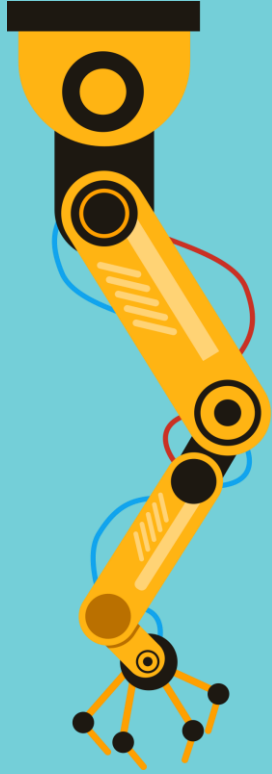
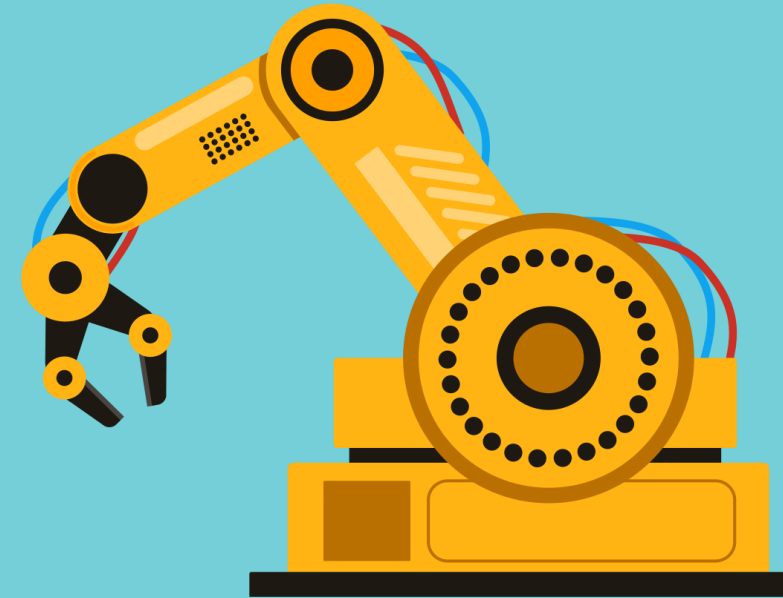
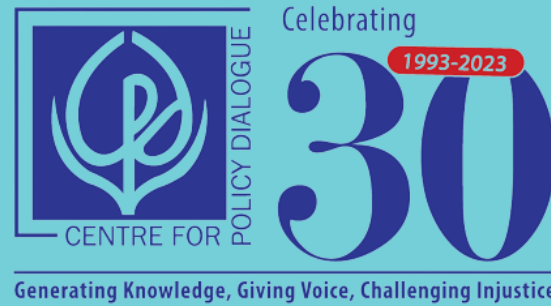


Technology Use in Manufacturing Industries of Bangladesh

An Exploratory Analysis



Presented by
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Dhaka: 22 October 2023

Acknowledgement

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- The Research Team consisted of ***Dr Fahmida Khatun***, Executive Director, CPD, ***Mr Syed Yusuf Saadat***, Research Fellow, CPD, and ***Ms Anika Ferdous Richi***, Research Intern, CPD.
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Outline

1. Introduction
2. Methodology
3. Macro perspectives on technology use in manufacturing
4. Overview of technology use in manufacturing industries
5. Conclusions
6. Recommendations

1. Introduction

1.1 Introduction

- This presentation provides an exploratory analysis of technology use within the manufacturing industries of Bangladesh, shedding light on the current state of technology adoption, its impact on industrial practices, and the prospects for growth.
- The findings reveal a stark digital divide among manufacturing firms, with a notable gap in digital presence, primarily bridged by the export-driven garment sector.
- The study emphasises the role of international trade in driving technology adoption, the significance of a well-educated workforce, and the need for environmental sustainability.
- It also underscores the importance of investment in research and development, both by the government and by the private sector.
- The findings from this study shows that despite the challenges, the manufacturing sector in Bangladesh has displayed resilience in the aftermath of the COVID-19 pandemic.
- To harness its potential, this presentation offers a set of policy recommendations as a blueprint for strengthening the manufacturing sector, enhancing its competitiveness, and positioning Bangladesh for sustainable economic growth beyond its graduation from the Least Developed Countries group.

1.1 Introduction (continued)

- The success of Bangladesh's manufacturing industry is based on price-led competitiveness which it has achieved through labour-intensive production facilitated by low wages.
- There needs to be a shift towards increasing the productivity of labour to remain competitive in a technologically advanced world that is rapidly evolving.
- Technology may be the key tool for manufacturers in Bangladesh, that will enable them to increase output and efficiency and thus achieve a productively competitive edge.
- Bangladesh has significant untapped potential for technological innovation.
- Technology use in the manufacturing sector will be essential in transforming the production capacity of the nation.



1.2 Background and context

- As the global trade pattern is changing, the manufacturing industry may face a lot of challenges because of its high dependence on labour, and inadequate connectivity and Information Technology (IT) infrastructure.
- The Fourth Industrial Revolution (4IR) has transformed the manufacturing industry, and the industrial model centred around price-led cost competitiveness has reached its limits.
- The emerging 4IR technologies are changing the nature of manufacturing and work, lowering the significance of low labour costs while stressing the importance of sustainability and digitization.
- Bangladesh's labour productivity growth rate remains alarmingly low, and the country is at risk of being trapped in a low-wage and low-productivity spiral.

1.3 Justification and policy relevance

Increasing labour productivity across all sectors is one of the major objectives in the Eighth Five-Year Plan

The National Industrial Policy 2016 states upgrading technology at the firm level as one of its key targets and emphasises the significance of increasing the productivity of firms

In terms of contribution of the medium-and-high tech industries to the GDP, Bangladesh was ranked 115th among 137 countries.



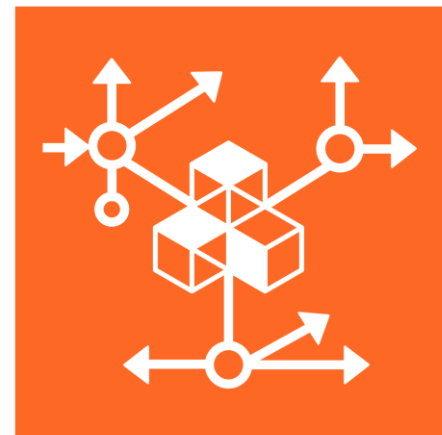
1.4 SDG 9: Industry, innovation & infrastructure

- The manufacturing industries of Bangladesh must be made more technologically advanced to achieve the Sustainable Development Goal (SDG) 9 (Industry, Innovation, and Infrastructure) and to better prepare for future challenges.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



TARGET 9-5



ENHANCE RESEARCH AND UPGRADE INDUSTRIAL TECHNOLOGIES

TARGET 9-A



FACILITATE SUSTAINABLE INFRASTRUCTURE DEVELOPMENT FOR DEVELOPING COUNTRIES

TARGET 9-B



SUPPORT DOMESTIC TECHNOLOGY DEVELOPMENT AND INDUSTRIAL DIVERSIFICATION

TARGET 9-C



UNIVERSAL ACCESS TO INFORMATION AND COMMUNICATIONS TECHNOLOGY



2. Methodology

2.1 Methodology

- For the purpose of exploratory statistical analysis of this study, data from the World Bank's Enterprise Survey 2022 for Bangladesh and the Survey of Manufacturing Industries conducted by the Bangladesh Bureau of Statistics (BBS) were used.
- BBS's Survey of Manufacturing Industries was conducted all over Bangladesh in 2019 to provide a nationally representative dataset. A total of 8,533 manufacturing firms were sampled using a stratified random sampling procedure from the target population of 46,110 manufacturing firms.
- The World Bank's Enterprise Survey was conducted in Bangladesh between March 2022 and October 2022. The survey was conducted at the firm level and covered a representative sample of 998 firms of which 544 were manufacturing firms. The analysis in this paper is based on the data of the 544 manufacturing firms. A stratified random sampling methodology was used for the World Bank's Enterprise Survey to ensure representative and unbiased results.

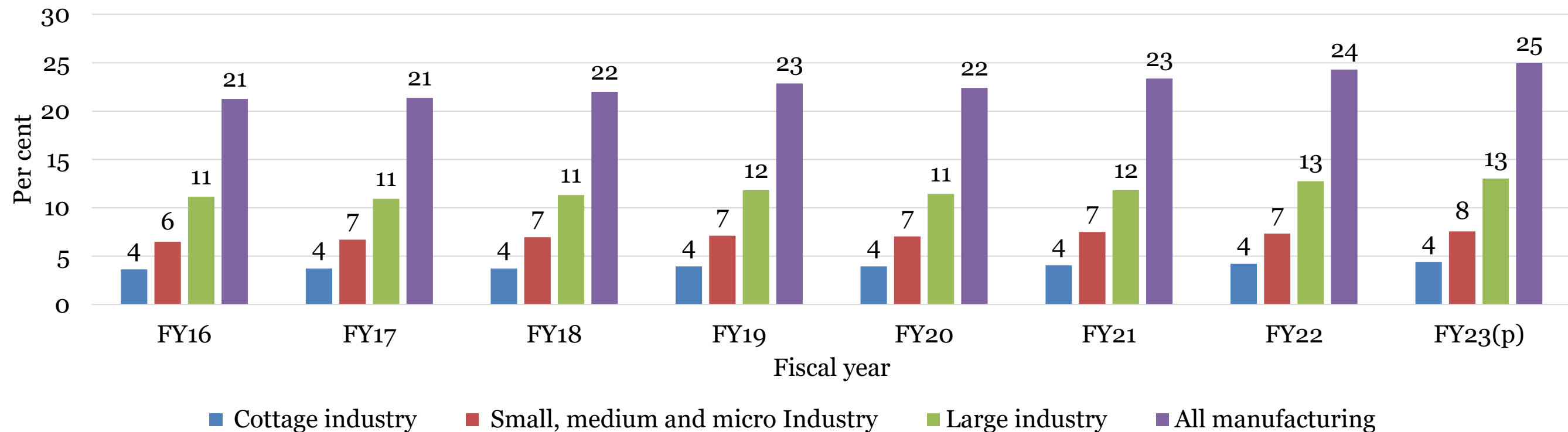


**3. Macro perspectives on
technology use in manufacturing**

3.1 Manufacturing's share of GDP

- In FY22, the manufacturing industry generated roughly 24.29% of the GDP, more than double the 11.20% produced by the agriculture industry.
- The increasing share of the manufacturing output highlights the growing importance of manufacturing industries in the economy of Bangladesh.

