

2. Selection of Sectors and Sub-Sectors

2.1 Introduction

Ideally the assessment and anticipation of skills should be estimated for all the sectors. However, if sectors are to be selected, this chapter illustrates how they can be selected using scientific criteria. The idea is to develop a methodology which would be replicable at the regional (state/district) and sectoral level. Further, the data required should be freely available from credible data sources like national statistics available from the Ministry of Statistics and Programme Implementation (MoSPI) and administrative data. The methodology to choose the seven sectors as per the Terms of Reference (ToR) in the “National Skill Gap Study for High Growth Sectors” are demonstrated here in a step-wise fashion, even mentioning the different pathways that were examined and dropped.

2.2 Estimating Income and Output Multipliers and Ranking Them

- I. As a first step, the national I-O model for 64 sectors was used to estimate output, income, and employment multipliers for 2021–22. The national I-O tables are derived from the Supply-use Table (SUTs) provided by the MoSPI at that level of aggregation. Input-output analysis is a technique invented by Professor Wassily W. Leontief in 1951. It is used to analyse inter-industry relationship in order to understand the inter-dependencies and complexities of the economy and thus the conditions for maintaining equilibrium between supply and demand.¹ Annexures 2.1 and 2.2 give a detailed explanation about deriving direct employment numbers from Periodic Labour Force Survey and I-O analysis respectively.
 - An income multiplier is defined as total income generated in the economy due to one unit of output generated in the said sector. Income is measured by the Gross Value Added (GVA).²
 - An output multiplier is defined as total output generated in the economy due to one unit of output generated in the said sector. Output in an economy is measured by the Gross Value of Output (GVO).³
 - An employment multiplier is defined as total direct and indirect employment generated in the economy due to change in one unit of final demand in that sector.
- II. The income and employment multipliers are estimated and ranked. The top 25 sectors are reported in Table 2.1.

¹Sharma, J.L. undated.
https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004160614287891JaiLakshmi_App_Input_Output_Analysis.pdf.

² Gross Value Added is the value of all final goods and services produced in an accounting period in a particular industry or sector or region.

³ GVO is a measure of the value of production of new goods and services during an accounting period. It represents the total value of sales by producing enterprises (their gross revenue or turnover) in an accounting period, before subtracting the value of intermediate goods used up in production from the value of sales.

Table 2.1: Top 25 sectors with the highest GVA and employment multipliers (2021–22)

S. No.	GVA Multiplier	Employment Multiplier
1.	Iron ore	Agriculture
2.	Crude petroleum and natural gas	Other services*
3.	Non-ferrous metal ores	Manufacture of wearing apparel, except custom tailoring
4.	Trade	Manufacture of grain mill products, etc. and animal feeds
5.	Insurance services	Manufacture of tobacco products
6.	Manufacture of coke and refined petroleum products	Printing and reproduction of recorded media except publishing
7.	Natural gas	Hotels and restaurants
8.	Gas	Manufacture of other food products
9.	Railway transport	Livestock
10.	Education and research	Production, processing and preservation of meat, fish, fruit, vegetables, oils, and fats
11.	Communication	Manufacture of electronic component, consumer electronics, magnetic and optical media; Manufacture of computer and peripheral equipment and repair; and Installation of machinery and equipment
12.	Livestock	Manufacture of dairy products
13.	Manufacture of chemical and chemical products except pharmaceuticals, medicinal and botanical products	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting material
14.	Community, social, and personal services	Construction
15.	Real estate activities	Manufacture of textiles + cotton ginning
16.	Manufacture of basic precious and non-ferrous metals + Casting of non-ferrous metals	Trade
17.	Ownership of dwellings	Manufacture of furniture
18.	Fishing and aquaculture	Community, Social, and personal services
19.	Manufacture of basic iron and steel + Casting of iron and steel	Other manufacturing
20.	Electricity	Manufacture of leather and related products
21.	Agriculture	Storage and warehousing
22.	Forestry and logging	Land transport
23.	Other business services#	Manufacture of beverages
24.	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting material	Manufacture of fabricated metal products, except machinery and equipment
25.	Manufacture of rubber and plastic products	Renting of machinery and equipment

Source: NCAER computations.

Note: At the time of initiation of the work, the latest GVA data available was from 2021–22.

