Economic and environmental insights for manufacturing in India and the benefits and challenges of a linked India-UK carbon market

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Executive summary

Economic growth in India has accelerated in recent decades but growth in manufacturing industries has remained elusive. The services-oriented nature of India's economy has meant less broad-based income growth, whilst inadvertently reducing the carbon intensity of the economy. Future ambitions to reach advanced economy status by 2047 and grow export-oriented manufacturing industries may reverse this and increase carbon intensity, adding challenges to decarbonisation and plans to reach net zero by 2070.

In India, manufacturing sectors generate more output, employment, and emissions in the supply chain than in production. Accounting for these total effects, the paper finds that the most labour-intensive and least emissions-intensive sectors are similar, whilst also being relatively more export-oriented. It suggests no trade-off between employment and emissions *within manufacturing*.

Specific manufacturing sectors will be central to the net-zero transition. This includes 'green tech' industries (e.g. EVs) where demand is expected to increase considerably, and 'hard-to-abate' industries (e.g. steel) where existing technology makes decarbonisation prohibitively costly and they may be subject to shifting demand patterns and carbon pricing. In India, the paper finds that the six broad sectors identified under these categories are typically less labour-intensive and more emissions-intensive than other manufacturing sectors. Compared to other emerging markets, India's production in these sectors is generally *more* labour-intensive and *more emissions-intensive*.

In 'hard-to-abate' sectors, compared to seven emerging markets, India's higher labour intensity appears linked to lower labour productivity, except for the chemicals sector where labour productivity is higher. Compared to the same sample, India has the highest emissions intensity in the basic metals sector and the third highest in chemicals and other non-metallics. In these sectors, as expected, emissions are concentrated in production (scope 1 emissions), rather than electricity and energy input (scope 2) or the supply chain (scope 3).

In 'green tech' sectors, India's higher labour intensity is not as great as in 'hard-to-abate' sectors, nor as closely linked to lower labour productivity. Emissions intensity, however, is significantly higher in India across all three sectors. In these sectors, emissions are concentrated in either the electricity and energy input (scope 2) or the supply chain (scope 3). India's high emissions intensity comes from a much higher contribution from scope 2 emissions, likely due to a more carbon-intensive electricity system, and scope 3 emissions, due to higher emissions intensity in the domestic basic metals sector.

India's higher emissions intensity may run into challenges as carbon pricing regimes increase in number and scope, which are already covering many 'hard-to-abate' industries. As these expand and production costs become linked to carbon content, emissions intensity will have greater implications on global competitiveness. India's higher emissions-intensity relative to other emerging markets could leave it exposed in every net zero sector examined except for chemicals. To alleviate this, India could capitalise on its geopolitical advantage as countries seek to diversify their supply chains in key net zero sectors.

The UK, like other high-income economies that predominantly import net zero products, is facing a strategic choice between faster and cheaper decarbonisation on one hand, and economic security on the other. Naturally, India is, or could be, a strong contender to help the UK smooth this trade-off. Currently, the level of UK import dependence on India's net zero exports, and the level of UK market share that India has captured varies by sector, but there are already important linkages from both perspectives.

One option to support decarbonisation and economic security in the UK whilst developing export-oriented manufacturing sectors in India could be a linked carbon market. Fundamentally, linking carbon markets converges carbon prices and expands abatement options, helping to make decarbonisation more efficient. The UK currently relies upon a carbon price and emissions trading scheme to encourage decarbonisation in key manufacturing industries, and India has recently adopted the legal basis for an emissions trading scheme. Linking carbon markets is not yet practiced outside of EU and non-EU countries, but increasingly discussed, such as between EU and China.

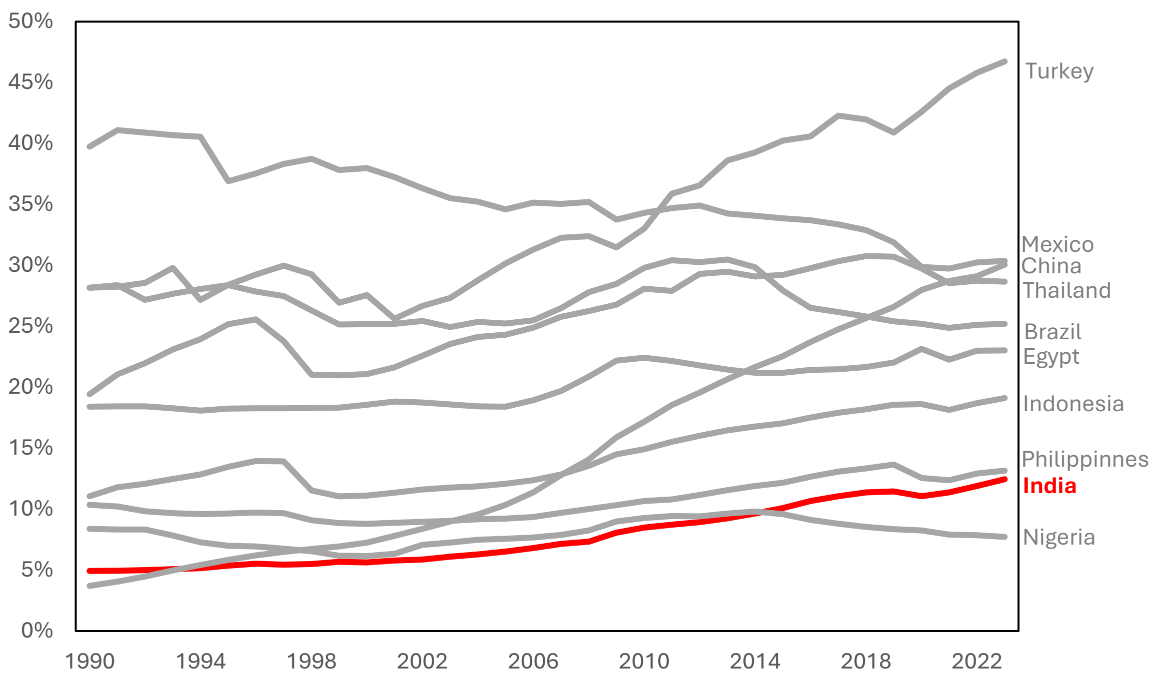
Creating a joint India and UK market would open opportunities to raise finance in India and protect export-oriented sectors, whilst supporting a lower cost transition in both countries. Higher cost abatement in the UK would create demand for emissions reduction credits from India, channelling international finance for emissions reduction investment. This would make it cheaper for the UK to decarbonise, which could conversely slow national decarbonisation efforts. For India, attracting greater finance would come with higher production costs due to the higher carbon price, but which by design would mean a zero CBAM charge for Indian firms (to the UK). A joint market would primarily improve decarbonisation outcomes at the India-UK aggregate, help channel resources more efficiently, and send a powerful international signal.

This paper recommends further work to explore the compatibility of a linked market and early discussions to understand priorities. Any linkage would happen over the long-term and needn't inhibit continued development of respective domestic carbon markets. To this end, it's likely a future India carbon market would have different design features to the UK, such as an intensity rather than absolute cap, but this should not prevent linkage. At the same time, a domestic carbon market in India could use similar tools as the UK, including free allowances, to help support domestic competitiveness. Linkage could be phased or limited to specific sectors, helping to limit any negative consequences and preparing administrations for further ambition. Early discussions could explore how these features may evolve, or need to evolve, to facilitate future collaboration.

Section 1: Context

Since 1990, India has experienced substantial income convergence but it remains low in absolute terms. Since 1990, GDP per capita[1] has climbed from 5% of US levels to 12.5% in 2023, with only China recording a quicker improvement over that timeframe (Chart 1). This was driven by economic liberalisation reforms in the 1990s and rapid global growth and liquidity in the 2000s. Despite a deceleration following the global financial crisis, growth remained robust and India experienced a strong rebound following the pandemic. It is now forecast to be one of the fastest growing major economies in 2024 and could be on track to be the third largest economy by 2030[2]. Nevertheless, GDP per capita remains low in absolute terms and below comparable emerging economies.

Chart 1: Income convergence across emerging markets, GDP per capita as a share of US levels (PPP, constant 2021 international $), 1990-2023



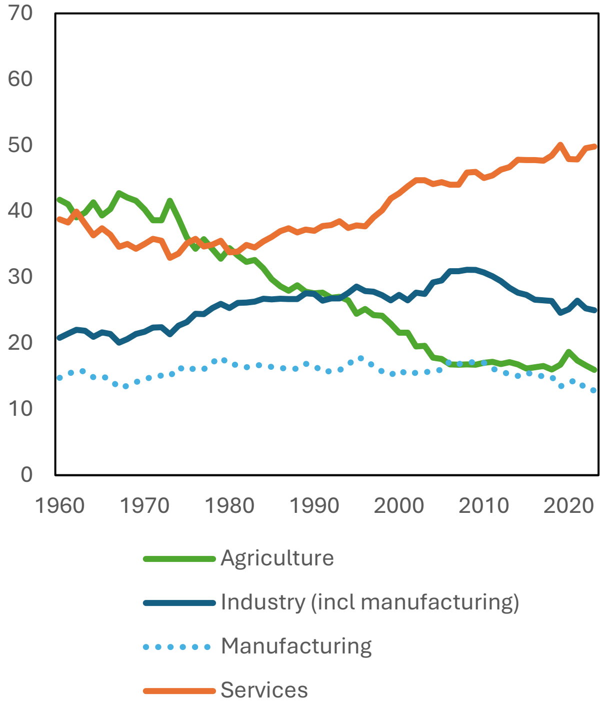
Data source: World Development Indicators, World Bank

The economy remains heavily dependent on services and agriculture. India's economy is defined as having large services and agricultural sectors, and low levels of industrialisation (Box 1). Compared to other emerging markets, India has relatively higher shares of agricultural employment and relatively lower shares of manufacturing activity. Industry, as a share of GDP, has fallen from a high of 31% in 2008 to 25% in 2023, with manufacturing recording a 1ppt decline over the same period. Instead of conventional structural transformation, workers and economic activity has moved from agriculture and into services and construction. These growing services sectors have been important drivers of rising living standards, but welfare gains remain heavily skewed towards higher-income urban dwellers.

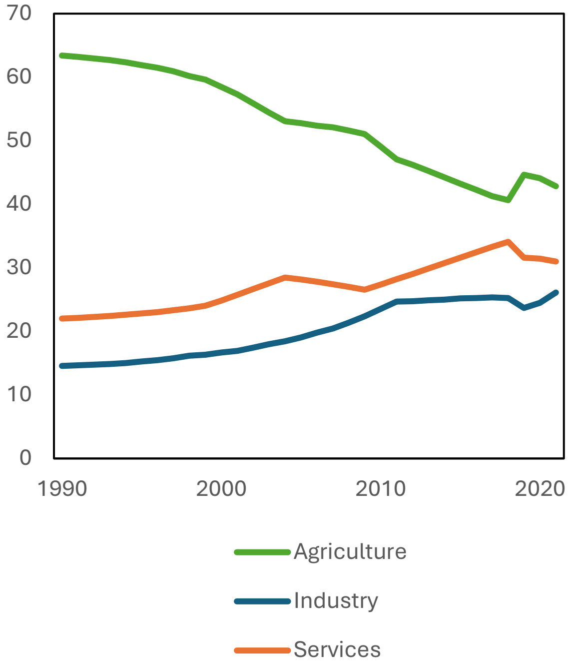
[1] GDP per capita as measured in PPP (constant 2021 international $).
[2] Government of India, Economic Survey 2023-2024

Box 1: Economic structure of India

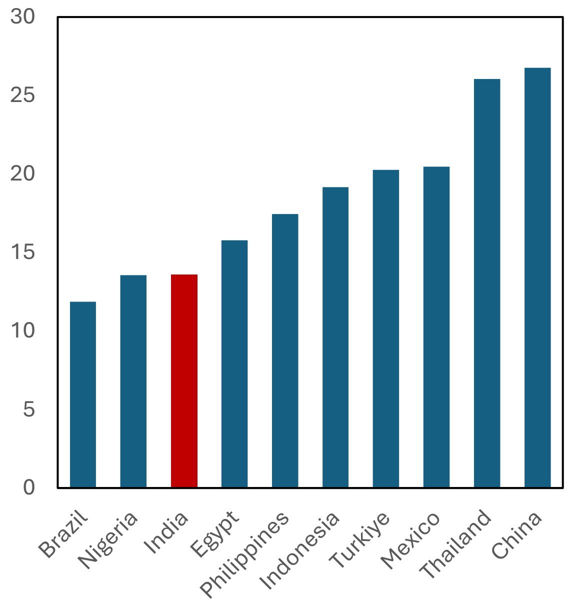
Sector by value-added (India, % of GDP)



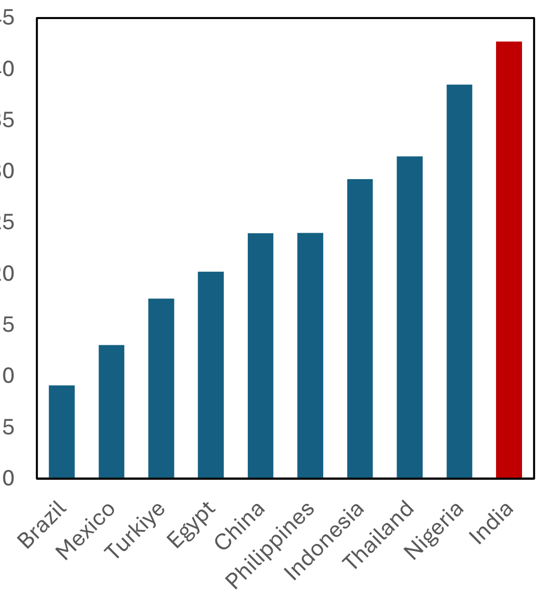
Employment by sector (India, % of total employment)