Figure: Manufacturing sector's share of GDP at constant prices, base: 2015-16, by firm size (in %)

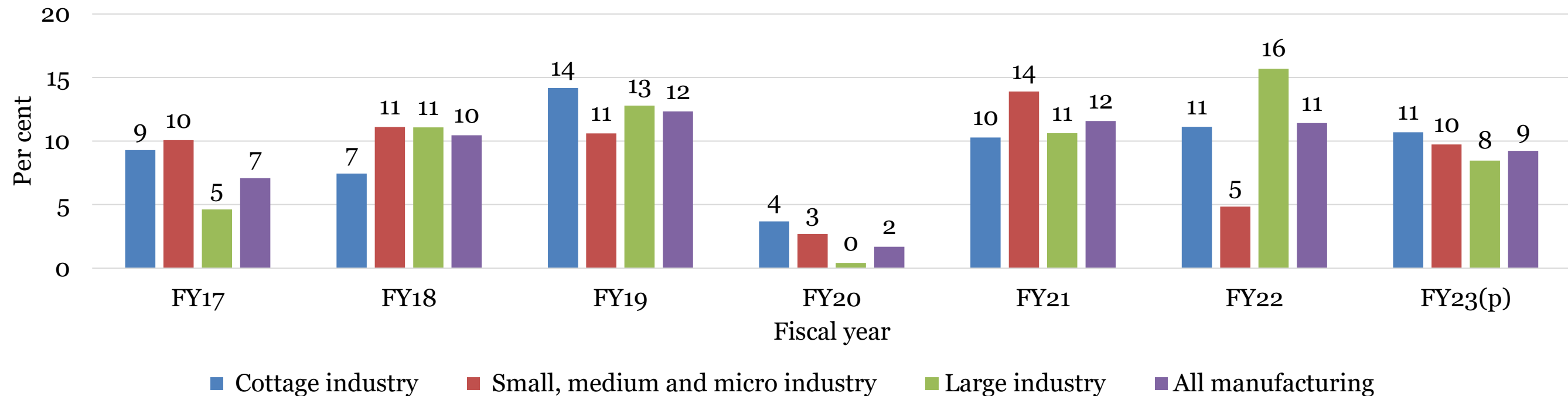


Source: Bangladesh Bureau of Statistics (BBS)

3.2 Manufacturing's growth rate

- We can see a decline in the growth rate of the manufacturing sector from 12.33% in 2019 to 1.68% in 2020.
- After 2020, the sector has not yet achieved its peak pre-pandemic growth level but has recovered well.

Figure: Manufacturing sector's growth rate at constant prices, base: 2015-16, by firm size (in %)

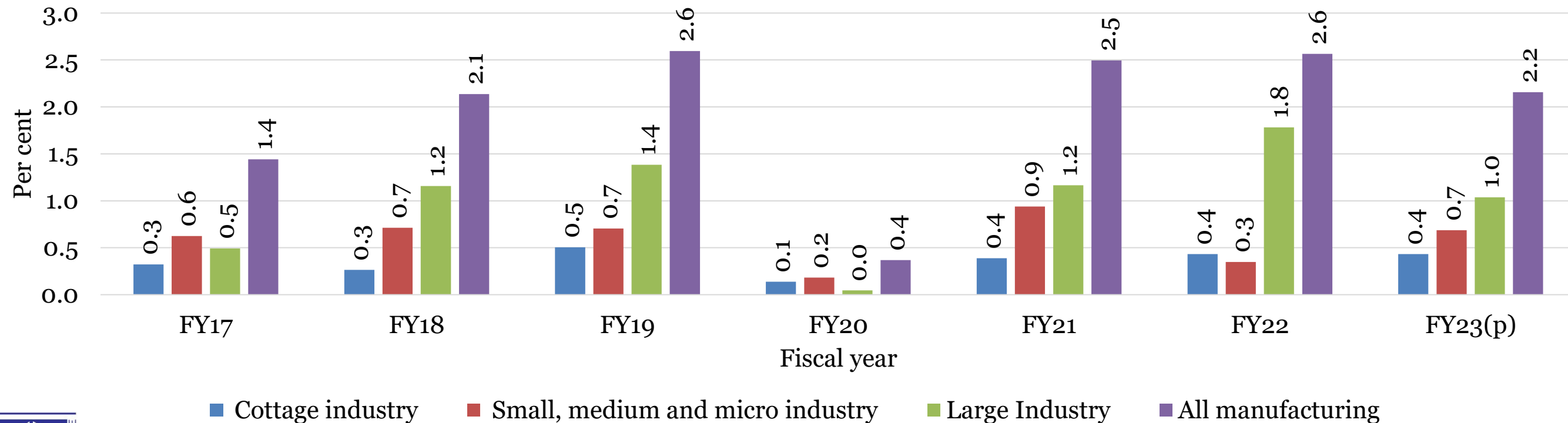


Source: Bangladesh Bureau of Statistics (BBS)

3.3 Contribution to GDP growth

- After a sharp decline in the manufacturing sector's contribution to GDP growth in 2020, in 2021 a quick recovery was seen as the manufacturing sector accounted for 2.5% of the growth in GDP.
- In 2022, the manufacturing sector accounted for 2.6% of the overall GDP growth.

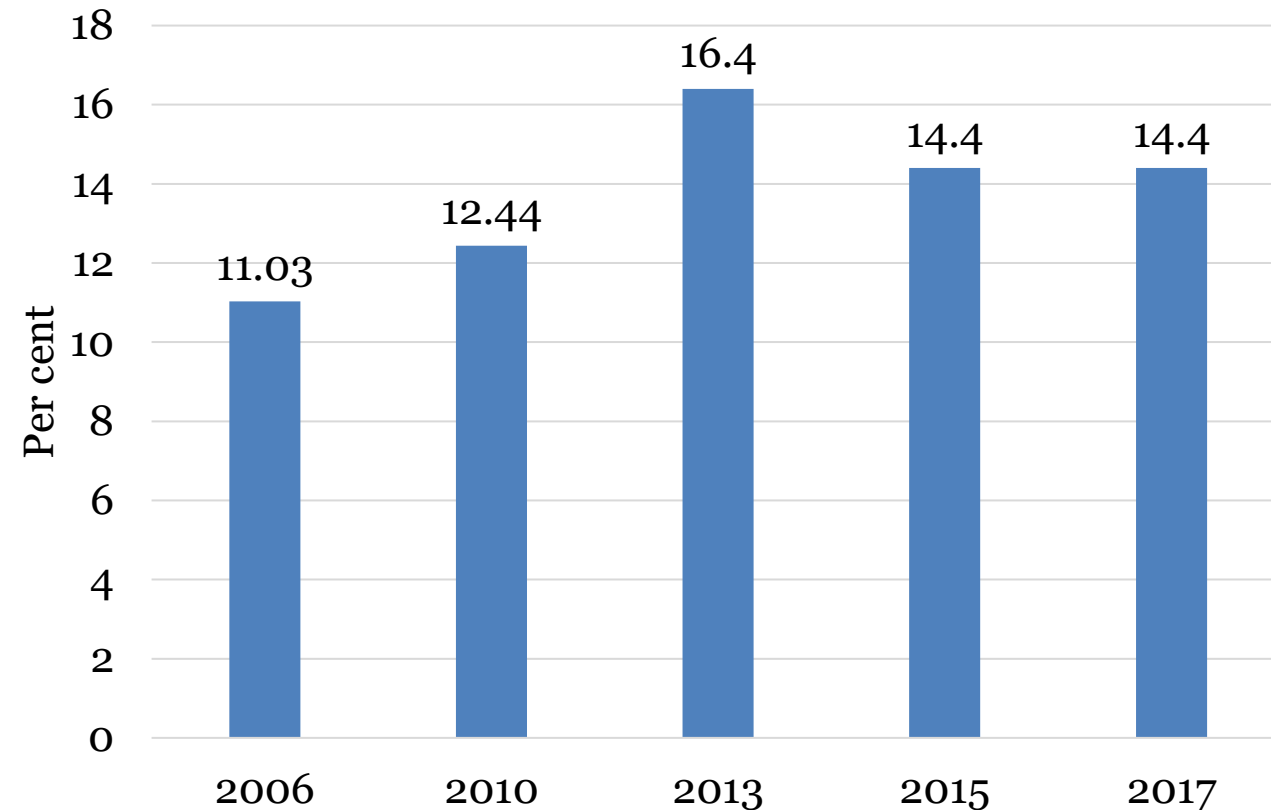
Figure: Manufacturing sector's contribution to GDP growth by firm size, base: 2015-16 (in %)



3.4 Contribution to employment

- The manufacturing sector creates vast employment opportunities for people in Bangladesh. The apparel manufacturing industry is among the largest private sector employers in the nation.
- Data from the labour force survey of 2017 shows that the manufacturing sector accounted for 14.4% of the total employment in Bangladesh.