*includes Services of membership organisations, Arts, entertainment & recreation, Private household with employed person, Remediation & other utility services electricity, gas, water supply)

includes Administrative & support service activities and other professional services like Employment activities (placement activities), Travel agency, tour operator and other reservation service activities, Security and investigation activities, Services to buildings and landscape activities, Office administrative, office support and other business support activities.

2.3 Secondary Data Analysis

III. Other variables are examined which can support the above analysis and give a holistic perspective. For that, one looks at the size of the sectors, current and future

growth prospects, labour employed, and capital & labour productivity. All variables are derived from nationally available statistics which are freely available for the same year 2021–22.

- Gross Value Added (GVA)
 - Ten-year average share of GVA
 - Ten-year average growth rate of GVA
 - Ten-year average ratio of GVA to Gross Value of Output (GVO)
- Gross Capital Formation (GCF)
 - Ten-year average growth of GCF
 - Ten-year average share of GCF to GVA
 - Ten-year average share of GCF to GVO
- Labour
 - Five-year average share of workers (Periodic Labour Force Survey is available from 2017–18 onwards on an annual basis)
 - Five-year average share of labour inputs to GVO
 - Percentage share of female workers
 - Average intensity of work (average hours worked in a week)
- Forecasting
 - Auto-regressive integrated moving forecasting model.

One could additionally look at trade (exports and imports data from the Directorate General of Commercial Intelligence and Statistics (DGCIS)) and Foreign Direct Investment (FDI) from Department for Promotion of Industry and Internal Trade (DPIIT) & RBI). However, there are many challenges with the above variables. They are:

1. While data on merchandise trade are available from the DGCIS, data on service exports by region, either state or district are not available. The methodology would not be consistent across sectors and therefore these variables were dropped.
2. FDI data are not mapped to the National Industrial Classification code and therefore hard to classify and map with the data provided by the National Accounting System. The available data are available at the State-level but not district level.
3. Data on GCF are not available at the regional level, either state or district.
4. ARIMA forecasting can give erroneous results given the rapid technological changes and various transitions involved like transition to a green economy.

Therefore, two variables are chosen—the percentage share of GVA and percentage share of workers in the economy—and that also for only one year, 2021–22. This is to ensure that there is mapping to the I-O analysis. Then sectors are ranked separately based on the above two indicators. The top 25 sectors are chosen that appear in both the separate lists are shown in Table 2.2.⁴

⁴ Depending on one's goal, one can choose different indicators to select sectors. For example, Bhandari and Sahu (2025) show that one can choose percentage share of workers and employment intensity to select sectors that maximise employment.

Bhandari, B. and Sahu, A.K. 2025. "Moving Workers from Agriculture to Where?" *Economic & Political Weekly*. <https://www.epw.in/engage/article/moving-workers-agriculture-where>. March 2.

Table 2.2: Top 25 sectors with the highest share of GVA and employment, 2021 – 22

<i>S.No.</i>	<i>Share of GVA</i>	<i>Share of Employment</i>
1.	Trade	Agriculture
2.	Agriculture	Construction
3.	Construction	Trade
4.	Computer related services	Livestock
5.	Public administration and defence	Land transport
6.	Ownership of dwellings	Education and research
7.	Financial services	Manufacture of wearing apparel, except custom tailoring
8.	Livestock	Other services
9.	Education and research	Hotels and restaurant
10.	Other business services	Public administration and defence
11.	Land transport	Manufacture of textiles + cotton ginning
12.	Manufacture of textiles + cotton ginning	Medical and health
13.	Manufacture of basic iron and steel + Casting of iron and steel	Community, social and personal services
14.	Manufacture of transport	Computer related services
15.	Communication	Manufacture of electronic component, consumer electronics, magnetic and optical media; Manufacture of computer and peripheral equipment and repair; and Installation of machinery and equipment
16.	Electricity	Manufacture of other non-metallic mineral products
17.	Medical and Health	Financial services
18.	Manufacture of chemical and chemical products except pharmaceuticals, medicinal and botanical products	Other business services
19.	Forestry and Logging	Manufacture of fabricated metal products, except machinery and equipment
20.	Manufacture of machinery and equipments n.e.c.	Manufacture of tobacco products
21.	Manufacture of other non-metallic mineral products	Other manufacturing
22.	Manufacture of pharmaceutical; medicinal chemicals and botanical products	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting material
23.	Manufacture of coke and refined petroleum products	Manufacture of furniture
24.	Fishing and aquaculture	Manufacture of other food products
25.	Trade	Printing and reproduction of recorded media, except publishing

Sources: NCAER computations from

1. Ministry of Statistics and Programme Implementation, Government of India. 2023. *Periodic Labour Force Survey (PLFS), July 2021-June 2022*. Document No.: DDI-IND-CSO-PLFS-2021-22. <https://microdata.gov.in/nada43/index.php/catalog/165/study-description>.
2. Ministry of Statistics and Programme Implementation, Government of India. 2024. National Accounts. <https://mospi.gov.in/data>.