Share of manufacturing value added (average, 2017-2021)



Share of agricultural employment (average, 2017-2021)

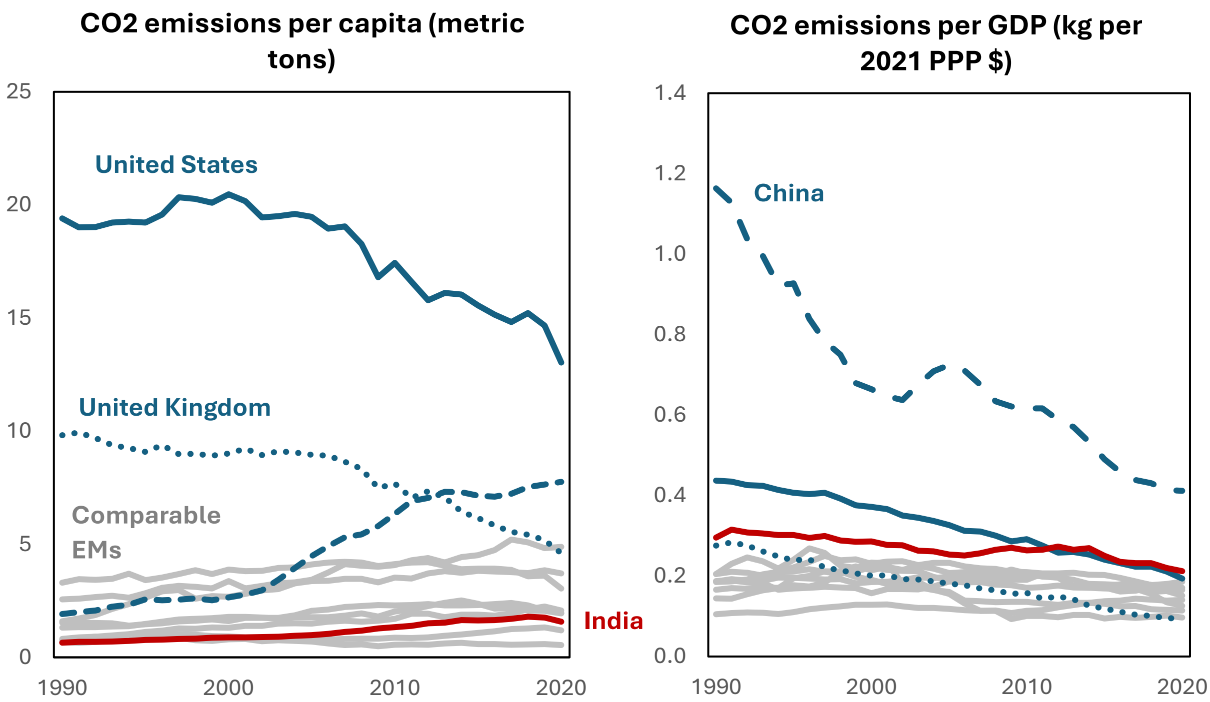


Data source: World Development Indicators, World Bank

India's economic development sits squarely in a debate over services- versus manufacturing-led growth pathways. Premature deindustrialisation, whereby countries are becoming service economies without a proper experience of industrialisation, is not unique to India. Many Latin American and sub-Saharan African economies are experiencing similar trends. It contrasts to the experiences of Western and East Asian economies where manufacturing was the main engine of growth and broad-based employment. Some economists argue that the manufacturing-led development path may now be out of reach due to the plateau in globalisation and more capital-intensive manufacturing production. Whilst unproven, the same economists point to the potential of a services-led development path that could generate productivity and income growth. As in the experience of India, a primary concern is how broad-based such a growth model would be.

India does not generate significant carbon emissions relative to its population but the economy is more carbon intensive than comparable markets. In 2020, India accounted for approximately 3.1% of world GDP (current prices) and 15% of the global population, but only 6.6% of global CO2 emissions[3]. On a per capita basis, India is emitting less than many other comparable emerging markets[4]. Nevertheless, the economy remains relatively more carbon-intensive (Chart 2) despite the high shares of services in the economy. Low per capita emissions but high carbon intensity arises from low levels of energy consumption that are predominantly sourced from coal. By virtue of its size, the growth in India's emissions is globally significant. This is evident by the fact it is now the 5th largest emitter (with EU27 combined) in cumulative terms since 1750, despite such low levels of energy consumption.

Chart 2: CO2 emissions per capita and emissions per GDP, select countries, 1990-2020

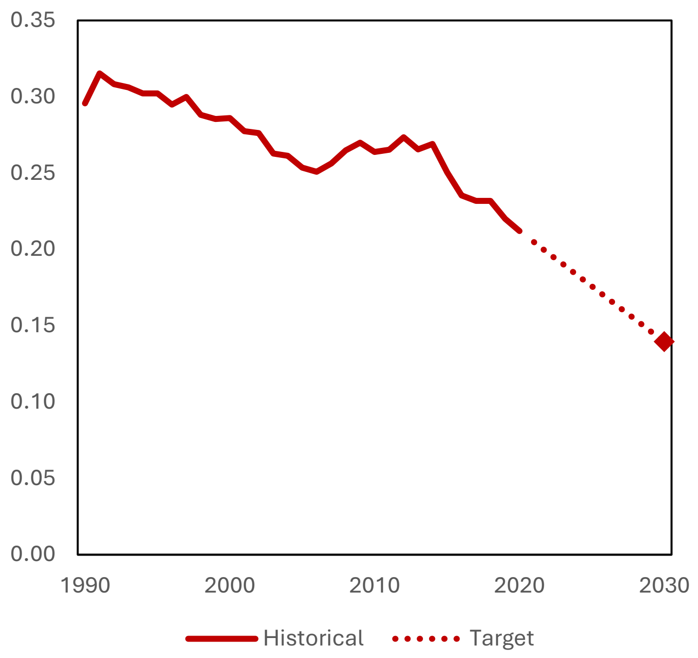


Data source: World Development Indicators, World Bank

[3] World Development Indicators, World Bank.
[4] Comparable emerging markets are used throughout the report and include Brazil, China, Egypt, Indonesia, Mexico, Nigeria, Philippines, Thailand, Turkiye. These were selected as economies that India may compete with or emulate in manufacturing, based on economic and population characteristics.

The carbon intensity of the Indian economy has fallen but this would have depended in part on growing services. Between 1990 and 2020, CO_2 emissions per GDP in India fell from 0.3 to 0.21 kg per 2021 PPP (Chart 3). At the same time, services increased from 37% to 48% of GDP. Given the lower carbon intensity in services relative to agriculture and industry, it's likely this was applying downward pressure to overall carbon intensity. Moreover, this downward pressure was outweighing upward pressure from greater carbon intensity in the energy supply, as the share of coal increased. Looking ahead, carbon intensity will depend on large parts on the future changes in the power sector and economic structure. On economic structure, the question will be whether India moves directly to a share of services in GDP similar to advanced economies (~75%), or the share of manufacturing increases. Ceteris paribus, greater manufacturing will increase carbon intensity which could make it harder to reduce the emissions intensity of GDP and reach the 2030 NDC target.

Chart 3: India CO_2 emissions (kg per 2021 PPP $ of GDP

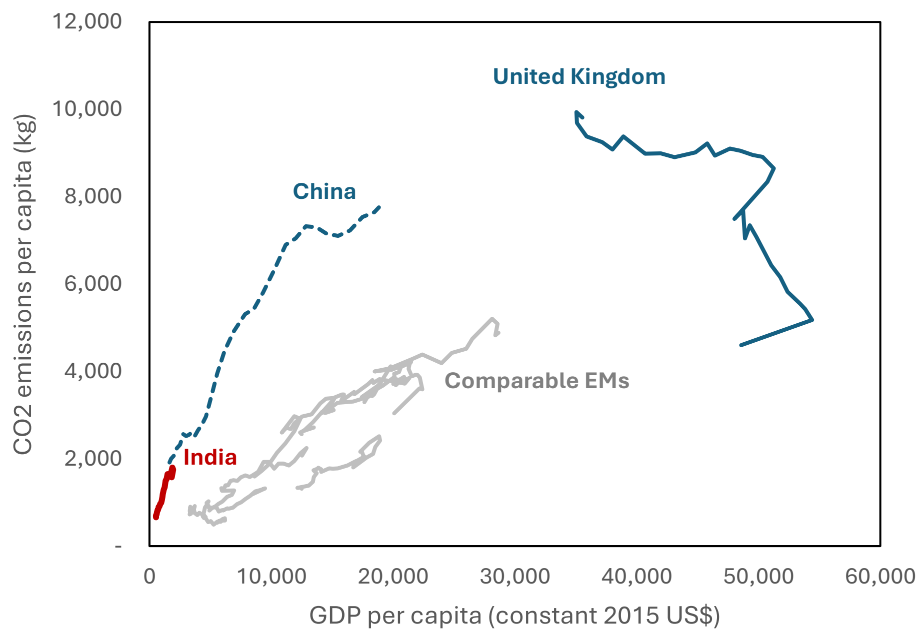


Data source: World Development Indicators, World Bank

Both growth and decarbonisations efforts will need to increase if the government is to achieve economic and net zero plans simultaneously. Viksit Bharat 2047 is the government's roadmap to reach advanced economy status exactly 100 years after gaining independence. This includes sustained economic growth of 7-8% per year and per capita incomes of $15,000. Currently, the IMF expect GDP per capita growth to average 5.8% per year between 2024-2029 and reach $3,102, closing in on upper-middle income status at $4,460. Viksit Bharat 2047 targets an increase in the share of manufacturing to 25% of GDP. This will likely increase the carbon intensity of the economy, and if export-oriented, shift more of the global carbon emissions to India. This may interact with the Government of India's NDC commitments, which is net zero by 2070 and a lower carbon intensity of GDP by 2030. If new, and more carbon-intensive industries grow, it may require greater and costlier decarbonisation in the sectors themselves or more broadly.

Driving a trajectory that increases incomes and minimises emissions will require an understanding of future pathways and international support. Energy usage is a necessary but not sufficient factor for economic growth, demonstrated by a strong historical correlation. Therefore, as incomes grow, there is a corresponding increase in carbon emissions. Higher-income countries have now managed to increase income whilst reducing emissions, driven by less fossil fuels in energy usage, and less energy usage in economic activity. Innovation, such as in solar energy, is promising to continue to alter this trade-off and at lower income levels. Nevertheless, countries face unique contexts and challenges that will determine their own energy development pathway (Chart 4). As Chart 2 and Chart 4 show, India has relatively high carbon emissions given the level of per capita income, and with a current trajectory that appears similar to China. In China, high per capita incomes and emissions are partly driven by their dominance in manufacturing industries (with the energy mix being another big contributor), as they help to drive broad-based employment whilst having a higher carbon-intensity. Manufacturing exporters indirectly benefit net zero ambitions (but not necessarily economic ambitions) for manufacturing importers, such as the UK, as NDC commitments are national and production-based. Greater international collaboration could help share the burden and ease the domestic link between emissions and income.

Chart 4: GDP and emission pathways, per capita, select countries, 1990-2020



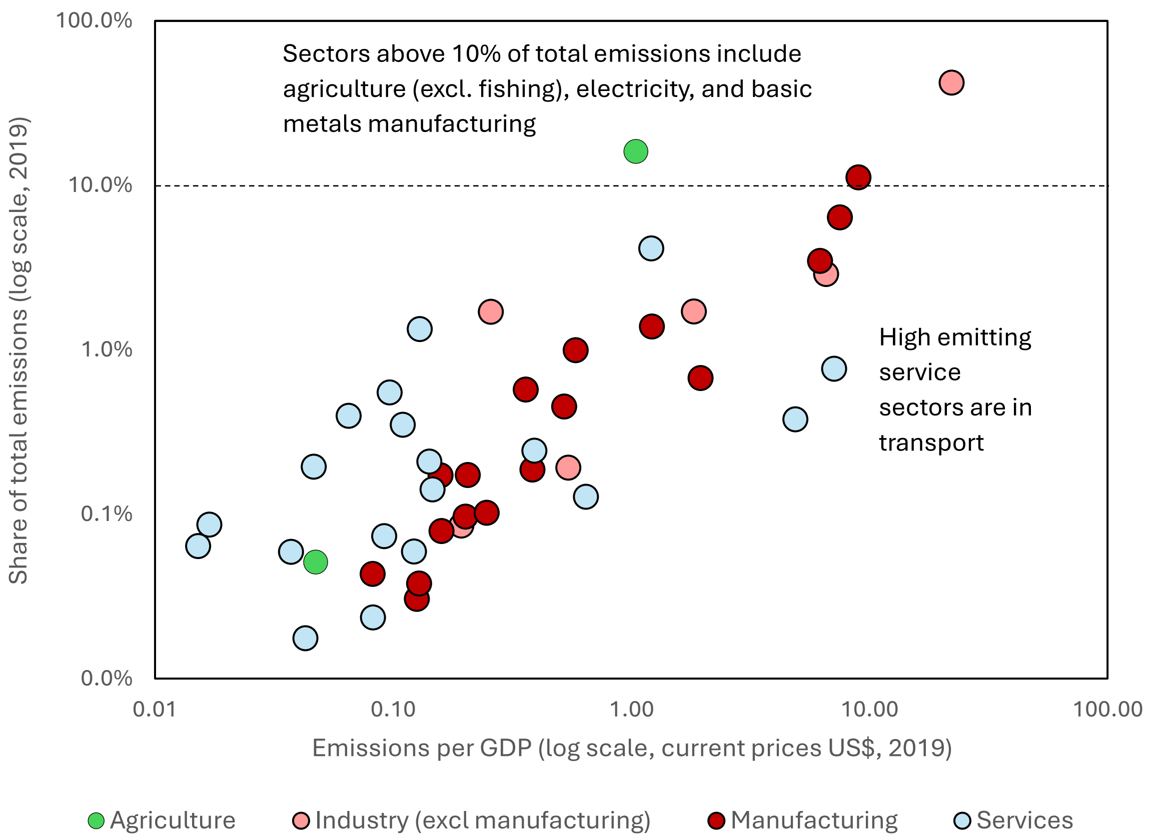
Data source: World Development Indicators, World Bank

Section 2: Employment and emissions intensity of manufacturing sectors in India

Employment and emissions are two of the key variables related to future economic development and net-zero pathways. There is unlikely to be a path to high-income status without generating significant employment opportunities. As per section 1, India's difficulty in building up labour-intensive manufacturing sectors is one reason why large amounts of employment remains in agriculture and broad structural transformation has been elusive. At the same time, the more carbon-intensive nature of manufacturing means building up these sectors risks greater decarbonisation challenges in the future. This section contextualises these dynamics by analysing the employment and emissions intensities of manufacturing sectors.