Figure: Manufacturing sector's contribution to total employment (in %)

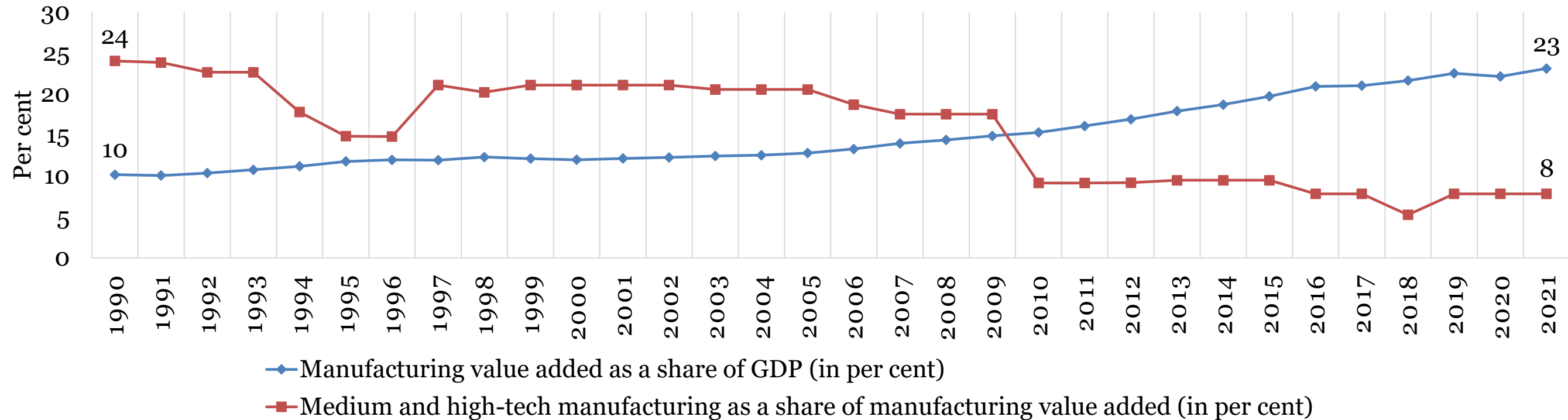


Source: Bangladesh Bureau of Statistics (BBS)

3.5 Manufacturing value added

- Manufacturing value added as a share of GDP increased from 10% in 1990 to 23% in 2021.
- Although manufacturing value added as a share of GDP has increased over the years, medium and high-tech manufacturing as a share of total manufacturing value added has fallen.

Figure: Manufacturing value added as a share of GDP and medium and high-tech manufacturing as a share of manufacturing value added (in %)

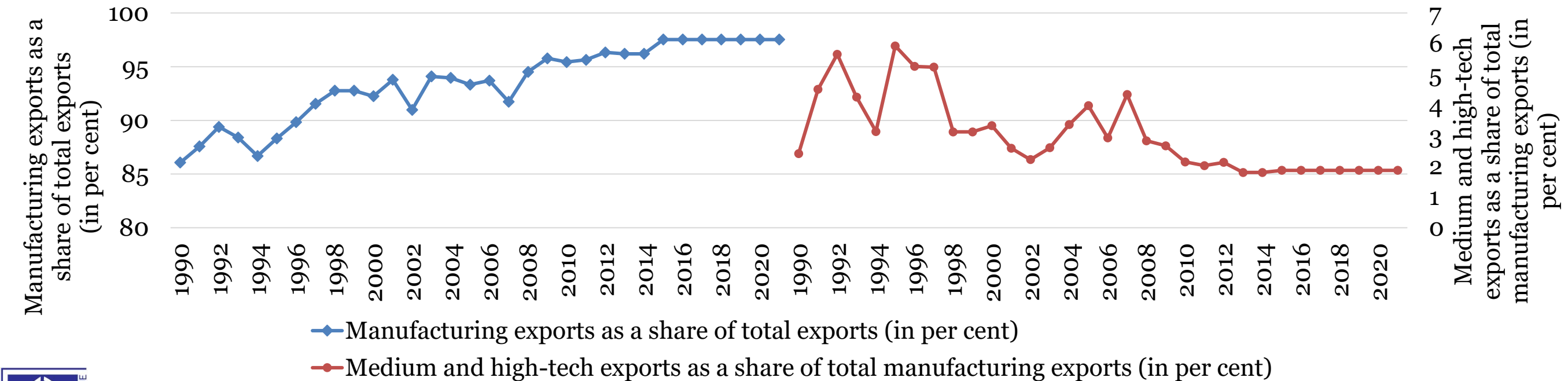


Source: United Nations Industrial Development Organisation (UNIDO)

3.6 Manufacturing exports

- In line with its manufacturing production structure, we also find that Bangladesh's manufacturing trade structure is also highly dominated by low-tech manufacturing.
- Bangladesh's manufacturing exports as a share of total exports increased from 86 % in 1990 to 98 % in 2021.
- On the other hand, medium and high-tech exports as a share of total manufacturing exports fell from 6 % in 1992 to 2 % cent in 2021.

Figure: Manufacturing exports as a share of total exports and medium and high-tech exports as a share of total manufacturing exports (in %)



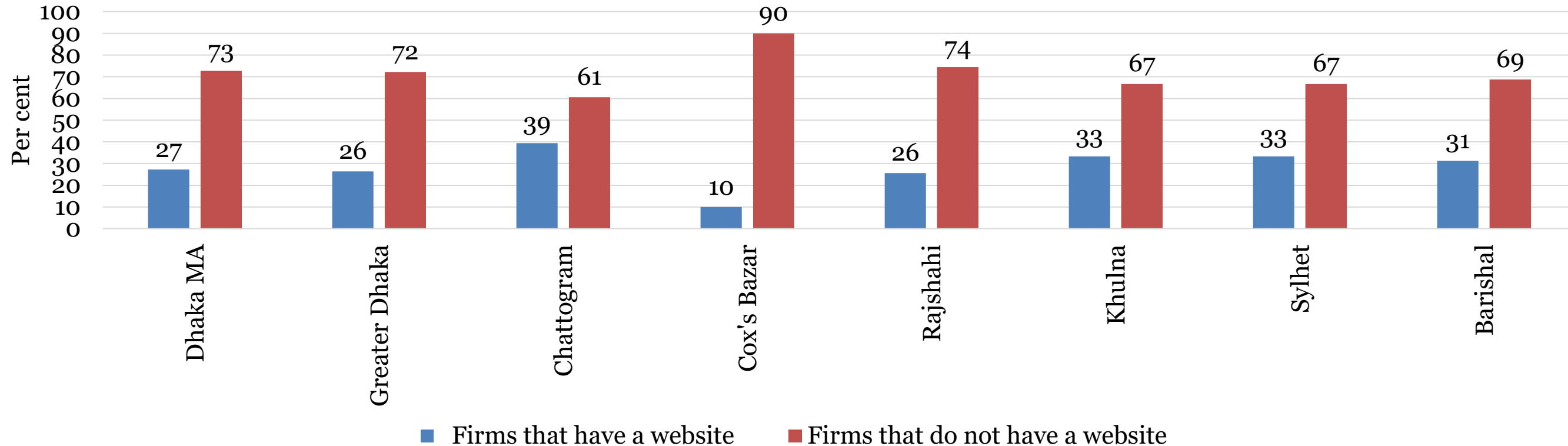


**4. Overview of technology use in
manufacturing industries**

4.1 Own websites across regions

- In all regions across the country, the majority of the firms in the manufacturing sector did not have their own website.
- Chattogram has the largest share of firms with websites, with 39% of the manufacturing firms having websites, followed by Khulna and Sylhet at 33%, and Barisal at 31%.

Figure: Establishment's own website across different regions (in %)

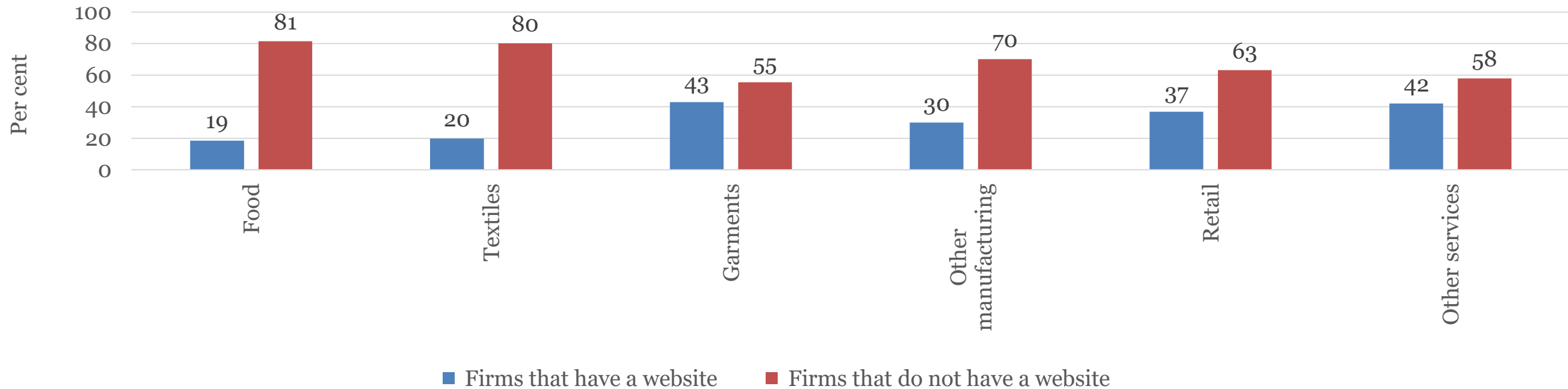


Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.2 Own websites across sectors