2.4 Ranking Sectors

IV. The top 25 sectors which have the highest share of GVA are first ranked. The rankings of these sectors regarding share of jobs, GVA and employment multiplier

are mapped. Table 2.3 shows the summarised results—the number of times a sector appears in the top 25 lists using the four indicators. For example, the agricultural sector appears in the top 25 rankings of all the four indicators. However, manufacture of transport sector only appears in one top 25 ranking namely the share of GVA.

Table 2.3: Number of top 25 lists that the sector appears in (max = 4)

Sector	No. of top 25 lists that the sector appears in (Max=4)
Trade	4
Agriculture	4
Livestock	4
Community, social & personal services	4
Construction	3 (Share of GVA, Share of Jobs & Employment Multiplier)
Education and research	3 (Share of GVA, Share of Jobs & GVA Multiplier)
Other business services	3 (Share of GVA, Share of Jobs & GVA Multiplier)
Land transport	3 (Share of GVA, Share of Jobs & Employment Multiplier)
Manufacture of textiles + cotton ginning	3 (Share of GVA, Share of Jobs & Employment Multiplier)
Computer related services	2 (Share of GVA & Share of Jobs)
Public administration and defence	2 (Share of GVA & Share of Jobs)
Ownership of dwellings	2 (Share of GVA & GVA Multiplier)
Financial services	2 (Share of GVA & Share of Jobs)
Manufacture of basic iron and steel + Casting of iron and steel	2 (Share of GVA & GVA Multiplier)
Communication	2 (Share of GVA & GVA Multiplier)
Electricity	2 (Share of GVA & GVA Multiplier)
Medical and health	2 (Share of GVA & Share of Jobs)
Manufacture of chemical and chemical products except pharmaceuticals, medicinal and botanical products	2 (Share of GVA & GVA Multiplier)
Forestry and logging	2 (Share of GVA & GVA Multiplier)
Manufacture of other non-metallic mineral products	2 (Share of GVA & Share of Jobs)
Manufacture of coke and refined petroleum products	2 (Share of GVA & GVA Multiplier)
Fishing and aquaculture	2 (Share of GVA & GVA Multiplier)
Manufacture of transport	1 (Share of GVA)
Manufacture of machinery and equipment n.e.c.	1 (Share of GVA)
Manufacture of pharmaceutical; medicinal chemicals and botanical products	1 (Share of GVA)

Source: NCAER computations.

2.5 Sunrise Sectors

V. From the Union Budget Speech of the Honourable Finance Minister 2022–23, the sunrise sectors are identified—Agri-tech, Artificial intelligence, Deep tech and digital economy, Geospatial systems and drones, Semiconductor and its eco-system, Space economy, Genomics and pharmaceuticals, pharma, Green energy, Clean mobility systems and Climate action.⁵ These sectors are then mapped on to the 64 sectors. Table 2.4 shows that correspondence map.

Table 2.4: Sunrise sectors

<i>S.No.</i>	<i>Sunrise Sector (mentioned in Union Budget 2022–23)</i>	<i>Sector</i>	<i>Sub-sector</i>	<i>Ranks</i>
1.	Agri-tech	Primary	Agriculture	Top 25 GVA and Employment Multiplier
2.	Artificial intelligence, deep tech and digital economy	Tertiary	Computer related services	GVA Multiplier Rank 28
3.	Geospatial systems and drones	Secondary	Manufacture of computer, electronic and optical products	GVA Multiplier Rank 63
4.	Semiconductor and its eco-system	Secondary	Manufacture of communication equipment	GVA Multiplier Rank 62
5.	Space economy	Tertiary	Air transport	GVA Multiplier Rank 30
6.	Genomics and pharmaceuticals, pharma	Secondary	Manufacture of pharmaceutical; medicinal chemicals and botanical products	GVA Multiplier Rank 55
7.	Green energy	Secondary	Electricity	Top 25 GVA
8.	Clean mobility systems	Secondary	Manufacture of transport	GVA Multiplier Rank 59
9.	Climate action			

Source: NCAER Conceptualisation from the Ministry of Finance, Government of India. 2023. Union Budget 2022–23. <https://www.indiabudget.gov.in/budget2022-23/>.