Manufacturing is typically more carbon-intensive than other economic sectors, but there is significant variation. Drawing on OECD's input-output tables 2023 release, manufacturing sectors[5] accounted for nearly 15% of GDP, 9% of employment, and 26% of emissions in 2019. Manufacturing sectors are typically more carbon intensive than service sectors, except for transport sectors (Chart 5). However, there is variation and the lowest emitting manufacturing sectors are not dissimilar to many services sectors. The other industrial sectors[6], including electricity and water supply, and agriculture are also typically more carbon-intensive.

Chart 5: Economic sectors in India by share of total emissions and emissions per GDP, 2019

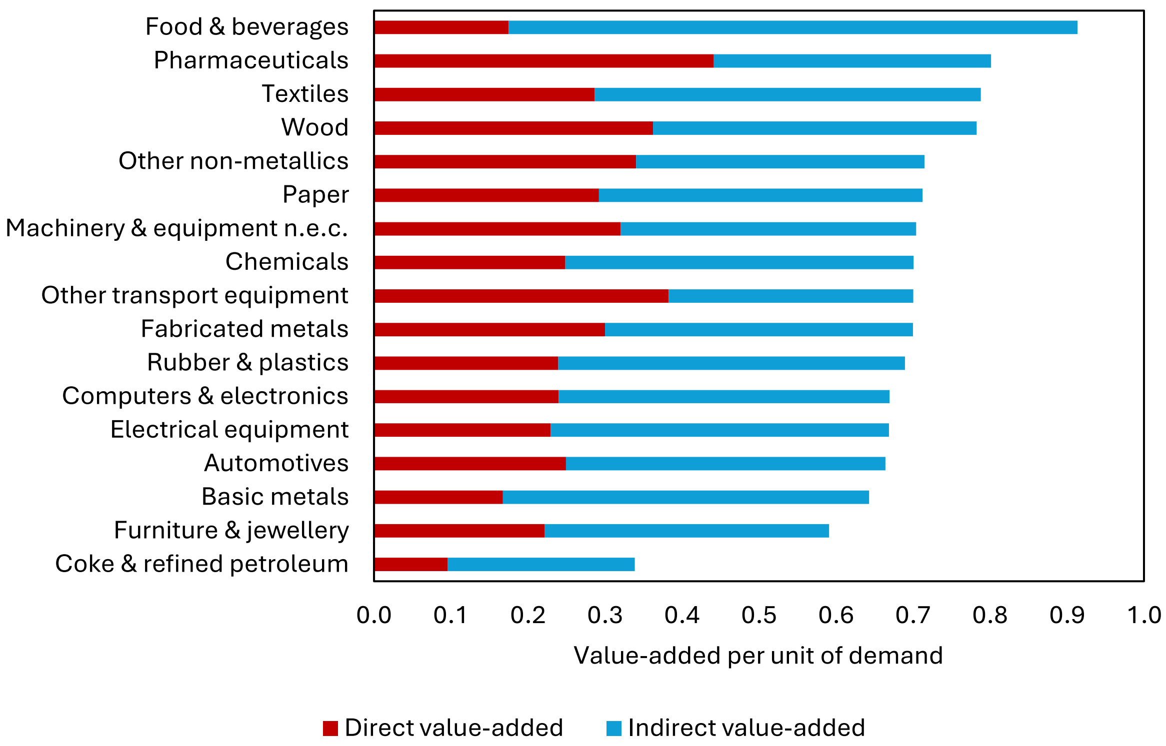


Data source: OECD Input-Output Tables 2023 release

[5] Manufacturing sectors refer to ISIC section B.
[6] Industrial sectors typically include manufacturing (ISIC B-F) but are separated in this analysis.

Manufacturing sectors typically have high economic linkages, meaning significant amounts of output, employment, and emissions can be created in the value chain. Manufacturing sectors often have considerable forward and backward economic linkages, due to the unbundling of production processes. Using input-output analysis (full methodology detailed in Annex 1), comparisons between 'direct' and 'total' effects can be made. 'Direct' effects refer to the amount of output, employment, and emissions that are created by a sector itself for every unit of demand (known as Scope 1 in emissions definitions). 'Indirect' effects refer to the output, employment, and emissions that are created in the supply chain for every unit of demand in a sector (known as Scope 2 and Scope 3 in emissions definitions). The analysis that follows focuses on domestic linkages and supply chains, as domestic output and employment is what will drive economic growth in India, and domestic emissions will be the target for NDC commitments.

Chart 6: Manufacturing sectors ordered by total value-added per unit of demand, India, 2019



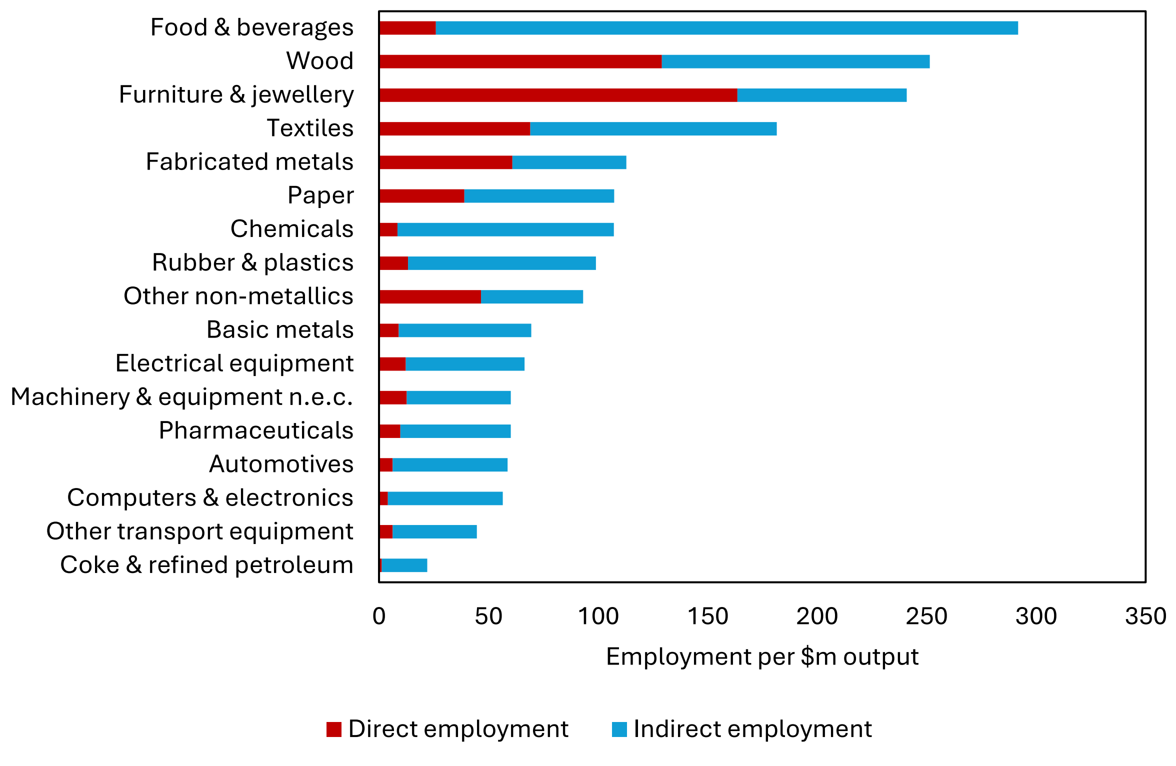
Data source: Authors' calculations, OECD Input-Output Tables 2023 release

Nearly all manufacturing sectors create more GDP through the supply chain than in the sector itself. In all manufacturing sectors except for 'other transport equipment', a unit of demand generates more indirect value-added than direct value-added (Chart 6). The difference between direct value-added and total value-added is known as the value-added multiplier which varies across sectors. The food & beverages sector has the highest total value-added ($0.91 for every $1 of demand) but the third-lowest direct value-added ($0.17 for every $1 demand). As most of the total value-added is generated indirectly, the food & beverages sector therefore has a very high multiplier of 5.2 ($0.91/$0.17). In comparison, the pharmaceuticals sector has the second-highest total value-added ($0.80 for every $1 of demand) but a multiplier of just 1.82, due to much higher direct value-added ($0.44 for every $1 of demand).

Unsurprisingly, sectors with higher shares of domestic inputs have higher multipliers, as more of the demand feeds through domestic supply chains.

Sectors with high value-added multipliers also have high employment multipliers, but there are variations due to the employment intensity of the sector and supply chain. As with GDP, nearly all manufacturing sectors generate more employment in the supply chain than in the sector itself (Chart 7). Unsurprisingly, the sectors are ranked similarly in terms of their position in total value-added per unit of demand (Chart 6) and in total employment and will have high or low multipliers in both. For example, the food & beverages sector tops the list for both value-added and employment. In both instances, it has a high multiplier, i.e. it creates significantly more indirect employment than direct employment. There are some differences, however. The furniture & jewellery sector has one of the lowest total value-added but one of the highest total employment, due primarily to the high direct employment intensity in the sector. In other instances, multipliers will vary because of the employment intensity of sectors in the supply chain.

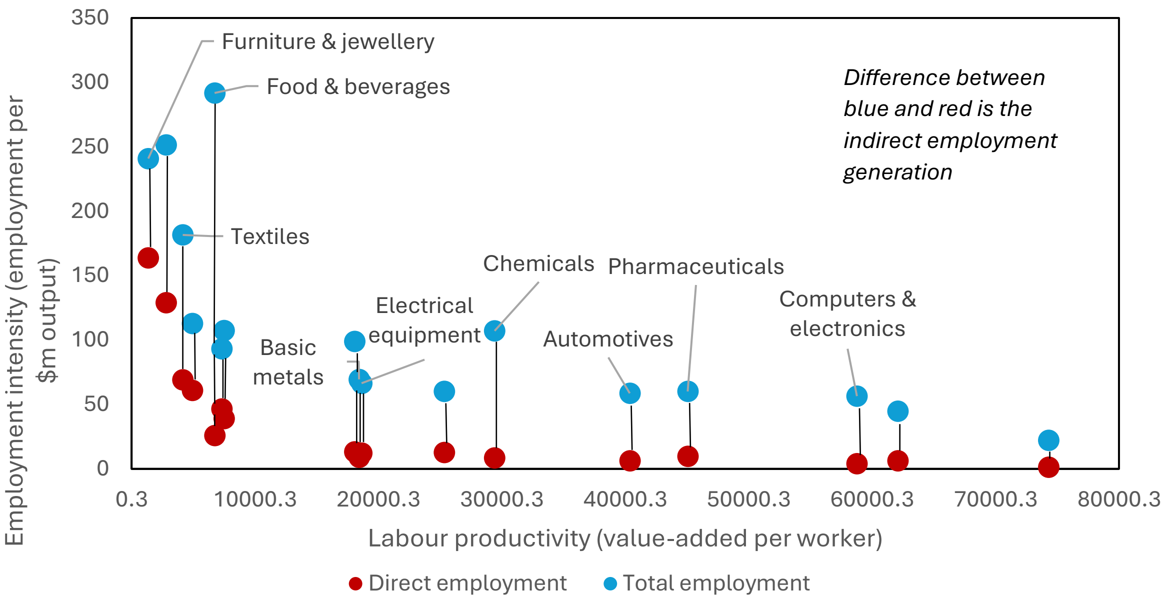
Chart 7: Manufacturing sectors ordered by total employment per unit of demand, India, 2019



Data source: Authors' calculations, OECD Input-Output Tables 2023 release

High employment intensity is associated with low labour productivity, which generally remains true after incorporating the employment in the supply chain. Across sectors, there is a strong inverse relationship between employment intensity and labour productivity (Chart 8). This is typically expected, as more labour-intensive production methods create more employment and use less capital. There is a further question to explore within sectors, comparing employment intensity and labour productivity with other countries, and how improving productivity might impact employment intensity. After incorporating employment in the supply chain, the relationship between employment intensity and labour productivity generally still holds (Chart 8). In other words, a sector with high productivity and low employment intensity sector does not generally become more employment intensive than a low productivity comparator. However, there are exceptions. The chemicals sector, relatively more productive and with lower employment intensity than other manufacturing sectors, becomes significantly more employment-intensive after accounting for the supply chain. Total employment intensity is comparable to the paper sector, despite being nearly four times more productive, because of a more employment-intensive supply chain.