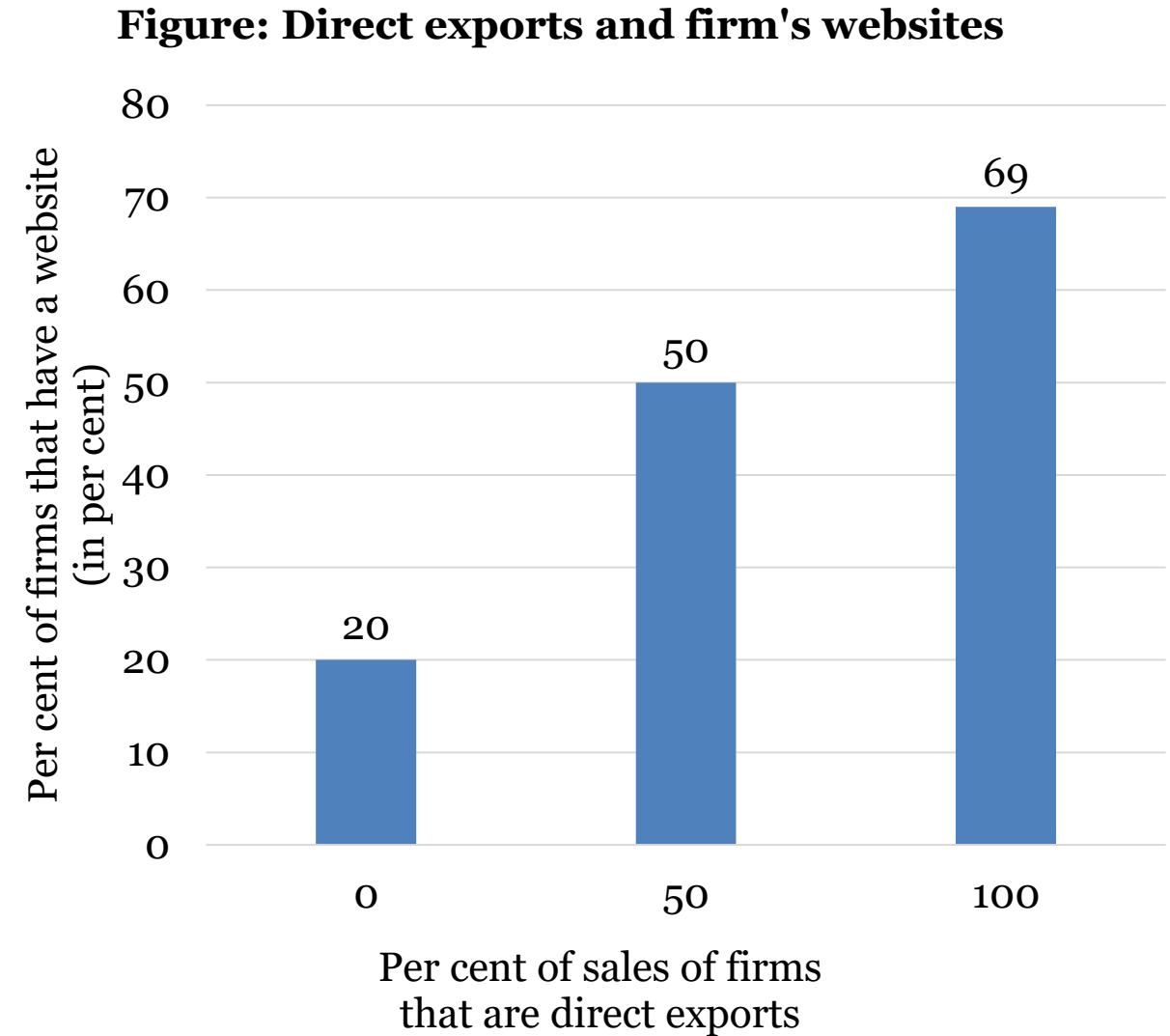
- The garments sector takes the lead as 43% of the firms surveyed in the garments sector have their own websites, which is the highest when compared to other sectors.
- This finding is not surprising as the garments sector is the powerhouse of the Bangladesh economy and is known to be highly export-oriented.
- The garments industry accounts for the largest share of exports of the country which may be a reason why this sector outperformed the others when it comes to website presence.

Figure: Manufacturing firms in different sectors that have their own websites (in %)



4.3 Own websites and exports

- Among firms that export 0% of their sales only 20% have their own websites.
- This share increases to 50% if half of the sales of firms are direct exports.
- Among firms that export 100% of their sales, 69% have their own website.
- A positive relationship can be seen between exports and the share of firms that have their own website.
- Since a website often serves as a gateway to the world market, it is natural that manufacturing firms which are more export-oriented are more likely to have their own website.

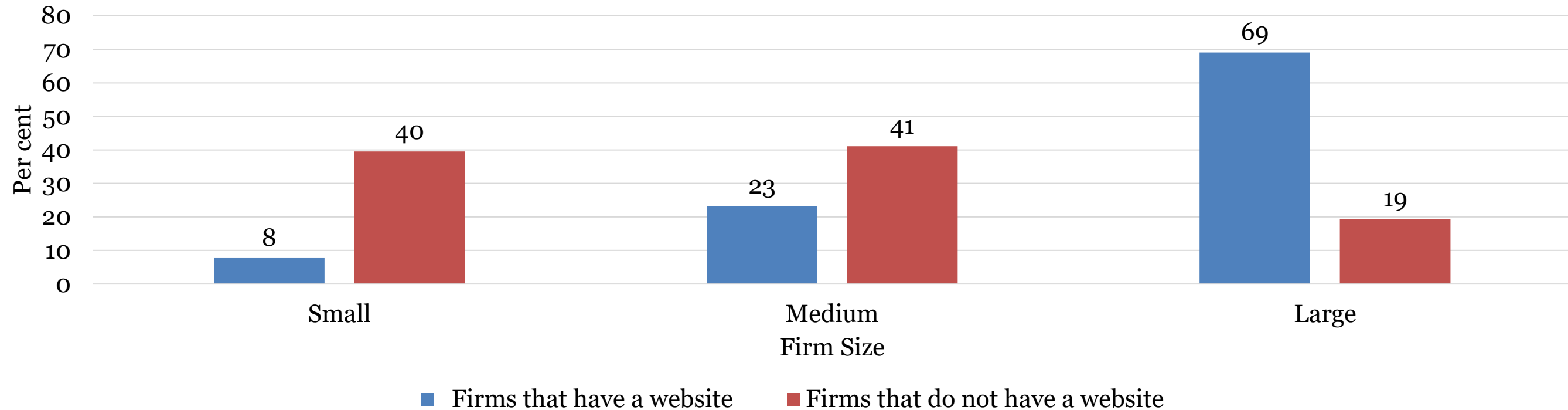


Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.4 Own websites and firm size

- While among small firms only about 8% of the firms have their own websites, this number increases to 23% in medium firms and further increases to 69% among large firms.
- This may be because large firms usually have access to greater finance when compared to SMEs, and due to greater resources may be able to invest more in digitisation.

Figure: Firm size and websites (in %)



Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.5 Websites and worker's education level

- In firms where 0% of the workers have completed high school, 8% of them have their own website.
- In firms where half of the workers have completed high school, about 37% of them have websites.
- In firms where all the workers have completed high school, 83% of them have websites.
- This goes to show that firms that have a larger share of educated workers are more likely to have a website compared to firms with a lower share of educated workers.
- A skilled workforce is essential when it comes to digitisation and technological advancement in manufacturing firms.

Figure: Worker's education level and firm's website

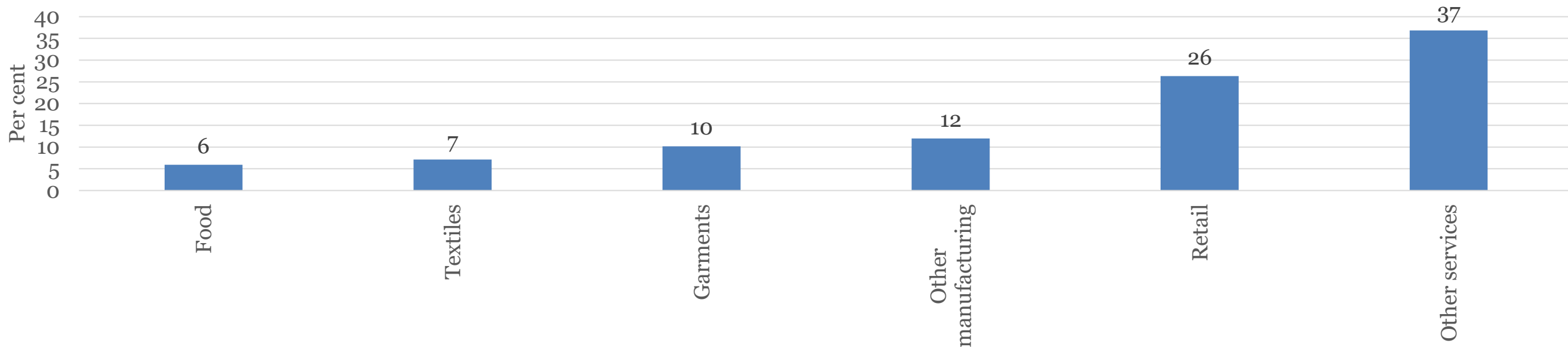


Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.6 Online sales across industries

- As the world around us gets more dependent on technology, sales through internet transactions continue to account for an increasing share of total sales across most industries in most countries.
- Across all the sectors, less than 40% of manufacturing firms had any sales through internet transactions.
- Most manufacturing firms in Bangladesh did not have any sales through online transactions.

