question is whether the growth of reserves is the objective of policy or the consequence of the central bank pursuing other objectives. The stability of the rupee–dollar rate certainly suggests a concern with exchange market intervention that would include sterilization of capital inflows. Patnaik (2005) shows that the nominal exchange rate, but not the real exchange rate, has been stabilized persistently by monetary policy. The net benefits of the RBI's reserves need to include any benefits of exchange rate management including reductions in relative price volatility or resistance to appreciation. These also need to account for the consequences of a *de facto* peg which can include the risk of a currency crisis in the form of a sudden large depreciation.

The need to accumulate reserves as precautionary balances against financial crises depends on the (*de facto*) exchange rate regime, as in the regression in Abhijit's paper. Reserve objectives include import cover in months, short-term external debt repayment, and insurance against international illiquidity. In his original speech advocating debt-based objectives for reserves, Alan Greenspan argued for covering "liquidity at risk" (Greenspan, 1999) which includes short-term foreign currency debt amortization and other forms of net foreign currency exposure of the domestic financial system. This is not quite captured by the short-term debt to GDP ratio, so Sen Gupta includes, following the literature, the M2 to GDP ratio. As emphasized by Obstfeld et al. (2008), reserve holdings also insure against a domestic bank run under a convertible currency. They show that the addition of this variable, representing domestic financial depth, helps considerably in explaining reserve levels in both advanced and emerging market economies.

The importance of a drain of domestic deposits, even if denominated in domestic currency, can be seen in two crises—in Argentina and Turkey in just a single year, 2001. Bank deposits and central bank reserves in Argentina declined steeply and steadily together for several months leading up to the collapse of the peso–dollar peg. Residents sought to avoid the risk of a freezing of accounts and conversion of dollar-denominated deposits to devalued pesos by holding dollars in safety deposit boxes or off-shore accounts. Similarly in Turkey in February 2001, a run on domestic lire deposits financed purchases of foreign currency from the central bank that precipitated that crisis.

In the light of this, it is interesting to look at the appendix to the Tarapore Committee's "Report on Fuller Capital Account Convertibility" of 2006 (RBI, 2006). Annex K of the report provides a table of measures of reserve adequacy based on precautionary motives for several countries. In the few years before each of these crises, Argentina and Turkey had about the same ratios of reserve to broad money as India does currently. A quick glance over the tables reveals low ratios of short-term debt and portfolio stocks to reserves for India and China, relative to the other reporting countries. The extraordinarily low ratio of reserves to short-term debt exposure reported by Sen Gupta for India is the prominent outlier in these tables and a reasonable suspect to associate with his predicted excess reserve holdings by India.

Two natural concerns about moving to a convertible rupee would be the increase in potential foreign currency liquidity risk to include domestic deposits and the growth of gross short-term foreign currency debt. It is possible to hypothesize that the reserve accumulation by the central bank is not simply endogenous to exchange rate management but a forward-looking policy of building precautionary balances in anticipation of possible further international financial integration for India. If this is a possibility, then the analysis of reserves in the Sen Gupta paper should be interpreted as an estimation of reserve holding in the *status quo ante* policy regime. Note that changes in capital account regulation and monetary policy over the period of the regressions is a policy regime. The relaxation of outward capital flows or full convertibility of the rupee would lead to a structural change in capital flows.

A back-of-the-envelope calculation that just substitutes values for the explanatory variables based on other emerging markets post liberalization may be misleading. For example, Chilean reserve holdings reflect years of policy reform and adjustment to liberalization after a crisis-bearing initial liberalization. The appropriate level of precautionary reserves for the transition to full capital account convertibility could be larger than the equilibrium level years after liberalization. Hence, even further partial liberalization may justify the buildup of reserves beyond that predicted by comparison to already open emerging market economies.

There will be many lessons from the US financial crisis and its counterparts in Europe. Among the first is the importance of the capacity of the central bank to provide liquidity to domestic financial markets. The balance sheet of the Federal Reserve has grown dramatically with its accumulation of private debt obligations. The ability of the RBI to act similarly depends on its capacity to sell securities regarded by financial markets as safe havens—that is, debt issued by the governments of advanced industrialized economies with long histories of repayment and not higher interest securities issued by emerging market governments or quasi-governmental agencies in the advanced economies. A second lesson is that central bankers should probably concern themselves with the possibility of improbable but severe financial crises.

The international economic environment of the last several years favored the accumulation of reserves by the RBI and other Asian central banks. The current international environment of a US-centered financial crisis disfavors large capital inflows in the near term. Capital inflows and export revenues have already declined justifying some of the demand for international liquidity by the RBI. The contraction in the emerging markets may be modest or just beginning. Only in retrospect will we learn if the reserve buildup in the emerging markets, especially in East Asia, India, and Russia, over the last several years, was a transitory and appropriate response to temporary yield-seeking capital inflows.