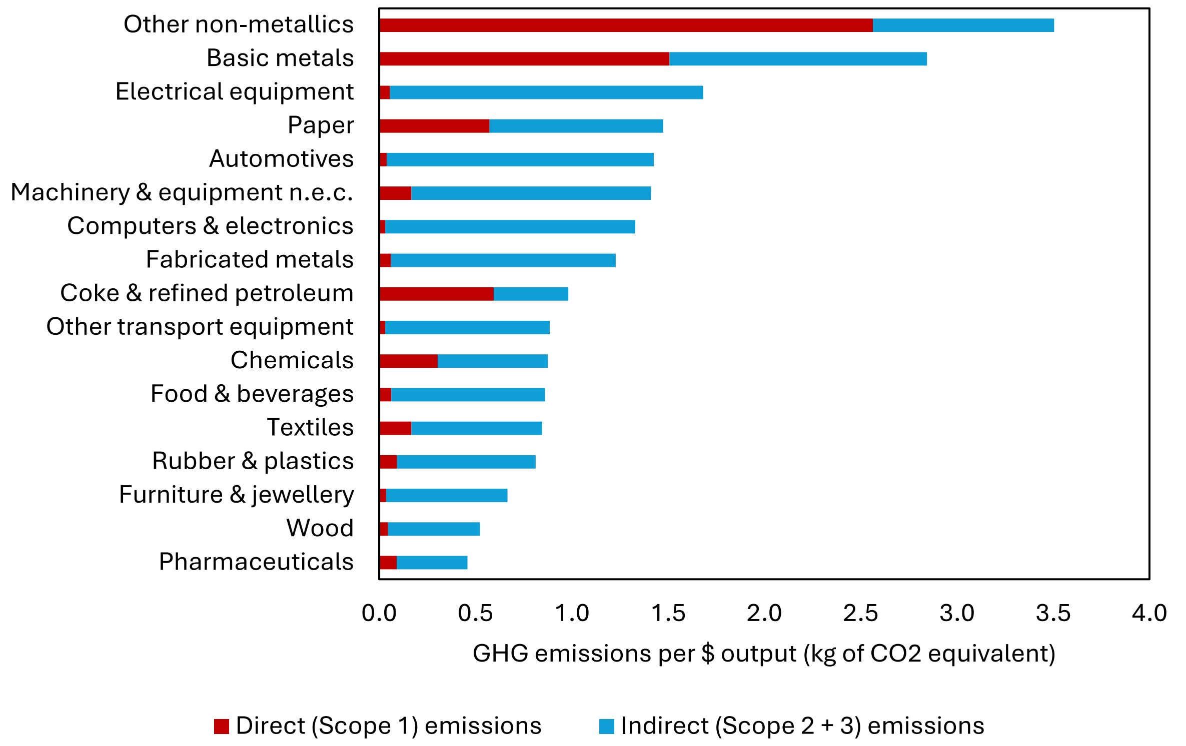
Chart 8: Manufacturing sectors by employment intensity and labour productivity, India, 2019



Data source: Authors' calculations, OECD Input-Output Tables 2023 release

Many manufacturing sectors have high emissions multipliers, but these do not correspond to high value-added and employment multipliers. For most manufacturing sectors, a significant share of the emissions intensity comes indirectly via the supply chain (Scope 2 & 3 emissions) rather than in direct production (Scope 1 emissions). It should be noted that the supply chain in this case includes electricity as an input, which we explore in more detail for specific sectors later in the paper. However, unlike value-added and employment multipliers, there is not a strong link with emissions multipliers. It suggests domestic linkages are not as strong a determinant of total emission intensity as they are for value-added and employment. Instead, the emissions intensity of the supply chain, including how much electricity and fuel is used, is more important. Sectors with hard-to-abate industries (e.g. steel, cement, fertilisers), including other non-metallics, basic metals, and chemicals, have a greater share of emissions intensity arising from production, and the former two sectors have the highest total emissions intensity of all manufacturing sectors.

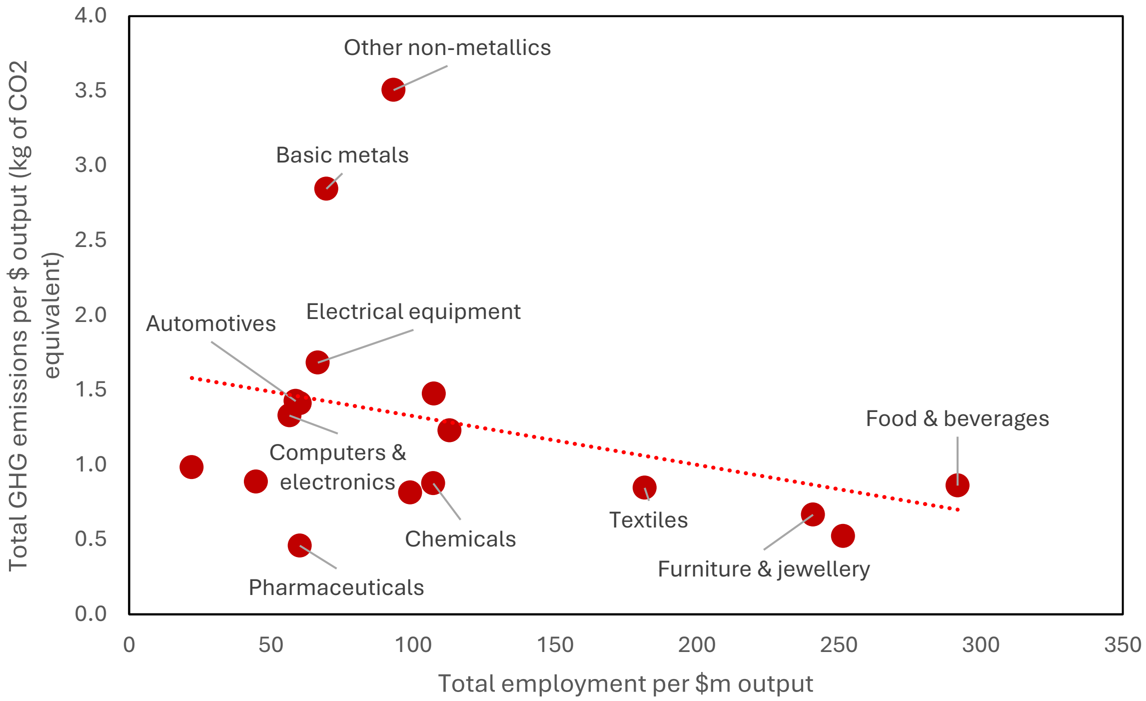
Chart 9: Manufacturing sectors ordered by total emissions per unit of demand, India, 2019



Data source: Authors' calculations, OECD Input-Output Tables 2023 release

Typically, employment-intensive sectors are less emissions-intensive. There is a negative relationship between employment and emissions intensity in manufacturing sectors (Chart 10). In other words, the more employment-intensive sectors are typically less emissions-intensive, and the more emissions-intensive sectors are typically less employment-intensive. For example, the furniture & jewellery sector generates 3.5 times more employment for each unit of demand than the electrical equipment sector, whilst emitting less than half. It suggests no prohibitive trade-off between employment and emissions across manufacturing in aggregate. There is naturally variation in the 'emission cost' of employment between specific sectors. For example, the food & beverages sectors, the most employment-intensive sector, generates nearly five times more employment than the pharmaceuticals and the automotives sector for each unit of demand. At the same time, the emissions intensity of food & beverages is close to double that of pharmaceuticals, but only 60% of automotives.

Chart 10: Manufacturing sectors by total emissions and total employment per unit of demand, India, 2019



Data source: Authors' calculations, OECD Input-Output Tables 2023 release

Across the top five highest and lowest emissions intensive and employment intensive manufacturing sectors (Table 1), the following observations are made:

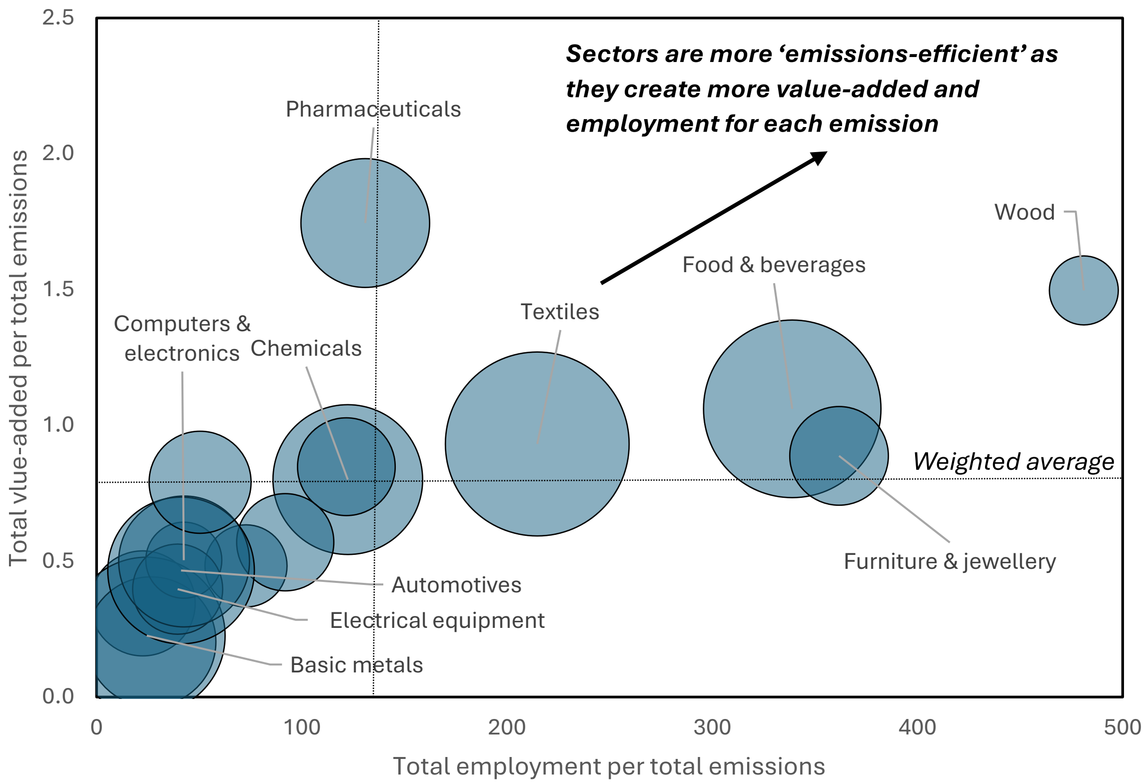
- The least emissions-intensive manufacturing sectors have high levels of employment intensity and very high export ratios, but low value-added multipliers.
- The most emissions-intensive manufacturing sectors have high value-added multipliers but low employment intensity and very low export ratios.
- The most labour-intensive manufacturing sectors have very high value-added multipliers, high export ratios, and low emissions intensity.
- The least labour-intensive manufacturing sectors have low value-added multipliers and average levels of emissions intensity and export ratios.

Table 1: Top 5 manufacturing sectors by emissions intensity and employment intensity

	Total emission rate	Total employment rate	Value-added multiplier	Export ratio
Least emissions-intensive sectors				
Pharmaceuticals	**0.46**	60.1	1.82	32.6%
Wood	**0.52**	251.5	2.16	29.8%
Furniture & jewellery	**0.67**	240.9	2.67	91.4%
Rubber & plastics	**0.81**	99.0	2.88	10.9%
Textiles	**0.85**	181.6	2.75	28.9%
Average	*0.66*	*166.6*	*2.45*	*38.7%*
Most emissions-intensive sectors				
Other non-metallics	**3.51**	93.1	2.10	5.2%
Basic metals	**2.85**	69.5	3.84	11.8%
Electrical equipment	**1.68**	66.5	2.92	17.3%
Paper	**1.48**	107.4	2.44	4.4%
Automotives	**1.43**	58.7	2.67	10.0%
Average	*2.19*	*79.0*	*2.79*	*9.7%*
Most labour-intensive sectors				
Food & beverages	0.86	**291.8**	5.22	11.3%
Wood	0.52	**251.5**	2.16	29.8%
Furniture & jewellery	0.67	**240.9**	2.67	91.4%
Textiles	0.85	**181.6**	2.75	28.9%
Fabricated metals	1.23	**112.9**	2.33	12.6%
Average	*0.82*	*215.8*	*3.03*	*34.8%*
Least labour-intensive sectors				
Coke & refined petroleum	0.98	**22.1**	3.54	37.2%
Other transport equipment	0.89	**44.7**	1.83	31.5%
Computers & electronics	1.33	**56.5**	2.79	16.9%
Automotives	1.43	**58.7**	2.67	10.0%
Pharmaceuticals	0.46	**60.1**	1.82	32.6%
Average	*1.02*	*48.4*	*2.53*	*25.6%*

Data source: Authors' calculations, OECD Input-Output Tables 2023 release

Chart 11: Manufacturing sectors by total value-added and employment per emissions created for each unit of demand, bubble size = share of GDP, India, 2019



Data source: Authors' calculations, OECD Input-Output Tables 2023 release

Five sectors are significantly above average in either their value-added or employment per emissions, as could be categorised as highly 'emissions-efficient'. Chart 11 plots manufacturing sectors against both their total value-added and total employment on a per emissions basis. In other words, for every unit of demand, how much value-added and employment each sector creates per emissions. The bubble size indicates the share of GDP and dotted lines indicate a weighted average by GDP. Four sectors fall above the weighted average for both employment and value-added on a per emission basis and could be classified as highly 'emissions-efficient': wood, furniture & jewellery, food & beverages, and textiles. These sectors are 4 of the top 5 most labour-intensive sectors in Table 1, with Chart 11 visualising the stylised facts identified above. That is, labour-intensive sectors have relatively low emissions intensities and high value-added multipliers. The remaining labour-intensive sector, fabricated metals, sits near chemicals on the weighted average lines. Another sector, pharmaceuticals, could also be classified as highly 'emissions-efficient' for its very high total value-added per total emissions ratio, despite a more average total employment per total emissions ratio. A few additional sectors are close or slightly above average in some regard, including chemicals, fabricated metals, and computers & electronics. Most sectors, however, sit in the bottom left of the chart.