Figure: Firms across different sectors that have some sales through internet transactions (in %)

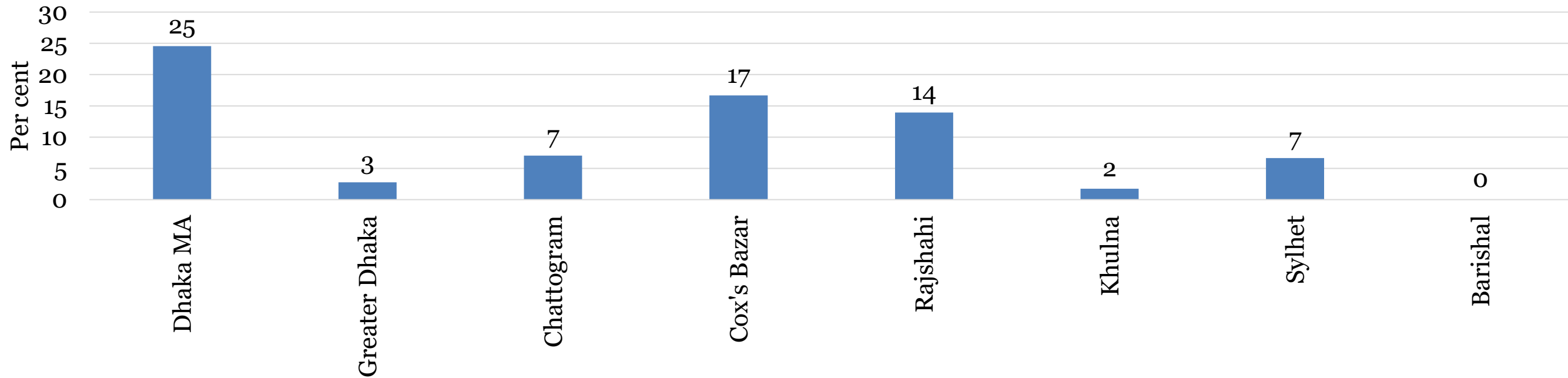


Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.7 Online sales across regions

- It can be observed that the region that accounts for the highest share of manufacturing firms that sell through internet transactions is unsurprisingly the Dhaka metropolitan area. Even in Dhaka, only about 25% of the manufacturing firms have some share of their sales through internet transactions. In other regions, this share is even lower, with the lowest being in Barishal at 0%.

Figure: Firms across different regions that have some sales through internet transactions (in %)

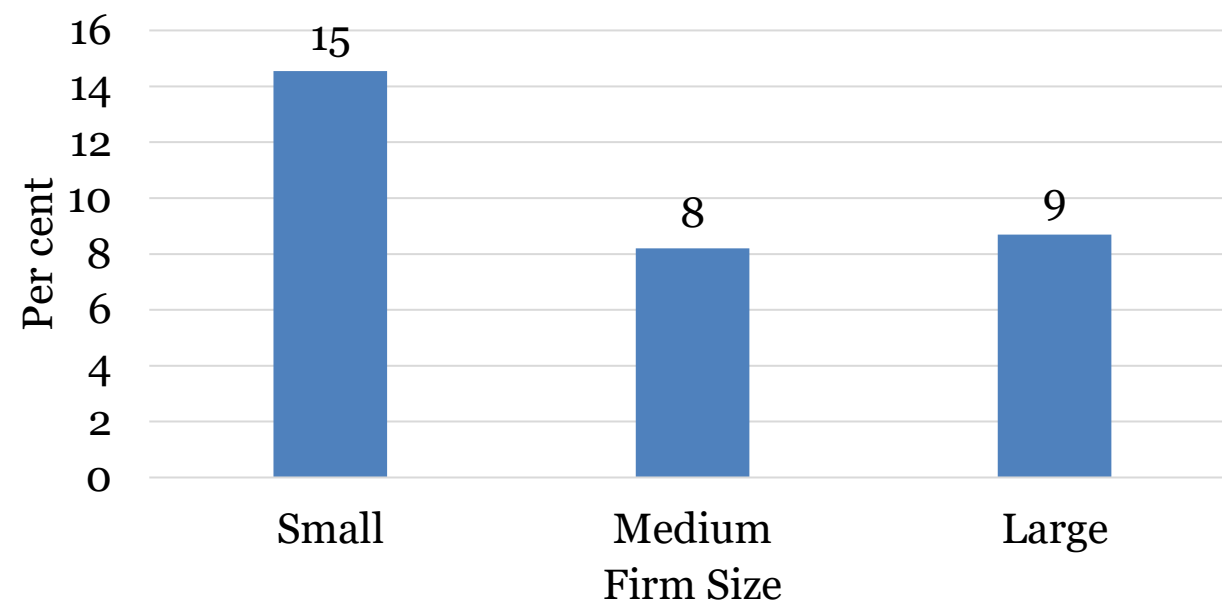


Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.8 Online sales across firm sizes

- Disaggregating the firms by their sizes shows that small-sized firms have the largest share of firms that have some sales through internet transactions, as about 15% of small firms have some sales through internet transactions whereas for medium and large sized firms this number is 8% and 9% respectively.

Figure: Firms of different sizes that have some sales through internet transactions (in %)

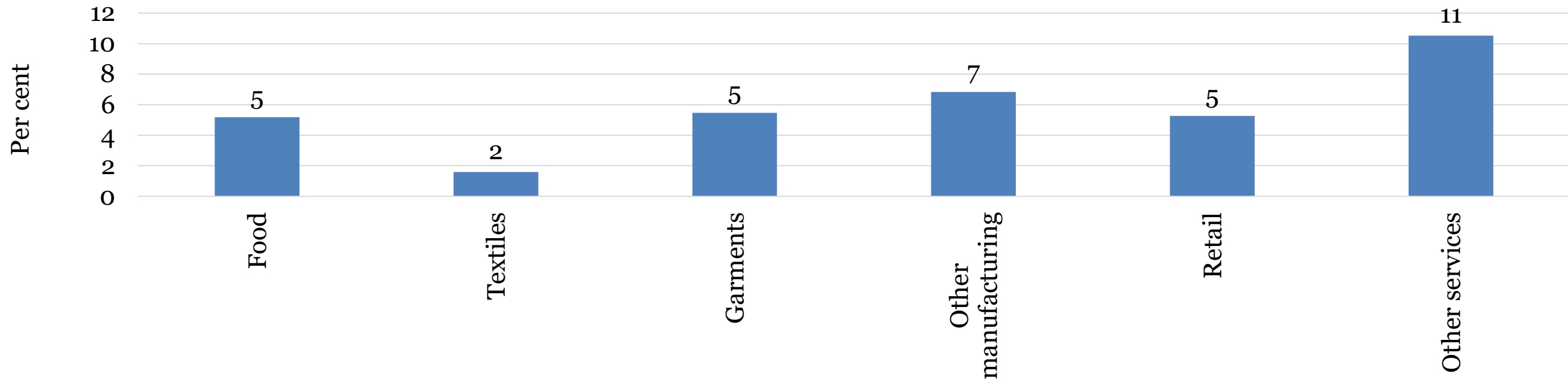


Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.9 Foreign technology use across industries

- The share of foreign technology use is low across all the sectors and lowest in the textile industry with only 2% of the firms in the textile industry using technology licensed from a foreign-owned company.
- The food and garments industries have the second smallest share of foreign technology use as 5% of the firms in the food and garments sector use technology licensed from a foreign company.

Figure: Firms in different sectors that use technology licensed from a foreign-owned company (in%)

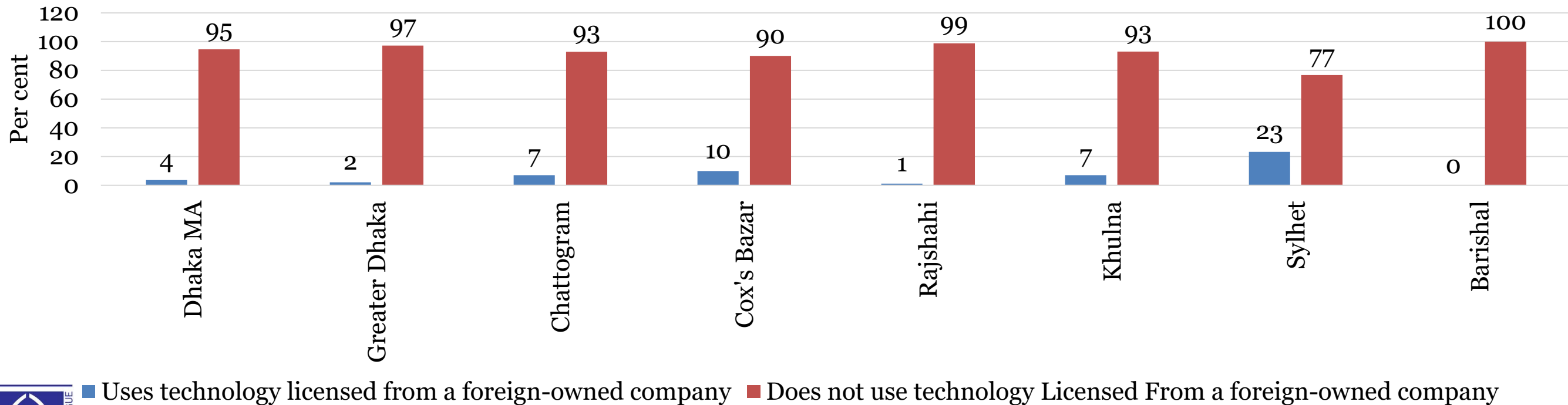


Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.10 Foreign technology use across regions

- In Sylhet, about 23% of manufacturing firms use technology licensed from a foreign-owned company, followed by Cox's Bazar where only about 10% of the firms use foreign technology.
- In Khulna and Chattogram, around 7% of the manufacturing firms use technology licensed from foreign companies.
- This share is even lower in Dhaka and Greater Dhaka with the number being 4% and 2% respectively.