2.6 Selected Sectors: Intermediate Step

VI. The Inception Report had mentioned that two sectors each from the Primary, Secondary, and Tertiary sectors were to be selected. Table 2.3 gives information about a sector’s current competitiveness and Table 2.4 about a sector’s future potential. Therefore, in each broad sector of primary, secondary, and tertiary, one sector each is chosen for its current competitiveness (Table 2.3) and one for its future potential (Table 2.4). Table 2.5 shows the selected sectors. Alternative sectors to the six ones selected are presented in Annexure 2.3.

⁵ Newer sunrise sectors may have emerged after the Union Budget 2022–23, like technical textiles in the ‘weaving of textiles sector’. The analysis would or should incorporate new and emerging sectors.

Table 2.5: Integrated sectors from Tables 2.3 and 2.4 to select sectors

S. No.	Sector	Sub-sector	Appears in all 4 top 25 lists of Multipliers and Shares	Sunrise Sector (mentioned in Union Budget 2022–23)	Sector Skill Council(SSC)
1.	Primary	Agriculture	4	Agri-tech*	Agriculture Skill Council of India (ASCI)
2.	Primary	Livestock	4		ASCI
3.	Tertiary	Trade	4		Retailers' Association Skill Council of India
4.	Tertiary	Computer related services	2	Artificial intelligence, Deep tech and digital economy	IT-ITeS Sector Skill Council-NASSCOM
5.	Secondary	Construction	3		Construction Sector Skill Council
6.	Secondary	Electricity	2	Green Energy	Skill Council for Green Jobs

Source: NCAER computations.

Notes: * Agri-tech enterprises are registered as information technology sectors and can be classified too.

2.7 Policymakers' Inputs

VII. The last step involved taking in the policymakers' inputs. It was suggested to replace construction with manufacturing sectors. From Annexure 2.1, the top manufacturing sector in that list is manufacturing of textiles. That was selected. The sunrise manufacturing sector is manufacturing of electrical vehicles and therefore manufacturing of automotive sector was chosen. Consequently, instead of six as proposed in the ToR, seven sectors were selected (Table 2.6). The seven sectors selected are:

1. Primary
 - a. Agriculture
 - b. Livestock
2. Secondary
 - a. Manufacturing of textiles
 - b. Manufacturing of auto
 - c. Generation of green electricity
3. Tertiary
 - a. Retail
 - b. Computer-related services (Information Technology or IT)

Table 2.6: Final selected sectors after policy direction

S. No.	Sector	Sub-sector	Appears in all 4 top 25 lists of Multipliers and Shares	Sunrise Sector (mentioned in Union Budget 2022–23)	Sector Skill Council
1.	Primary	Agriculture	4	Agri-tech	ASCI
2.	Primary	Livestock	4		ASCI
3.	Tertiary	Trade	4		Retailers' Association Skill Council of India
4.	Tertiary	Computer related services	2 (Share of GVA & Share of Jobs)	Artificial intelligence, deep tech and digital economy	IT-ITeS Sector Skill Council-NASSCOM
5.	Secondary	Manufacturing of Textiles plus cotton ginning	3 (Share of GVA, Share of Jobs & Employment Multiplier)		Textiles Sector Skill Council
6.	Secondary	Manufacture of Transport	1 (Share of GVA)	Clean mobility systems	Automotive Sector Skill Council
7.	Secondary	Electricity	2 (Share of GVA and GVA Multiplier)	Green energy	Skill Council for Green Jobs

Source: NCAER Computations.

2.8 Identification of Sub-sectors

VIII. There are many sub-sectors within the above mentioned seven sectors. Therefore, it was recommended to narrow them down further. Data on GVA are not available at a disaggregated level on a consistent basis. Therefore, share of workers was used to select the largest sub-sector (using National Industrial Classification (NIC) codes) within each of the above seven sectors (Table 2.7).⁶

The sub-sectors selected within the seven sectors were the following (see Table 2.7) and Annexure 2.4 shows the summary data of all the above sectors and sub-sectors.

- Primary
 - Agriculture: Initially only growing of cereals (excluding rice), leguminous crops and oil seeds was selected but stakeholder interviews suggested that it was hard to separate out technology and skilled labour required for rice and other cereals. It was eminently more sensible to take the whole of cereals production and therefore one looks at cereal production wholly.