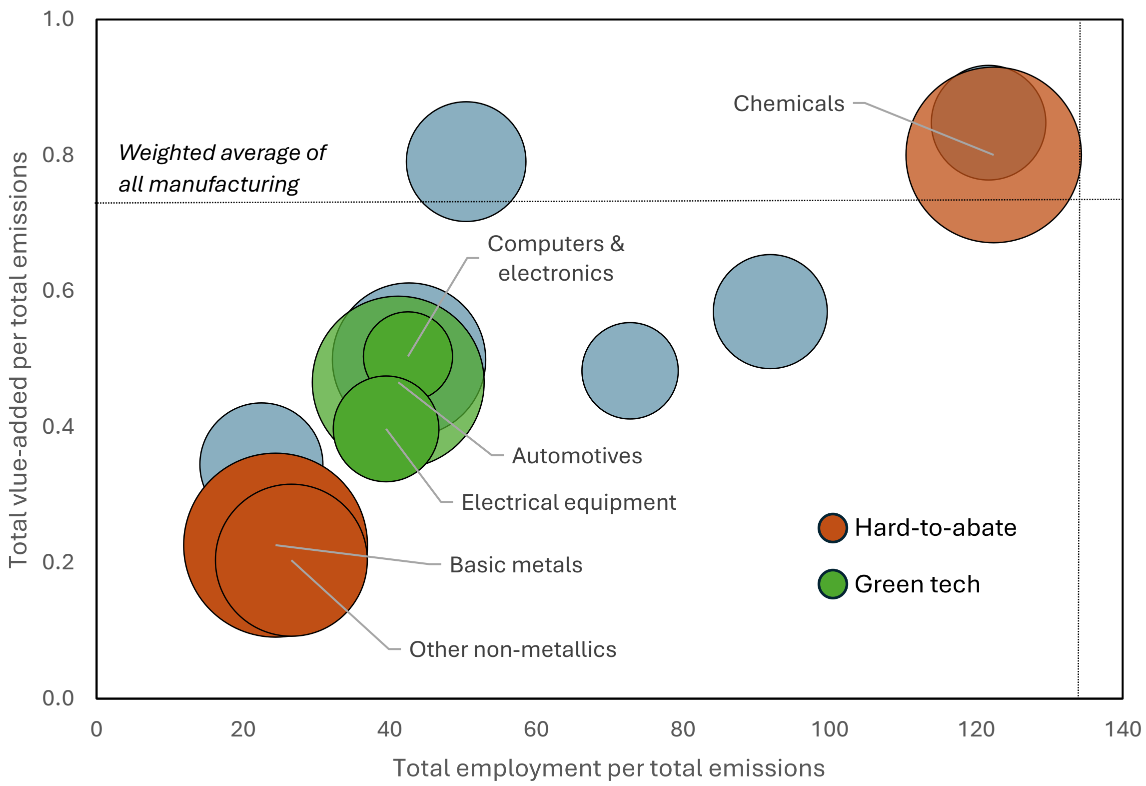
Emissions-efficient sectors will still have climate and environmental consequences but do not present as much risk to a economic development and net-zero pathway. At a macroeconomic level, these sectors offer large output, employment, and export potential at a relatively low emissions cost. That doesn't mean they present no environmental or climate risk. For example, textile manufacturing is still resource-intensive and can have significant environmental consequences, because of local pollution or relatively more energy-intensive production methods. Nevertheless, they will be most suitable to driving forward economic growth and net zero goals simultaneously. As such, the paper now focuses on the sectors that will most impact, and be impacted by, the net zero transition.

Section 3: Net zero relevant manufacturing sectors – an international comparison

Specific manufacturing sectors will underpin the net zero transition. The Government of India has identified key manufacturing industries through Viksit Bharat 2047 and manufacturing plans. Manufacturing priorities are categorised as high-tech (e.g. electronics, semiconductors, automotives, chemicals), nascent (e.g. batteries, solar panels), and labour-intensive (e.g. food & beverages, textiles, leather). Further, sectors such as steel, cement, and fertilisers are important government priorities, and notable hard-to-abate industries.

Six manufacturing sectors are identified as most critical to the net-zero transition in India. Based on Government priorities and the requirements of the net zero transition, the automotives, electrical equipment, computers & electronics, basic metals, other non-metallics, and chemicals are explored in more depth. These sectors can be split into two groups. The first 'green tech' group includes automotives, electrical equipment, and computers & electronics. These are sectors which include key green products and technologies where demand is expected to grow considerably due to the transition (e.g. EVs, solar panels, batteries). However, it's important to note these broad sectors can contain the 'brown' alternatives they are displacing. The second 'hard-to-abate' group includes basic metals, other non-metallics, and chemicals. These are sectors where existing technology makes emissions reduction prohibitively costly (e.g. steel, cement, fertilisers). Demand for these products will continue but incentives will shift towards greener production, which depending on innovation and global transitions, may cause a displacement of 'browner' products for 'greener' products.

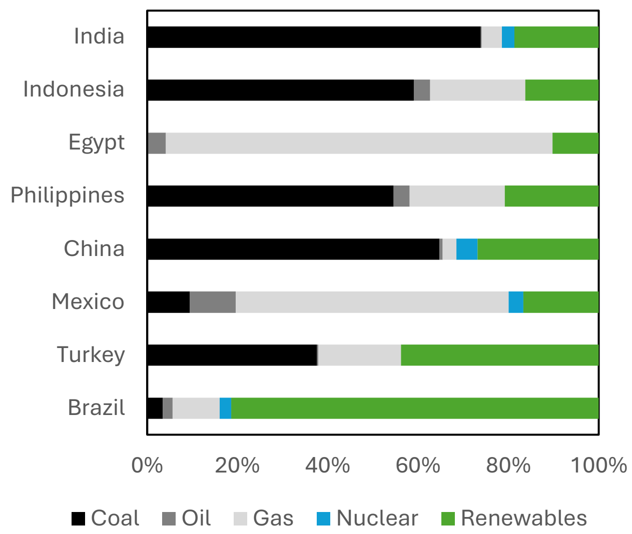
Chart 12: Selected manufacturing sectors by total value-added and employment per emissions created for each unit of demand, bubble size = share of GDP, India, 2019



Data source: Authors' calculations, OECD Input-Output Tables 2023 release

Net zero relevant sectors are less employment-intensive and there is not a large difference between green tech and hard-to-abate sectors. Except for the chemicals sector, total employment generation in the net zero relevant sectors is low. Two sectors, computers & electronics and automotives, are in the top 5 least employment-intensive sectors (Table 1). Electrical equipment and basic metals have similar levels of employment intensity. On a per emission basis, as expected, hard-to-abate sectors are relatively less 'emissions-efficient' (except for chemicals). In other words, these sectors have a high emissions-intensity and, when compared to the more labour-intensive sectors, do not generate sufficient value-added or employment to account for this. The chemicals sector does offer modest employment and value-added potential on a per emissions basis which as mentioned above, is primarily coming from the supply chain. More surprisingly, green tech sectors are not much more emissions efficient than the hard-to-abate sectors (Chart 12)

Chart 13: Electricity generation by source for select emerging markets, ordered by emissions per output of electricity sector, 2019



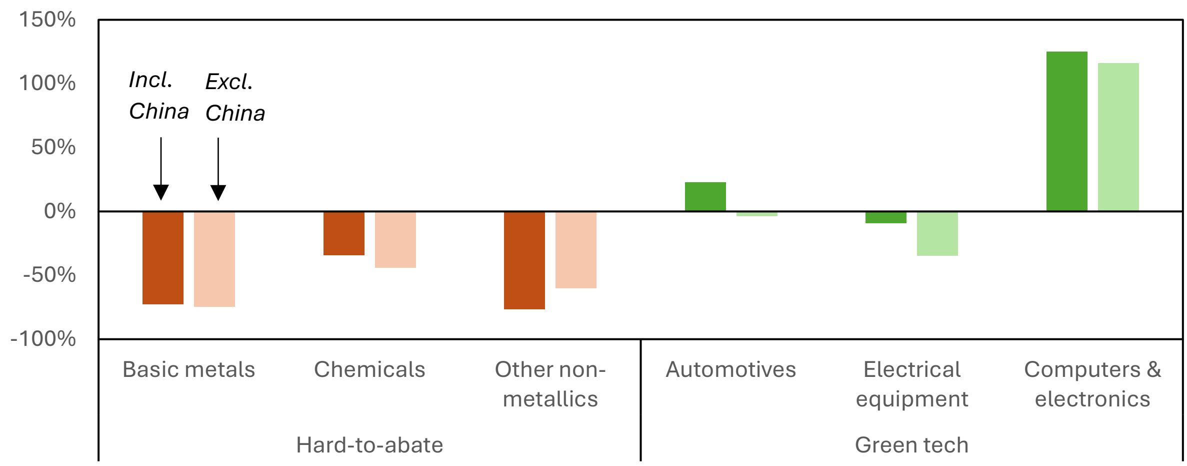
Electricity, gas, steam & air conditioning supply sector, GHG emissions per output, kg of CO2 equivalent, 2019	
India	8.8
Indonesia	5.3
Egypt	5.2
Philippines	4.9
China	4.9
Mexico	3.9
Turkey	2.2
Brazil	0.8

Data source: OECD Input-Output Tables 2023 release, OWID electricity generation by source

In comparison to other emerging markets, India has a relatively more emissions intensive electricity sector which will impact the emissions intensity of production elsewhere. India's electricity sector is more emissions-intensive than other emerging markets (Chart 13). This can be seen both in terms of the share of coal and renewables in the electricity mix, as well as the emissions intensity of the electricity sector, which is a large input to other sectors. Of these emerging markets, India has the highest share of coal usage (74%) and a reasonably low share of renewables usage (19%). This is likely the biggest driver of India having the largest emissions per output in the electricity, gas, steam & air condition supply sector. Below India, countries including Indonesia, Egypt, Philippines, and China all have similar levels of emissions intensity and, except for Egypt who has the lowest share of renewables in the sample, large shares of coal usage. The higher emissions intensity in the power sector would be expected to feed through into a higher emissions intensity in sector production.

Compared to a weighted basket of emerging markets, labour productivity in India is lower in the hard-to-abate sectors but more mixed in the green tech sectors. Labour productivity in each sector is compared to a weighted basket of emerging markets, including Indonesia, Egypt, Philippines, China, Mexico, Turkey, and Brazil (Chart 14). Another basket excluding China is created, as they can account for between 70-90% of market share in the sample. In the hard-to-abate sectors, labour productivity is around a third lower in chemicals, and around three-quarters lower in basic metals and other non-metallics. Despite lower productivity, India's global market share in these industries has increased and products across metals and chemicals offer some of the greatest growth opportunities, according to the Atlas of Economic Complexity. In the green tech sectors, India has a higher labour productivity than the emerging markets basket in automotives (excluding China) and in computers & electronics. In electrical equipment, it is only marginally less productive than the basket excluding China. However, current production is not yet focused on net zero products (such as EVs), and except for automotives, these sectors are small parts of the Indian economy (<0.5% of GDP). Nevertheless, again as per the Atlas of Economic Complexity, vehicles, machinery, and electronics offer significant growth opportunities.

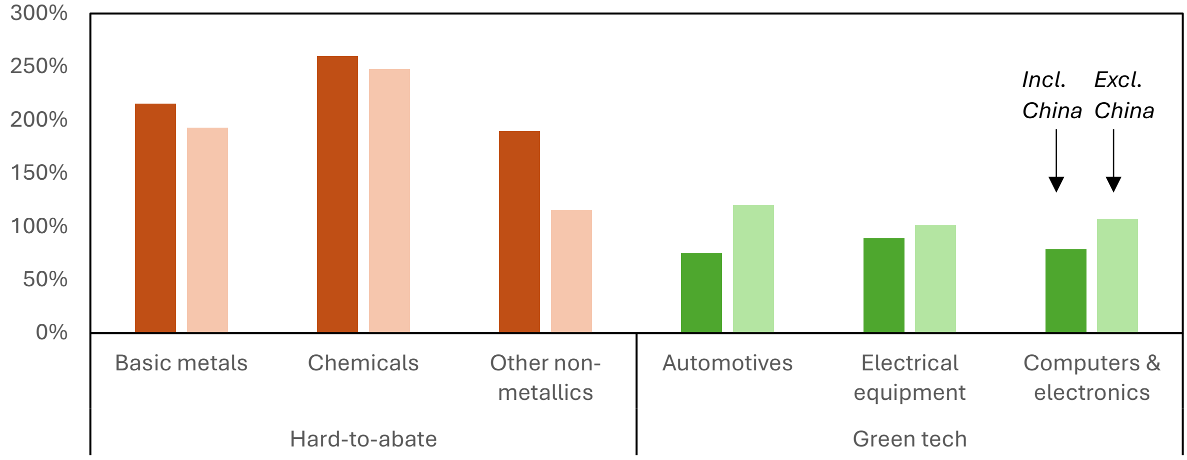
Chart 14: Difference in labour productivity (value-added per worker) between India and a weighted basket of emerging markets (including and excluding China), 2019



Data source: Authors' calculations, OECD Input-Output Tables 2023 release

India is significantly more employment-intensive across all net zero relevant sectors. The total employment intensity is calculated for each emerging market individually, incorporating the supply chain, and then aggregated into a weighted basket (including and excluding China). Across the board, India is notably more employment-intensive (Chart 15). At the lower end, India is between 75-120% more employment-intensive in the green tech sectors. At the higher end, in the hard-to-abate sectors, India is between 185-260% more employment-intensive, except for in electrical equipment when excluding China, where it is 115% more employment-intensive. India's high employment intensity does not always come at the expense of low labour productivity (Chart 14 and 15). In the green tech sectors, despite higher employment intensity in automotives and computers & electronics, India's relatively good labour productivity matches countries with much lower employment intensity. In electrical equipment, whilst labour productivity remains relatively low and employment intensity relatively high, there does not appear to be a direct substitution. In the hard-to-abate sectors, particularly basic metals and other non-metallics, India's low labour productivity is matched by having the highest employment intensity. In chemicals, similar to electrical equipment, the relatively low labour productivity is not directly matched by a higher employment intensity, although the latter remains high.