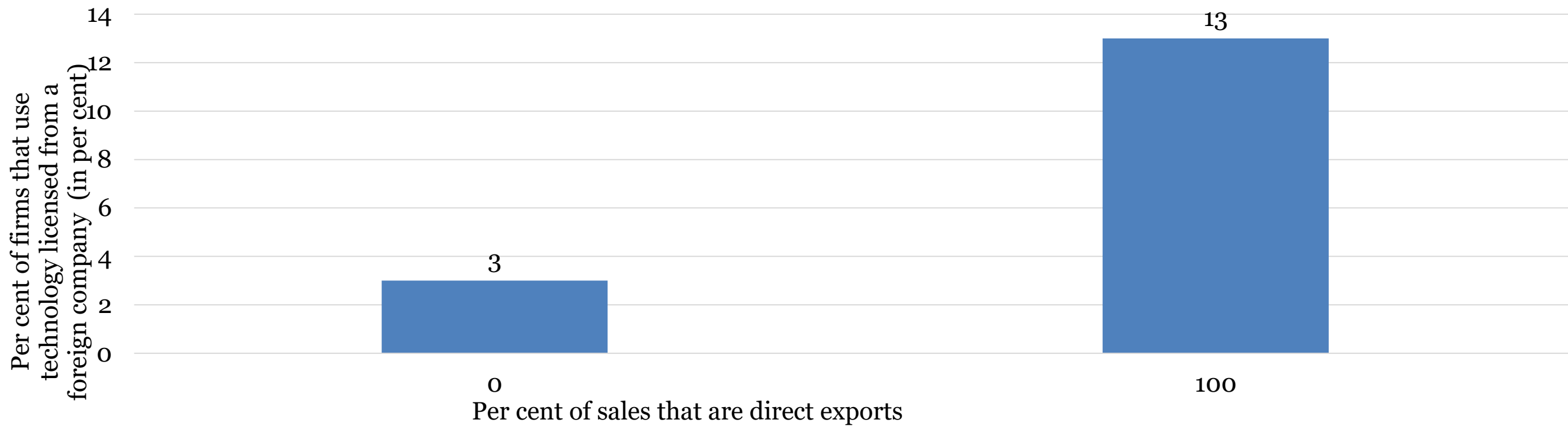
Figure: Use of technology licensed from a foreign-owned company across different regions



4.11 Foreign technology use and exports

- Among firms that export 0% of their sales, 3% of the firms use technology licensed from a foreign-owned company.
- While among firms that export 100% of their sales, around 13% use technology licensed from a foreign-owned company.

Figure: Exports and use of technology licensed from a foreign-owned company



Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.12 Foreign technology use and exports

- Among firms where 0% of the workers have completed high school, 0% of such firms use technology licensed from a foreign-owned company.
- In contrast, among firms where all the workers have completed high school, 33% of the firms use technology licensed from a foreign-owned company.

Figure: Worker's education and foreign technology use

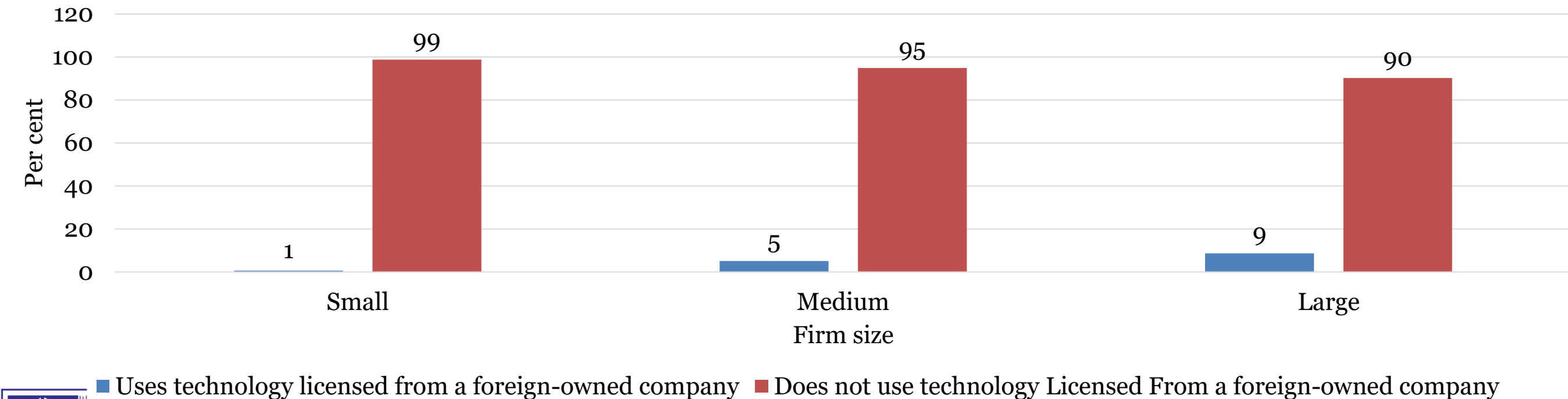


Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.13 Foreign technology use and size

- Only 1% of small firms use technology licensed from foreign-owned companies, in medium firms this number is 5%.
- The share further increases to 9% among large firms. SMEs often lack the skillset, the finances or the overall capacity to obtain and use technology licensed from a foreign company.

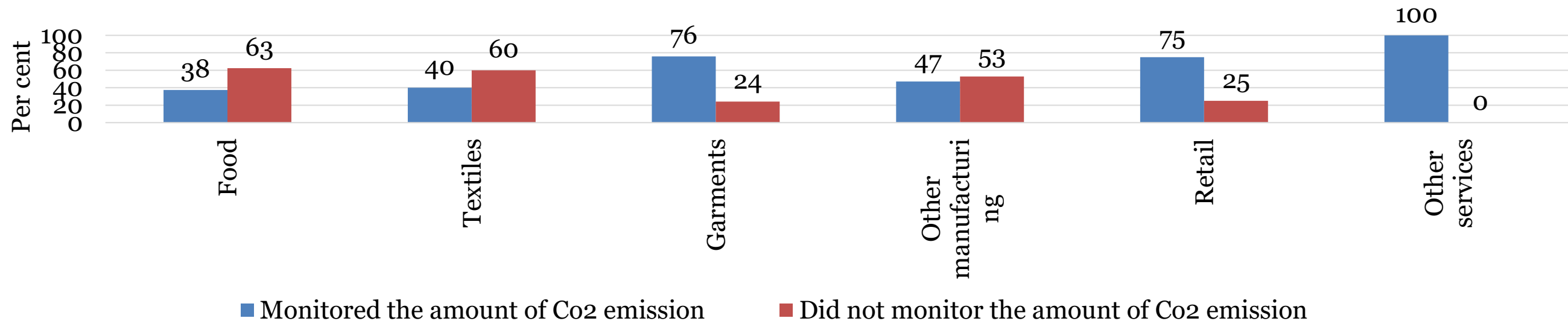
Figure: Use of technology licensed from a foreign-owned company across different firm sizes (in %)



4.14 CO₂ monitoring across industries

- Monitoring the emission of CO₂ is seen as an indicator of technology because some level of technological sophistication and inventory is required to monitor the levels of CO₂ emission.
- 76% of garment manufacturing firms monitor their CO₂ emissions, which is the highest among all sectors except the 'Other services' sector.
- This is likely because of the export-oriented nature of the garment industry in Bangladesh.
- Pressure from foreign buyers to produce sustainably may act as an incentive for firms in the garment industry to come up with innovative ideas to make their manufacturing process sustainable.

Figure: CO₂ monitoring across different industries (in %)

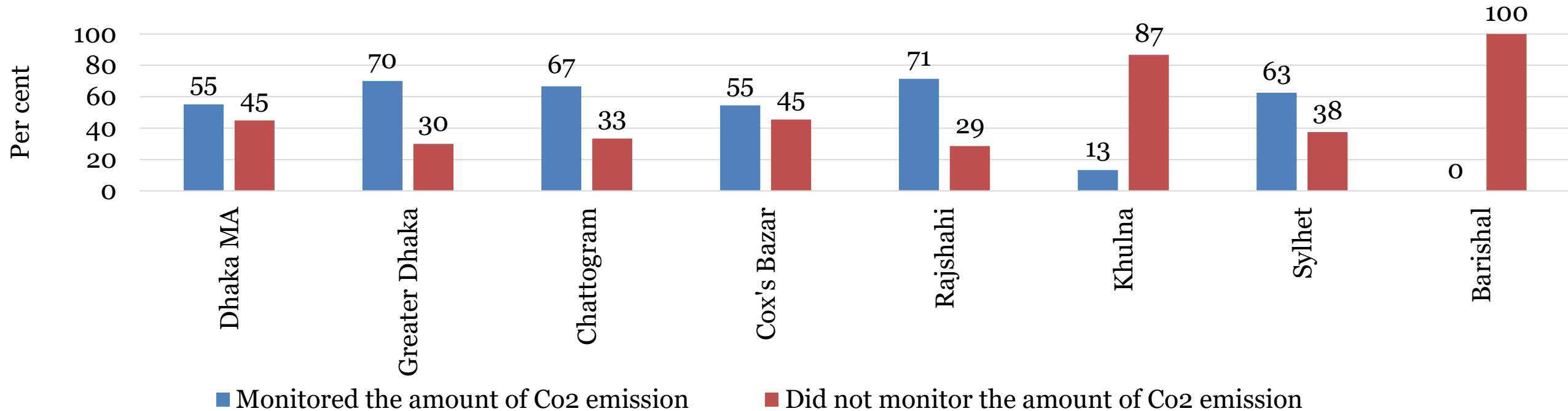


Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.15 CO₂ monitoring across regions

- In Rajshahi, the highest share of firms, that is about 71% of the firms, monitor CO₂ emissions, followed by Greater Dhaka and Chattogram at 70% and 67% respectively.
- Overall, in almost all regions except Barishal and Khulna, more than half of the manufacturing firms claim to monitor their CO₂ emission levels, which is a significantly positive sign for Bangladesh.