Vijay Joshi: Abhijit Sen Gupta's paper is an interesting assessment of India's reserve accumulation policy. He begins by estimating an "international norm" of reserve adequacy that takes account of various determinants of reserve holding. Most of the independent variables in his empirical model are familiar from the literature on the subject, for example, trade and capital account openness, financial depth, and short-term external debt. But he introduces a new variable, namely, "exchange rate overvaluation," postulated to vary inversely with reserve holdings, to allow for the well-known fact that several emerging countries have lately accumulated reserves as a by-product of an exchange rate undervaluation strategy to pursue export-led growth. This variable turns out to be significant at the 5 percent level in the emerging countries sample. (A lagged export growth variable, intended to capture the same phenomenon, turns out to be insignificant. But the choice of this variable does not make much sense. My guess is that if Sen Gupta had chosen "current account imbalance" as the variable instead, it would have been significant.)

Sen Gupta then calculates "excess reserves" held by countries, relative to the "international norm" established by his empirical model. India turns out to have held substantial "excess reserves" from 2002–06. It should be noted, though Sen Gupta does not emphasize it, that his model also shows that India had reserves below the "international norm" from 1998–2001 (see figure 1). He argues that India suffered a loss by holding an excess of reserves after 2002. But by the same token, India also suffered a loss by holding deficient reserves from 1998–2001. Of course, neither of the above assertions is strictly correct since Sen Gupta does not have a welfare-theoretic framework underlying his model. Neither "excess reserves" nor "deficient reserves", as measured by him, have any clear significance for national welfare.

Sen Gupta ends by estimating the opportunity cost of India's "excess reserve holdings" from 2002–06 in three different ways. I have some comments on each of these apart from the general point made in the preceding paragraph. Sen Gupta takes the returns in three different foregone alternatives as representative of the gross cost of reserve accumulation. The net cost is estimated by subtracting therefrom the return on reserves (taken to equal the yield on US treasury bills).

The first method focuses on output foregone. He assumes that excess reserves could have been invested domestically at a yield given by the marginal product of capital (taken to be the inverse of ICOR). Here it is relevant to ask whether absorbing the excess reserves would in fact have resulted in a one-for-one increase in investment. Surely a sizeable fraction of the absorption would have led to increased consumption.

The second method takes the relevant counterfactual to be the paying down of short-term external debt, thus resulting in a saving of interest charges. This assumes that short-term debt does not yield a benefit. We must remember that India has controls on short-term capital inflows and, in consequence, the stock of short-term external debt is small compared to most other countries. The current level of short-term debt may be genuinely useful in oiling the wheels of trade and foreign direct investment.

The third method takes the foregone alternative to be a reduction in the sales of government debt undertaken to sterilize reserve accumulation. Note that this cost is a very different kettle of fish from the above two. It is a quasi-fiscal cost incurred by the government and the central bank as a combined entity, but not a cost to the nation as a whole. This is because the interest paid by the government constitutes income received by the holders of government bonds.

In conclusion, I return to my earlier observation that Sen Gupta's estimates are not derived from an optimizing model. Such a model would *inter alia* have to allow for the crucial point that the benefit of reserves extends beyond their use in cushioning the economy against a currency crisis. Possession of a large stock of reserves also reduces the probability of occurrence of capital flight and currency crises.[1] It is a sobering thought that India is fortunate in having "excess reserves" during the current global economic turmoil.

General Discussion

Kaushik Basu opened the general discussion by suggesting two additional aspects that should be included in modeling decisions about the desired level of reserves. First, the various institutions participating in the decision will have different objectives. For example, the central bank may be most interested in preventing a crisis, compared with the finance ministry which might be more focused on the cost of holding reserves. Second, countries

1. This point is explicit in models of self-fulfilling currency crises. See, for example, Obstfeld (1996).

might differ in the emphasis that they place on concomitant goals such as maintaining an undervalued currency as a means of building a brand name and the institutional links required to support future trade.

Rajnish Mehra argued for a greater consideration of risk concerns. The conceptual framework needs to incorporate the risk–return tradeoff when evaluating the investment options faced by a central bank. Similarly, there is a cost to investing in highly liquid assets.

Robert Lawrence suggested a broader consideration of the role of the central bank in the process: What is the motivation and what is the function? In the case of China, reserve holdings are approaching US$2 trillion. One dimension of the decision-making may well be a desire to keep the currency undervalued. An alternative interpretation, however, would start with the observation that China has generated a large amount of savings and the central bank may be an investment program for its citizens. In the second case, the central bank resembles a national investment manager, which is considerably different than the traditional view that it seeks to cushion temporary shocks.

Suman Bery summarized the two different ways of thinking about reserve accumulation. First, there is a risk management approach, which is the more traditional purpose of reserves; and second, there is the undervaluation approach, where a real exchange rate goal is related to a broader development strategy. Regarding the first approach, Bery noted that some researchers have argued that that the building up of reserves can make a country more of a target of a speculative attack. He also noted that the conversion of the central bank into a portfolio manager raises a host of questions regarding its accountability.

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