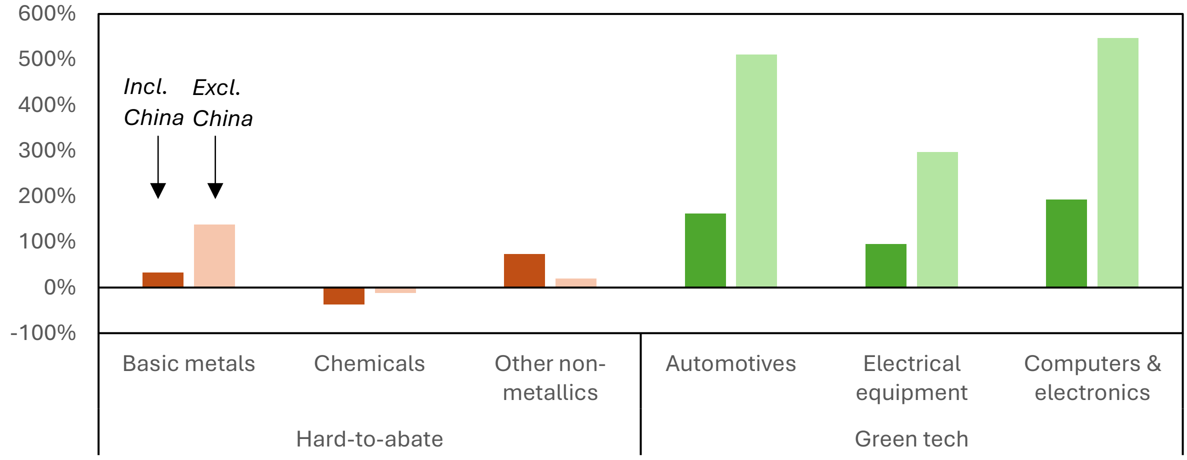
Chart 15: Difference in employment intensity (total employment per $m output) between India and a weighted basket of emerging markets (including and excluding China), 2019



Data source: Authors' calculations, OECD Input-Output Tables 2023 release

India is generally more emissions-intensive, but this is much more significant in the green tech sectors, with more variation in the hard-to-abate sectors. Similarly to employment, total emissions intensity is calculated for each individual country and then weighted together, including and excluding China. Starting with the green tech sectors, India is considerably more emissions-intensive and massively so when excluding China. For instance, India's automotive production is around 160% more emissions-intensive than the emerging market basket including China, but over 500% more emissions-intensive when excluding China. In the hard-to-abate sectors, differences in emission intensity are much smaller. India is more emission-intensive in basic metals (over 30% more including China and over 130% excluding China) and in other non-metallics (over 70% more including China and 20% more excluding China). In chemicals, India is less emission-intensive than the basket including (over 35% less) and excluding (over 10% less) China.

Chart 16: Difference in emissions intensity (total GHG emissions per $ output) between India and a weighted basket of emerging markets (including and excluding China), 2019



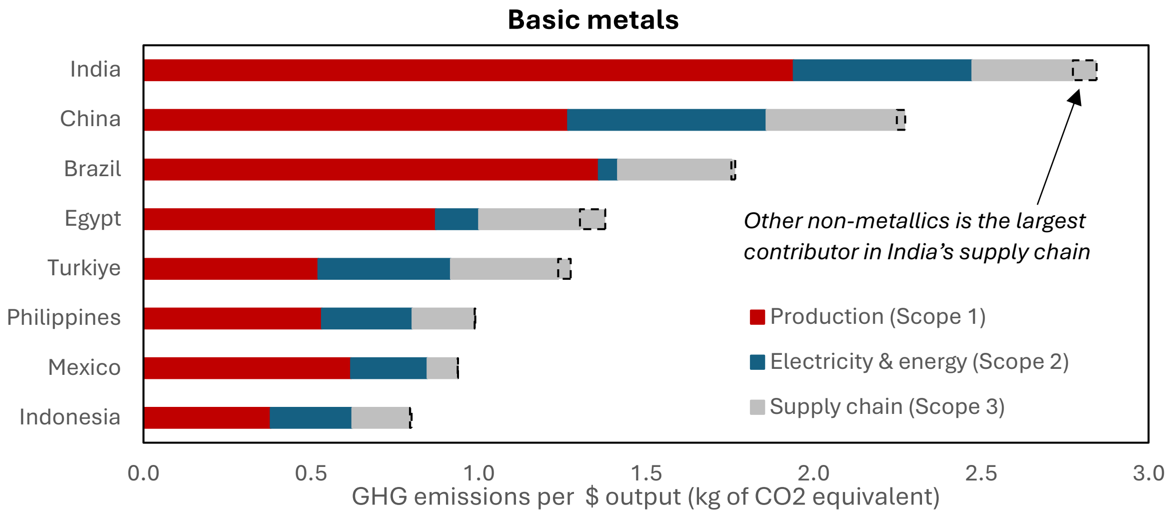
Data source: Authors' calculations, OECD Input-Output Tables 2023 release

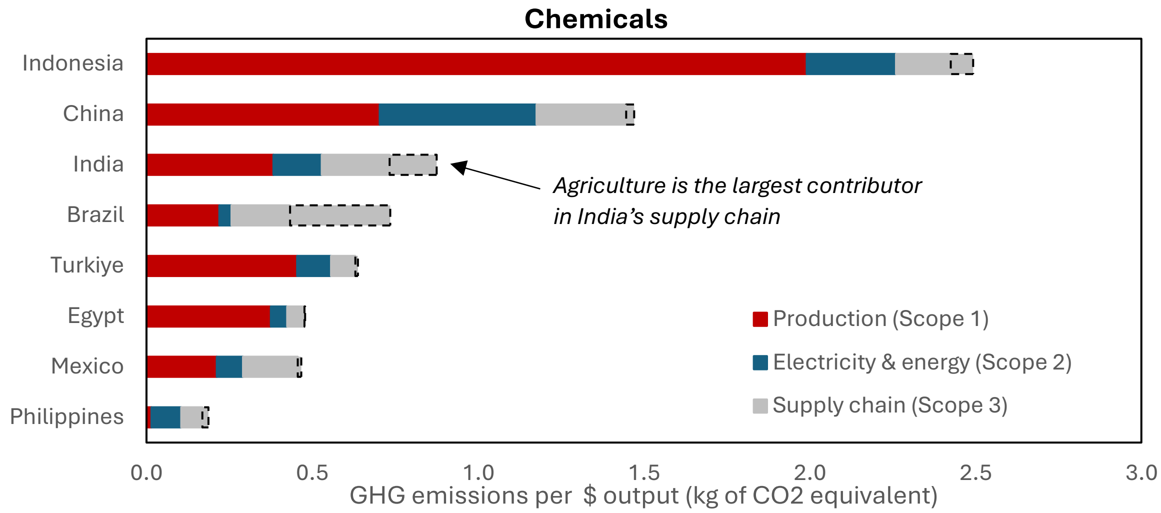
Differences in employment and emissions intensity are not wholly explained by differences in domestic economy linkages. In theory, if 'direct' employment and emission intensity in different sectors were equal across countries, then changes in 'total' employment and emission intensity could arise from changes in the share of domestic inputs. In other words, more emissions and employment could be generated domestically because there is more domestic production in the supply chain. On average across the six sectors and eight emerging markets, India has around the third highest share of domestic inputs, with China and Brazil often topping the lists. India has higher domestic input shares in basic metals and electrical equipment, and lower domestic input shares in other non-metallics. It suggests significant parts of the variation are coming from different employment and emission intensities embodied in production methods and/or differences in the composition of the supply chain.

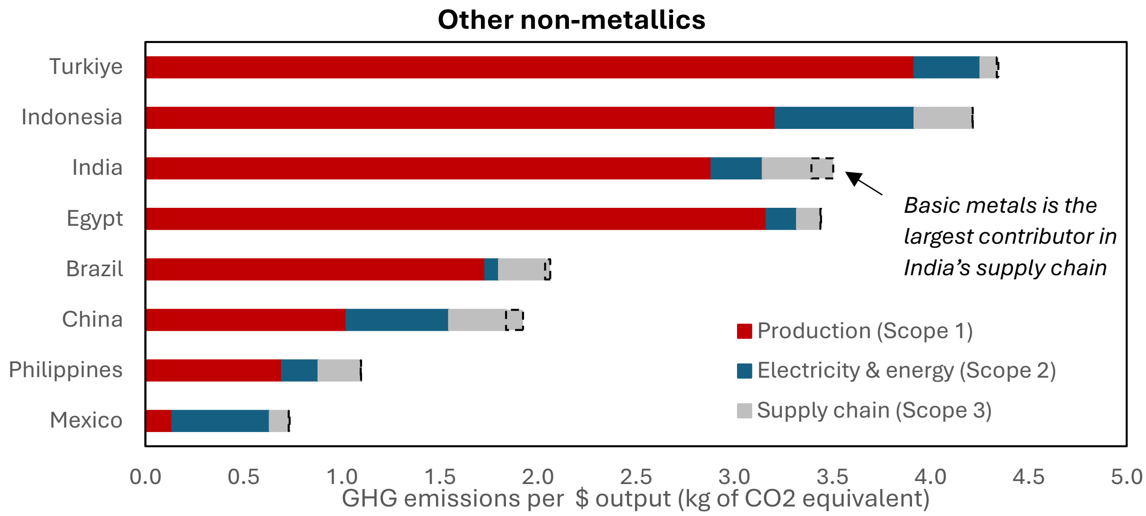
In hard-to-abate sectors, most of the emissions intensity comes from production and India is only more emissions-intensive than average in basic metals. As expected and by definition, the biggest contributor and often majority share of emissions intensity comes production (i.e. Scope 1 emissions), which is typically true for all eight emerging markets analysed (Box 2a). The contribution of electricity and energy (i.e. Scope 2 emissions) is often the second largest contributor but this varies. For example, it is true for India but not Brazil in basic metals, and for China but not India in chemicals. The contribution and composition of the supply chain contribution (i.e. Scope 3 emissions) also varies. For example, agriculture is the largest sector contribution in the domestic supply chain of India and Brazil, but not elsewhere. This is either because there are variations in input requirements or agricultural inputs (and thus emissions) are being imported. India has by far the largest emission intensity in basic metals, 25% higher than second-place China. In chemicals and other non-metallics, India has the third-highest emission intensity, 65% lower than first-place Indonesia and 20% lower than first-place Turkiye respectively.

In green tech sectors, India is significantly more emissions-intensive because of the contribution from electricity & energy and basic metals. Compared to other emerging markets (Box 2b), India has the highest emissions intensity in automotives (110% higher than second-place China), electrical equipment (76% higher than second-place China), and computers & electronics (71% higher than second-place Indonesia). Across all countries, the vast majority of emissions are generated by electricity & energy and the supply chain (i.e. Scope 2 and 3 emissions) but this varies by country. In India, the contribution from electricity & energy alone is higher than the total for all other emerging markets in automotives, computers & electronics, and all but China in electrical equipment. In the supply chain, the basic metals sector is the largest contributor across all three green tech sectors in India, and to varying degrees for other countries. As detailed in the previous paragraph, the basic metals sector in India is significantly more emissions-intensive than in the other emerging markets. Again, it's unclear how much of the difference arises because of variations in input requirements versus inputs being imported.