Figure: Firms that monitored Co₂ across different regions.

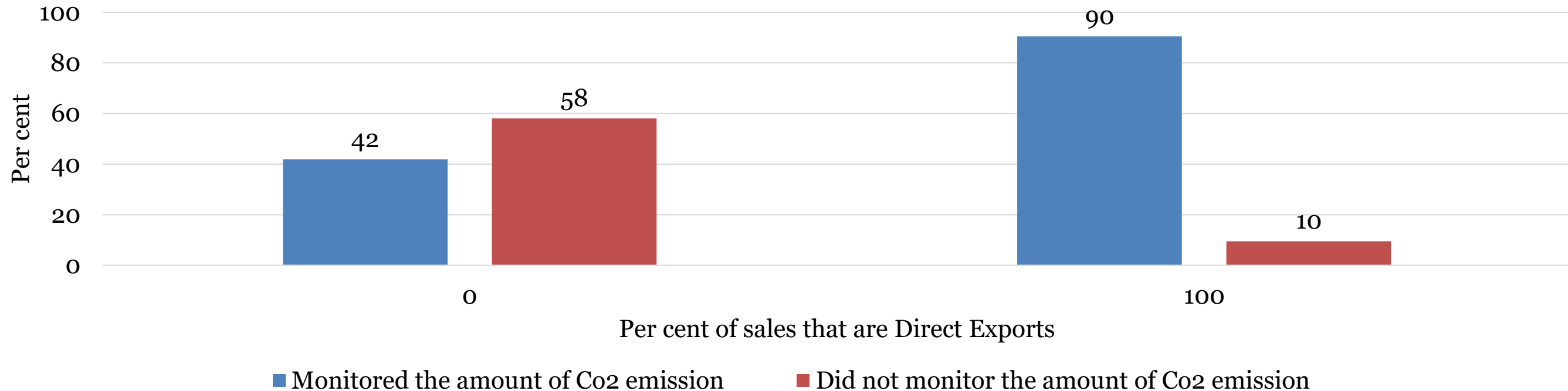


Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.16 CO₂ monitoring and exports

- Among firms that exported 0% of their sales, 42% of such firms monitored their CO₂ emission while 58% did not.
- Whereas, among firms that exported 100% of their exports, 90% of them monitored their CO₂ emissions, which is a considerably good number.
- We can therefore infer that exporting firms are better at monitoring their CO₂ emissions than non-exporting firms.

Figure: Exporting and monitoring CO₂ emissions (in%)

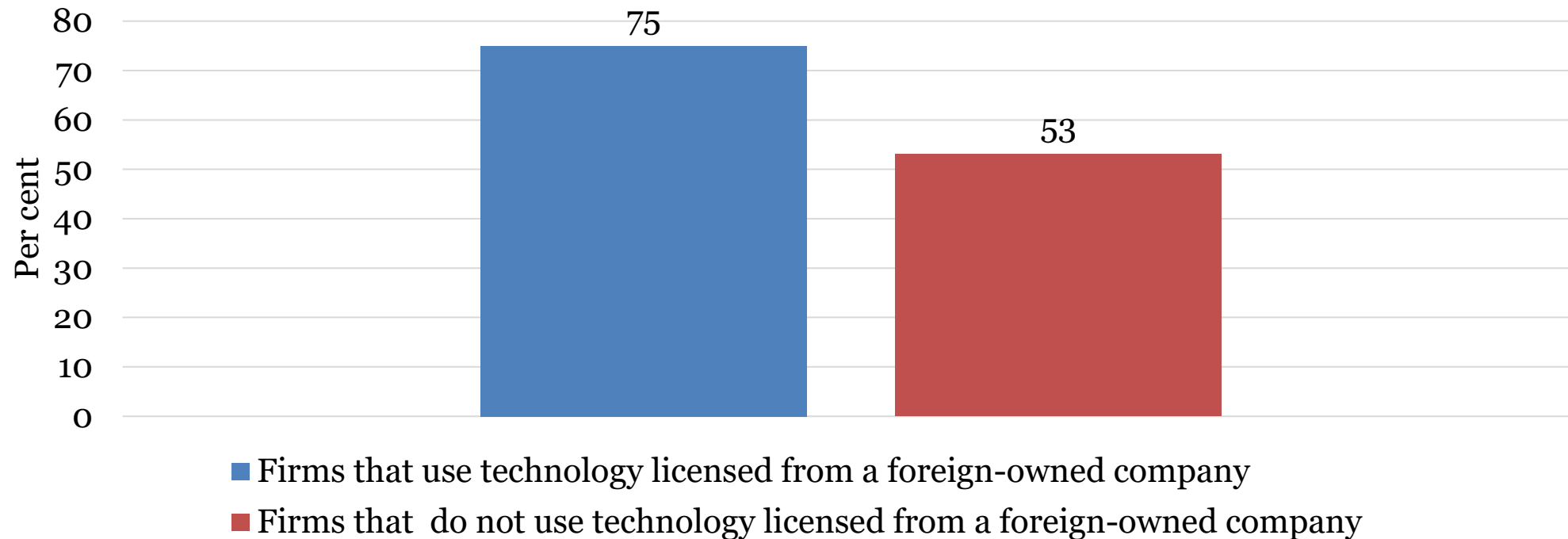


Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.17 CO₂ monitoring and foreign technology

- Among firms that use technology licensed from a foreign-owned company, about 75% of the firms monitor their CO₂ emissions.
- On the other hand, among firms that do not use technology licensed from a foreign-owned company, 53% of the firms monitor their CO₂ emissions.
- We can say that a great majority of the firms that use foreign technology also monitor their CO₂ emissions.

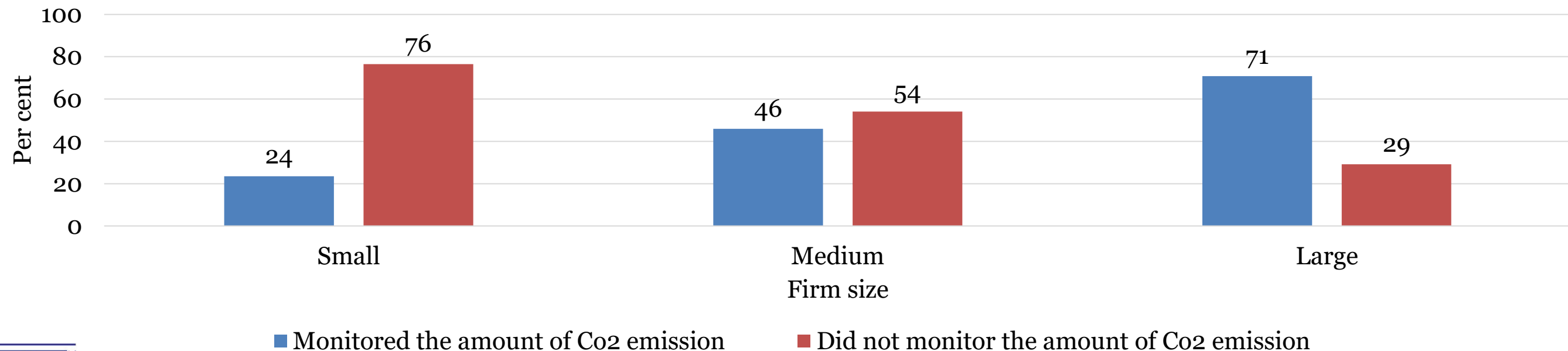
Figure: Foreign technology use and monitoring Co2 emissions (in %)