⁶ “The National Industrial Classification (NIC) is an essential statistical standard for developing and maintaining comparable data base according to economic activities. Such classifications are frequently used in classifying the economically active population, statistics of industrial production and distribution, the different fields of labour statistics, and other economic data such as national income. Comparability of statistics available from various sources, on different aspects of the economy, and usability of such data for economic analysis, are prerequisite for standardization of a system of classification.”

Central Statistical Organisation, Ministry of Statistics and Programme Implementation, Government of India. National Industrial Classification 2008.
https://www.ncs.gov.in/Documents/NIC_Sector.pdf.

- Growing of cereals (including rice), leguminous crops and oil seeds
 - Livestock
 - Raising of cattle and buffaloes
- Secondary
 - Manufacturing of textiles
 - Weaving of textiles was selected although not the largest sector within the ‘manufacture of textiles’ sector, it was more homogenous. The largest sub-sector ‘manufacture of other textiles n.e.c.’ was too diverse and mapping its skill needs within a particular a time frame would be challenging.
 - Manufacturing of auto
 - Manufacture of parts and accessories for motor vehicles
 - Manufacture of motor vehicles
 - Maintenance and repair of motor vehicles- While this sector is classified under retail, it will be included in the auto sector, enabling a holistic skill gaps assessment of motor vehicles sector.
 - Generation of green electricity
 - Electric power generation using solar energy
 - Electric power generation using other non-conventional sources
- Tertiary
 - Retail
 - Retail sale of food in specialised stores
 - Retail sale of clothing, footwear and leather articles in specialised stores
 - IT
 - Computer programming activities

Table 2.7: Choosing sub-sectors at the NIC 4-digit level-I

S.No.	Sector	Sub-sector	Sub-Sector (Share of Jobs within the sector)
1.	Primary	Agriculture	1. Growing of cereals (except rice), leguminous crops and oil seeds (39%)
			2. Growing of rice (33%)
			3. Growing of fibre crops (6.6%)
2.	Primary	Livestock	1. Raising of cattle and buffaloes (46%)
			2. Raising of sheep and goats (8.1%)
			3. Raising of poultry (3.15%)
3.	Secondary	Manufacturing of Textiles plus cotton ginning	1. Manufacture of other textiles n.e.c. (34.2%)
			2. Weaving of textiles (32.3%)
			3. Finishing of textiles (9.5%)
4.	Secondary	Manufacture of Transport	1. Manufacture of parts and accessories for motor vehicles (49%)
			2. Manufacture of motor vehicles (18.7%)
			3. Manufacture of motorcycles (15.5%)
5.	Secondary	Electricity	1. Electric power generation by coal-based thermal power plants (22%)
			2. Electric power generation using solar energy (6%)**
			3. Electric power generation using other non-conventional sources (1.2%)
6.	Tertiary	Trade	1. Retail sale of food in specialised stores (33.9%)
			2. Retail sale of clothing, footwear and leather articles in specialised stores (8.4%)
			3. Maintenance and repair of motor vehicles (3.7%)
7.	Tertiary	Computer related services	1. Computer programming activities (49.7%)
			2. Other information technology and computer service activities (34.3%)
			3. Computer consultancy and computer facilities management activities (9.1%)

Source: NCAER Computations from Ministry of Statistics and Programme Implementation, Government of India. 2023. Periodic Labour Force Survey (PLFS), July 2021-June 2022. Document No.: DDI-IND-CSO-PLFS-2021-22. <https://microdata.gov.in/nada43/index.php/catalog/165/study-description>.

Note: **Selecting the largest sub-sector (using NIC codes) within the broad sector was not followed here because the focus was to capture the sunrise sectors within the broad sector.

2.9 Summary

This chapter shows a scientific measure of selecting sectors for analysis, which includes both growth and employment considerations while simultaneously thinking about future growth. The seven sectors selected for analysis in this report are:

1. Growing of cereals (including rice), leguminous crops and oil seeds
2. Raising of cattle and buffaloes
3. Weaving of textiles
4. Manufacturing of motor vehicles and parts & components of motor vehicles
5. Electric power generation of solar energy and other non-conventional sources
6. Retail sale of food, clothing, footwear, leather articles in specialised stores and maintenance and repair of motor vehicles (this was clubbed with the manufacturing of motor vehicles and parts & components of motor vehicles sector).
7. Computer programming activities.