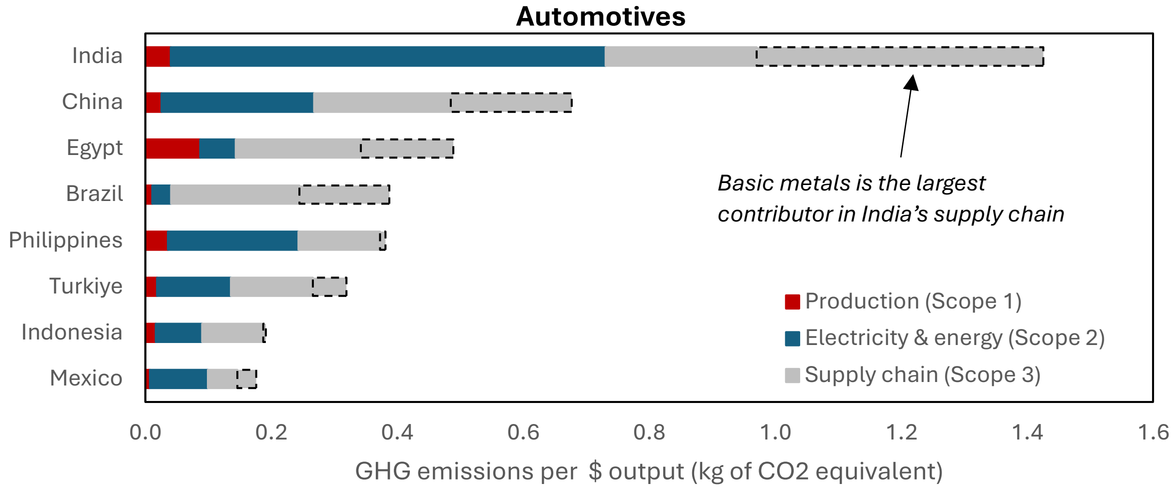
Box 2a: Composition of total emission intensity of hard-to-abate sectors by country

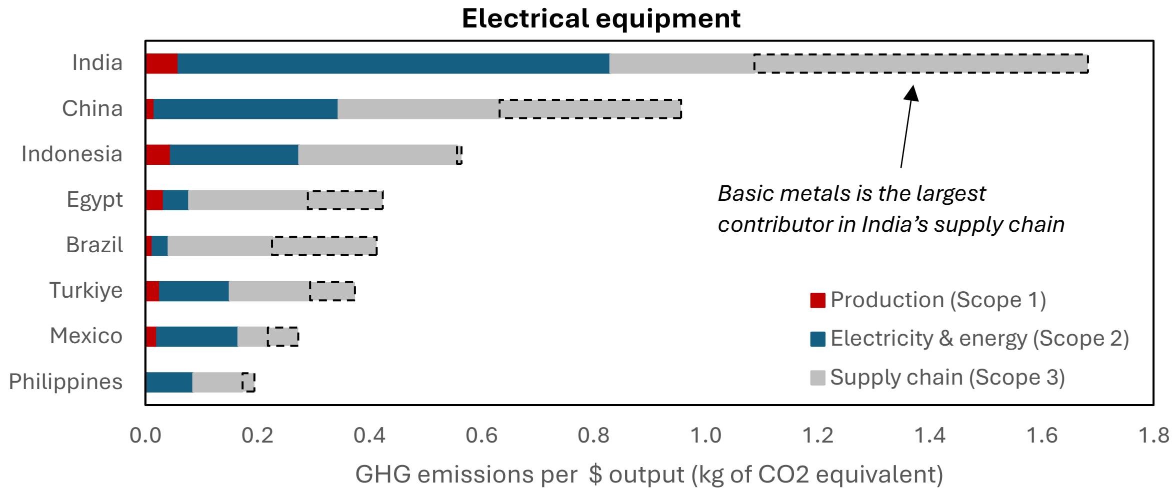


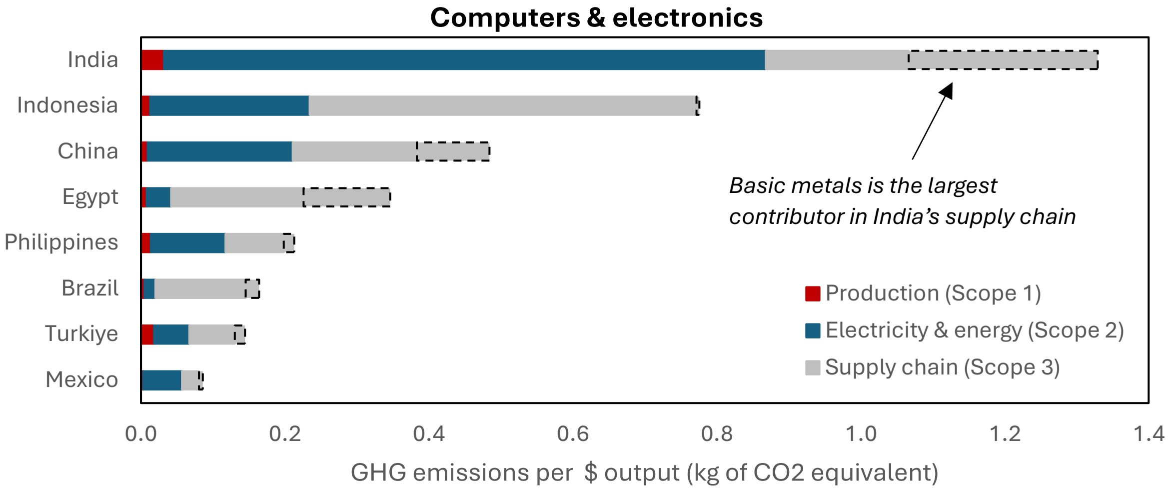




Box 2b: Composition of total emission intensity of green tech sectors by country







The more emissions-intensive nature of India's net zero relevant manufacturing sectors means they will face a higher cost if subject to carbon pricing. Carbon pricing instruments[7] now cover around 24% of global emissions and those under consideration are expected to bring coverage above 30% by 2030. There are now 75 such instruments in place worldwide, with key markets such as the UK, EU, China, Japan, and Australia all covered. India itself adopted the legal basis for an emissions trading scheme (ETS) in 2022. There remains large variation in the carbon price by jurisdiction and most markets are below the recommended $63-127 per tCO_2e that is needed to limit temperature rises to below 2°C. The World Bank estimate a global total carbon price of around $35 per tCO_2e in 2021. Compared to a weighted average of emerging markets (including and excluding China), India could face a significantly higher carbon cost per each unit of output in nearly all net zero relevant sectors (Table 2). This could be over 500% higher in computers & electronics and automotives, and nearly 300% higher in electrical equipment. Likewise, up to 73% higher in other non-metallics and 138% higher in basic metals. Only in the chemicals could India see a lower carbon cost, potentially up to one-third lower.

Table 2: Estimated carbon cost per unit of output in net zero relevant sectors, for India and a basket of emerging markets

Sector		Estimated carbon cost per unit of output (at $35 per tCO_2e)	
		Weighted average of emerging markets (incl. & excl. China)	**India**
Hard-to-abate	Basic metals	$42-75	$100
	Chemicals	$35–48	$30
	Other non-metallics	$71-103	$123
Green tech	Automotives	$8-19	$50
	Electrical equipment	$15-30	$59
	Computers & electronics	$7-16	$47

Data source: Authors' calculations, OECD Input-Output Tables 2023 release, State and trends of carbon pricing World Bank 2024

A higher carbon cost may leave India exposed to a competitive disadvantage in net zero relevant manufacturing sectors. The EU and UK are planning to implement carbon border adjustment mechanisms (CBAMs) which apply a carbon price equivalent to the domestic ETS price to imports of certain products, including iron & steel, aluminium, fertilisers, cement, hydrogen, and electricity (EU). Therefore, hard-to-abate sectors in particular are directly in scope of facing a charge from the EU and UK CBAM, and the EU ETS2 is extended coverage. By extension, if these hard-to-abate sectors face a carbon price, there could be knock-on effects downstream and, as above, this is likely to affect the green tech sectors that rely heavily on the basic metals sector. Initially, exports of such products may find opportunities in markets that do not have a carbon price but there will be incentives to invest in cleaner products to gain a competitive advantage. At the same time, despite debate over policy design, CBAMs are incentivising countries to consider their own carbon pricing regime, not least in India, to reduce CBAM costs and retain revenue domestically. As carbon pricing regimes increase in frequency

[7] These refer to direct carbon pricing instruments such as carbon taxes and emissions trading schemes. Indirect pricing instruments such as fuel subsidies and fuel taxes are not covered.

and price, either in India or abroad, less carbon-intensive production or goods will be become relatively more competitive. Given India's more carbon-intensive production across all net zero relevant manufacturing sectors except chemicals, it suggests India could face a competitive disadvantage.

As countries seek to diversify supply chains, India could leverage its geopolitical advantage to strengthen trading relationships. The past decade has seen a reorientation of trade and economic linkages along geopolitical lines, following US-China trade tensions and Russia's invasion of Ukraine. Geopolitical competition is intensifying over emerging technology and resources, with net zero industries as key targets. There is a growing appetite amongst policymakers in higher-income countries for greater supply chain diversification and less strategic dependence, exemplified by China+1 strategies. So far, the evidence remains mixed on whether the reorientation underway has realised these goals, rather than simply rerouting trade through 'third countries'. Nevertheless, opportunities to capture manufacturing value chains are rising, with India emerging as a favourable location, both economically and politically.

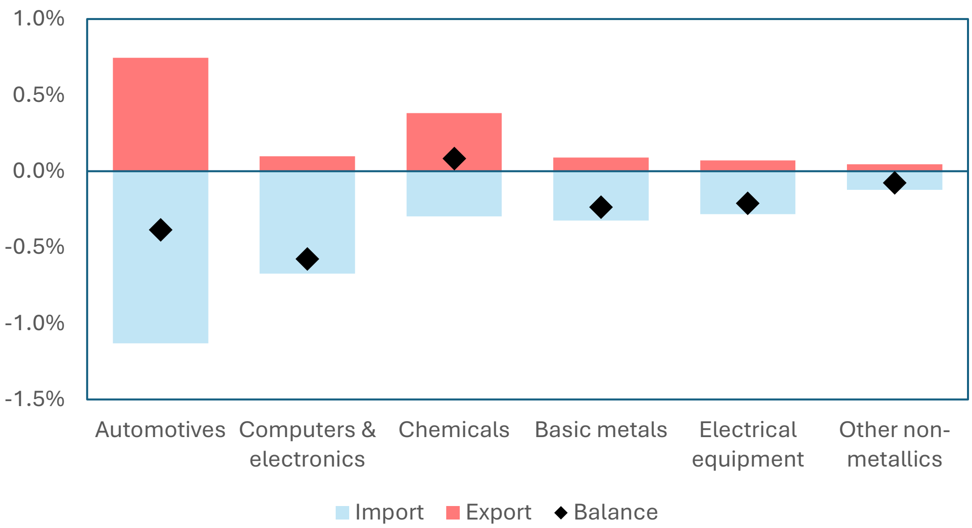
Lowering the carbon cost will require power sector decarbonisation as well as energy efficiency measures, all of which require investment. A large share of emissions intensity comes from electricity & energy, particularly in green tech sectors (Box 2), which is driven by the high carbon intensity of India's energy mix (Chart 13). If the emissions intensity of the electricity & energy sector was lowered to match China[8], India would face a carbon cost per unit of output that is 42% lower in electrical equipment, 48% lower in automotives, and 63% lower in computers & electronics. Outside the power sector, new or more efficient production methods can bring down the carbon cost but this will require investment and there may be broader challenges to economic viability. This will be most pronounced in hard-to-abate sectors, where there are more Scope 1emissions. For example, moving steel production from blast furnaces to electric arc furnaces. Specific sector interventions are not explored in detail in this paper but a greater investment requirement is assumed.

Section 4: Challenges in the UK and the rationale of a linked carbon market

[8] In the basket of emerging markets, China has the second highest emissions-intensity in computers & electronics and automotives. It has the third highest emission-intensity in electrical equipment. The share of coal and renewables in China's electricity system is 65% and 27% respectively.

The UK is a net-importer across most net zero relevant manufacturing sectors. The UK is a net importer of goods, which holds across most of the net zero relevant manufacturing sectors (Chart 17). Of these, automotives is the largest both in imports and exports. The UK EV market is dominated by imports of cars manufactured in China, as well as import-dependence across the full EV supply chain. The rollout of EVs in the UK remains off-track from key government targets. The UK is a net importer in other green tech sectors, including computers & electronics and electrical equipment, and does not manufacture solar panels. In the hard-to-abate sectors, chemicals is a significant manufacturing sector in the UK. It is one of few where it is a net exporter, but there are concerns over long-term competitiveness. In basic metals, and steel in particular, the UK has wrestled with long-term decline as cost pressures have squeezed out domestic production. The hope is for UK steel to be more competitive in greener production, including a UK government deal with Tata steel to transition production to the use of electric arc furnaces, though import-dependence in specific steel products is likely. Lastly, the UK is a net importer in the other non-metallics sector, which include cement and ceramics. As mentioned previously, the UK CBAM covers products across the hard-to-abate sectors.

Chart 17: Import and export in net zero relevant manufacturing sectors, ordered by total trade, share of GDP, UK, 2019



Data source: OECD Input-Output Tables 2023 release

The UK incentivises decarbonisation through the emissions trading scheme which risks carbon leakage. The UK emissions trading scheme (ETS) operates a cap-and-trade approach, whereby sectors covered by the scheme have an emissions cap that decreases over time. It is viewed as a key feature of UK net zero plans to 2050. Participants in the scheme receive free allowances and/or buy emission allowances, which can be traded as needed. As of early 2024, the UK ETS carbon price hit an all-time low, due to slower economic activity and generous allowances, raising concern of slower decarbonisation. The UK ETS covers aviation, power, and energy-intensive industries, including several products within the basic metals sector (steel, iron, aluminium), other non-metallics (cement, glass, ceramics), and chemicals. Introducing and increasing a carbon price risks carbon leakage. This is the movement of production and their associated emissions to jurisdictions with lower carbon prices or less stringent climate regulation, as higher carbon prices increase production costs and expose industries to import competition. Currently, free allowances within the UK ETS are the primary mechanism to prevent this. Ultimately, preventing carbon leakage requires some form of equalisation, which can come through pricing, standards, or subsidy.

To prevent carbon leakage, the UK will introduce a carbon border adjustment mechanism. As mentioned in the previous section, the UK will introduce a carbon border adjustment mechanism (CBAM) in 2027 to prevent carbon leakage, as free allowances in the UK ETS reduce from 2026. The CBAM applies a carbon price equivalent to the UK ETS carbon price to imports of iron & steel, aluminium, fertilisers, cement, and hydrogen, with glass and ceramics expected at a later date. Responses to the UK's CBAM consultation highlighted concerns around cost and compliance, and there were further considerations around better recognising variation in national emissions intensities and implicit carbon pricing measures, such as fuel taxes. Analysis of the EU CBAM suggests lower-income countries, particularly in Africa but also India, may suffer the largest GDP losses. Variations in policy design will affect the impact of CBAMs, such as how trading partners can measure the emission embodied in production and what values will be used if they cannot. The exposure to CBAMs more generally depends on the extent of trade flows between blocs, how carbon intensive production in, and the differences in carbon pricing regimes.

Across key sectors, the UK faces a strategic choice between a less costly transition versus economic security and domestic production. Strategic competition over emerging technology and resources has intensified. In 2024, America and the EU placed tariffs on Chinese EVs, followed by China banning the export of rare minerals to the US. The use of industrial policy and subsidies has become more commonplace and forced countries to respond. China has developed its position as a market leader in new industries and their supply chains, including EVs, solar panels, ad wind turbines, which has led to overcapacity and market dominance in strategic areas. This is in addition to China's existing manufacturing dominance, and similar overcapacity challenges, in sectors such as steel, computers & electronics, and electrical equipment. It presents a strategic choice for the UK (and other importers such as the EU). On one hand, cheaper green tech and products will lower the cost of the net zero transition domestically and globally. On the other, national industries will be unable to compete and strategic control in key areas will diminish. Navigating this trade-off will be central to determining the UK's climate and industrial priorities this decade.

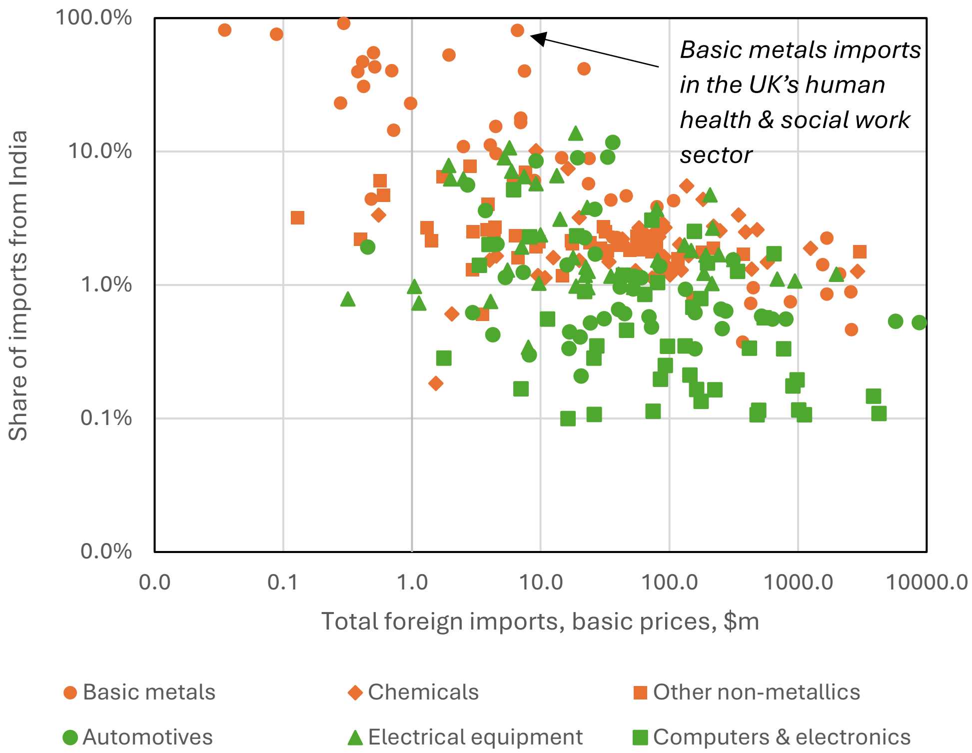
India-UK cooperation in net zero manufacturing sectors will suit mutual economic, climate, and security priorities. India wants to build competitiveness in emerging manufacturing sectors and in sectors exposed to green competition, whilst charting their own path to net zero. The UK wants to strike the right balance between supporting efficient decarbonisation (domestically and globally) with economic security, with partners like India being strong candidates to smooth this trade-off. This means a net flow of goods from India to the UK and a net flow of finance from the UK to India. There are clearly uncertainties over the extent to which a relationship could develop across different sectors and further work should explore specific products. But it's clear that realising both objectives in the most efficient way will require greater cooperation in climate, trade and investment.

There are existing areas where India-UK trade in net zero relevant manufacturing sectors is important from both perspectives. India has a greater UK market share in hard-to-abate sectors, all are close to 2%, compared to green tech sectors, where it ranges from 0.4% in computers & electronics to 1.5% in electrical equipment (Table 3). Conversely, a higher share of India exports to the UK are in green tech sectors (between 2.3-2.7%) than hard-to-abate sectors, except for non-metallics where 3.2% of India exports go to the UK. The share and size of UK imports from India are visualised in more detail in Chart 18. Each point represents a UK sector and its imports from a specific net-zero sector, capturing the total size of the net-zero imports on the x-axis and the share that comes from India on the y-axis. For example, the point highlighted shows the basic metals imports in the UK's human health & social work activities sector. It shows that it imports a total of $6.6m from the basic metals sector globally and 81% of that comes from India. As expected, the majority of hard-to-abate imports fall around 1-3% in market share, and green tech imports fall below 1%. India does have significant market share (above 20%) in the basic metals imports of several UK sectors, albeit relatively small market individually. There is a further cluster of relatively high market shares (5-14%) in slightly larger markets across hard-to-abate and green tech sectors, particularly in electrical equipment. Lastly, primarily in hard-to-abate sectors, there are instances of modest market shares in very large markets.

Table 3: Bilateral trade and investment, India and UK, 2019

Sector	Share of UK sector imports from India	Share of India sector exports to UK
Basic metals	2.0%	1.4%
Chemicals	1.8%	1.3%
Other non-metallics	1.9%	3.2%
Automotives	0.6%	2.7%
Electrical equipment	1.5%	2.6%
Computers & electronics	0.4%	2.3%

Chart 18: UK imports from net-zero relevant sectors by sector, 2019



Data source: OECD Input-Output Tables 2023 release

A linked carbon market could enhance trade, investment, and support decarbonisation. Linking carbon markets effectively means expanding ETS systems, increasing the number of participants and in theory allowing the market to gain greater efficiency, stability, and liquidity. Linkage could be entire markets or specific sectors. A direct 'two-way' linkage is where both ETS authorities recognise the allowances of one another and allow trading in both directions. A unilateral link is where the purchasing of permits only flows in one direction, only practical if the sellers ETS had a lower carbon price than the buyer, otherwise there would be no incentive to trade. Very few instances currently exist. The EU ETS has linkages with Norway, Iceland and Liechtenstein. However, given the benefits described more below, there have been internal discussions and analysis around the potential of a linked China-EU carbon market in the future.

Linking carbon markets can make international mitigation more cost-effective whilst removing competitiveness concerns. Expanding carbon markets allow the optimisation of abatement across more options and areas. A carbon price does this inherently, by equalising marginal abatement costs and incentivising reductions where it costs the least. By linking ETSs, higher-cost emission reduction options in one ETS are replaced by lower-cost emission reduction options in the other ETS. Carbon prices between the two systems would converge, with greater gains to be made from linking systems with larger price differentials. The initial allocation of allowances in the two systems is a significant determinant of the direction of trade. In a linked market between higher and lower-income countries, due to emissions profiles and climate commitments, the former would be expected to be net importers of allowances whereas the latter would be net exporters. Linking markets removes the risk of carbon leakage as there is no need to equalise between different carbon prices, thus eliminating any competitive distortions that could arise.

Creating a joint India and UK market would open opportunities to raise finance in India and protect export-oriented sectors, whilst supporting a lower cost transition in both countries. As the cost of marginal abatement in the UK is higher, there would be significant demand for emissions reduction credits from India, channelling international finance for emissions reduction investment whilst creating financial incentives for greater emissions cuts. This would make it cheaper for the UK to decarbonise whilst increasing finance in India. Equalising the carbon price between the UK and India would also mean zero charge from the UK CBAM and indirectly mitigate border adjustment charges elsewhere, such as the EU. On the downside, a linked market would likely increase climate stringency and the carbon price in India, causing higher production costs. For the UK, it may do the opposite, diluting climate stringency and slowing decarbonisation, as it effectively allows UK firms to pollute more at the expense of abatement in India. Nevertheless, it's important to remember that the joint market aims to improve outcomes at the India-UK aggregate, sending a powerful signal and improving efficiency.

Joining markets would be a long-term objective that could start in specific sectors. India's National Carbon Trading Scheme was introduced in 2022 and is expected to start trading in 2025. Fundamentally, this should help lower the cost of mitigation in India by incentivising least-cost abatement options. Analysis suggests a carbon market that covers industrial and power sectors in India with ambition commensurate with voluntary commitments in the corporate sector would lower the emissions intensity of India GDP by 5.6% in 2030 and lower the total cost of emissions reduction by 28%. ETS can use caps on absolute emissions or emissions intensities. The UK (and EU) ETS use an absolute cap. Absolute caps limit emissions based on quantity and used where concerns are solely on the amount of emissions, and thus more directly related to driving down emissions. An intensity cap, measured relative to output or GDP, considers two variables – namely emissions and GDP simultaneously. India, like China, would likely opt for an intensity cap to start with due to their NDC target and growth objectives. This creates more volatility and less predictability in the price, as the cap is not fixed and may adjust if economic growth deviates from projections, and so could affect companies investment decisions. In cases of economic certainty, however, both caps operate identically. Linking markets with absolute caps and intensity caps is more challenging but possible, and research suggests negative consequences may only arise in a situation with unexpected growth in the net exporter (i.e. India) and an unexpected contraction in the net importer (i.e. UK). Like other markets, India could benefit from providing free allowances to incumbent firms, protecting their competitiveness in the short-term and developing stakeholder buy-in. Linking markets would be a long-term process which can come in many forms. Limiting the linkage to certain sectors or types of permits that can be exchanged can help limit any negative consequences of full linkage, whilst preparing jurisdictions for further ambition if desired. If there is ambition for future linkage, considering compatibility and priorities early will help inform the design and implementation of markets today, expanding options for the future.

Annex 1 – Input-output tables and Leontief Inverse matrix

This section describes the data and methodology used to provide estimates of employment, emissions, and output intensities and multipliers.

The data comes from the OECD extended inter-country input-output tables database. This describes the flows of production, consumption, and investment within and between countries, broken down by economic activity and country. It covers 76 countries (with the remainder captured in a 'rest of world' entity') and 45 economic sectors. This is combined with the OECD greenhouse gas footprint indicators dataset and the OECD trade in employment dataset, which contains emissions and employment data for each economic sector respectively.

Input-output tables describe how products are used to produce further products and satisfy demand. For each economic sector, it details the output (from intermediate and final demand) and the input (intermediate demand) from every other country and sector covered in the tables. Using input-output tables, a matrix of coefficients can be created by dividing each input entry by the total input required in each sector, taking a value between 0 and 1. For each sector, this describes the distribution of inputs by monetary value, allowing users to analyse direct relationships with the economy. The Leontief Inverse expands on this by taking indirect relationships into account. It is calculated by the formula below, where I is an identity matrix, A is the matrix of coefficients, and $^{-1}$ is an inverse function.

Leontief Inverse: $(I-A)^{-1}$

The Leontief Inverse values are multipliers, showing how much output is generated in each sector for every unit of demand in a given sector. An example table has been copied from the ONS 2014 IOAT article below. To note, several columns have been cropped, and the OECD inter-country input-output table would have rows and columns that denote each sector in each country.

Product	1 Agriculture [1-3]	2 Production [5-39]	3 Construction [41-43]
1 Agriculture [1-3]	1.118	0.025	0.006
2 Production [5-39]	0.318	1.419	0.226
3 Construction [41-43]	0.046	0.023	1.278
4 Distribution, transport, hotels and restaurants [45-56]	0.127	0.108	0.074
5 Information and communication [58-63]	0.027	0.027	0.029
6 Financial and insurance [64-66]	0.077	0.048	0.040
7 Real estate [68.1-2-68.3]	0.007	0.005	0.010
8 Professional and support activities [69.1-82]	0.071	0.089	0.156
9 Government, health & education [84-88]	0.007	0.009	0.015
10 Other services [90-97]	0.003	0.003	0.003
11 Production (non-market) [5-39]	0.000	0.000	0.000
12 Information and communication (non-market) [58-63]	0.000	0.000	0.000
13 Government, health & education (non-market) [84-88]	0.000	0.000	0.000
14 Other services (non-market) [90-97]	0.000	0.000	0.000
15 Professional and support activities (NPISH) [69.1-82]	0.000	0.000	0.000
16 Government, health & education (NPISH) [84-88]	0.000	0.000	0.000
17 Other services (NPISH) [90-97]	0.000	0.000	0.000
Total	1.801	1.755	1.836

For every unit of demand in the construction sector, it generates 0.23 output in the production sector and 1.28 output in the construction sector (because of intermediate inputs)

In total, the construction sector generates 1.84 output across the economy for every unit of demand (the sum of the column)

The Leontief multipliers can be applied to emissions and employment. Combining the OECD data sources give estimates of the emissions and employment generated per output in each sector. Similar tables can then be created and used like the table above, but showing emissions and employment multipliers rather than output multipliers.