4.18 CO₂ monitoring and foreign technology

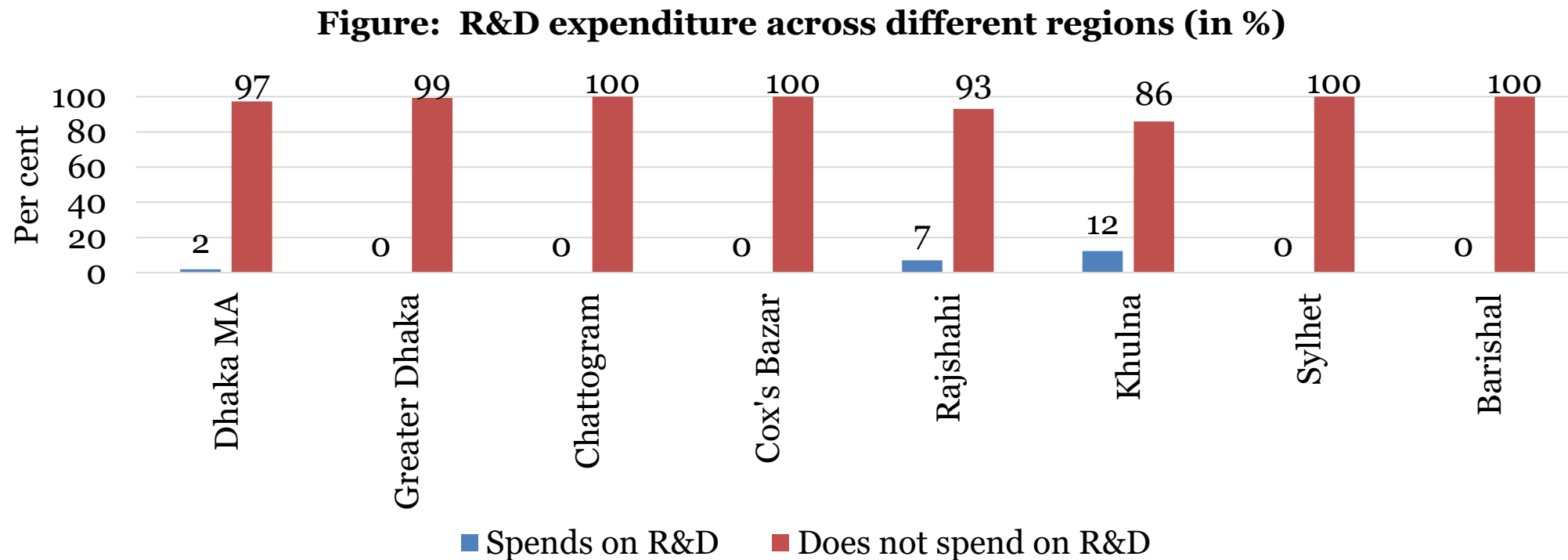
- Among small firms, 24% of the firms monitor the amount of CO₂ while 76% of them do not.
- For medium-sized firms, 46% of them monitor the CO₂ emission levels while 54% of them do not.
- As for large firms, around 71% of the firms monitor their CO₂ emission levels while 29% do not.
- Large firms have access to more resources and often also have to face more accountability with regard to environmental sustainability.

Figure: Firms that monitored Co₂ across different firm sizes



4.19 R&D spending across regions

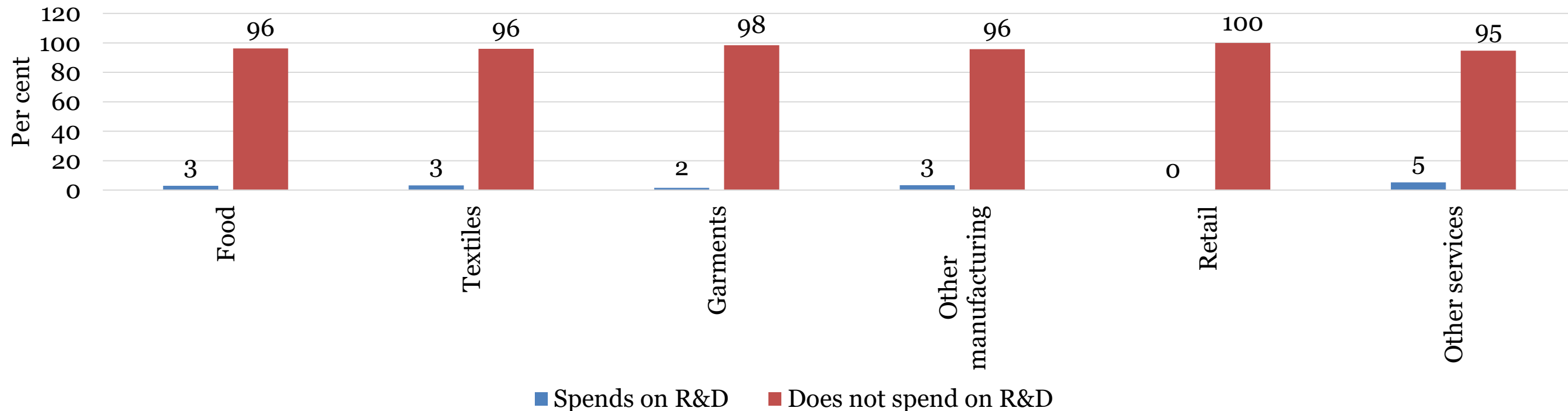
- Bangladesh has a poor R&D spending strategy in place.
- Most of the regions in the country show that 0% of the manufacturing firms are spending on R&D
- Only in Khulna, Rajshahi and Dhaka some of the manufacturing firms are seen to spend on R&D and even then, the number is very low.
- In Khulna only about 12% of the firms spend on R&D and this number further decreases to 7% in Rajshahi and 2% in Dhaka respectively.



4.20 R&D spending across industries

- The share of firms spending on R&D in each sector remains alarmingly low.
- For the ‘other services’ sector, 5% of the firms spend on R&D, while for the food, textiles and other manufacturing sectors only about 3% of the firms spend on R&D.
- The number is even lower for the garments industry as only 2% of the firms in the garments industry spend on R&D.

Figure: R&D expenditure across different sectors

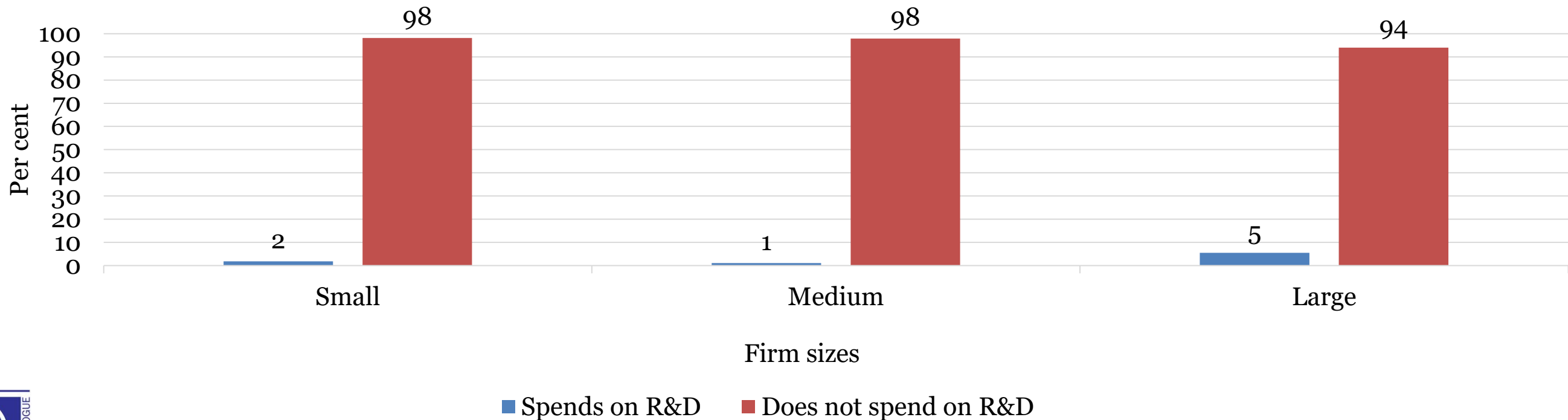


Source: World Bank's Enterprise Survey for Bangladesh, 2022

4.21 R&D spending across firm size

- R&D spending varies across firms of different sizes
- Among small firms, about 2 % of the firms spend on R&D.
- Only 1% of the medium-sized firms spend on R&D, while 5% of the large firms spend on R&D.
- Even in this case we can see that size is a crucial factor when it comes to indicators of technology use such as R&D expenditure.

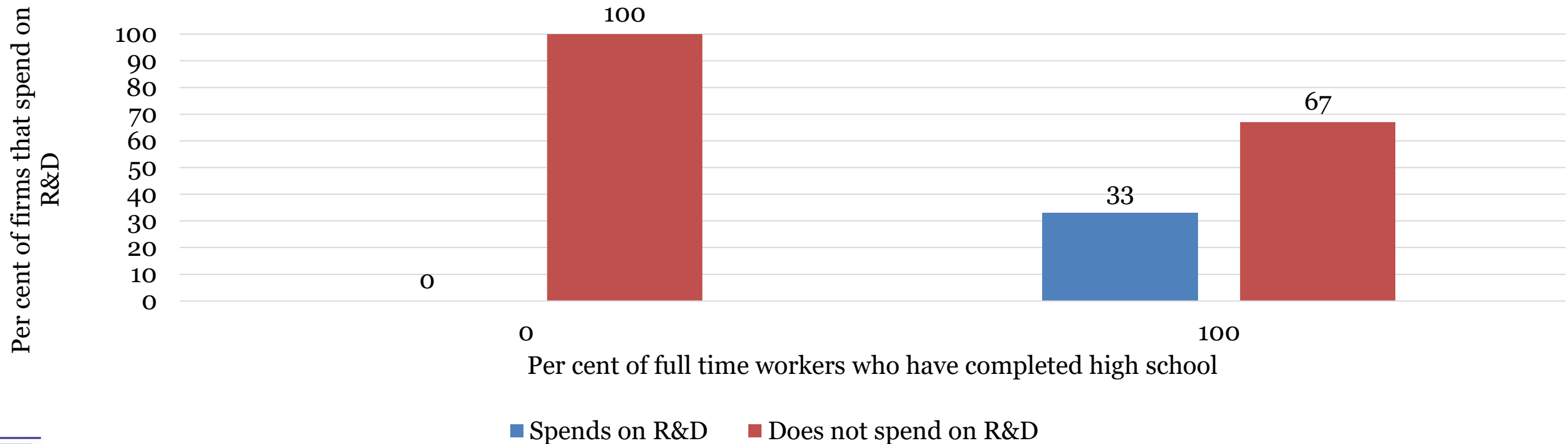
Figure: R&D expenditure across different firm sizes (in %)



4.22 R&D spending and worker's education

- In firms where 0% of the workers have completed high school, 0% of such firms spend on R&D.
- In contrast, among firms where 100% of the workers have at least completed high school, 33% of such firms spend on R&D.
- Firms with a more educated workforce may be more likely to spend on R&D.

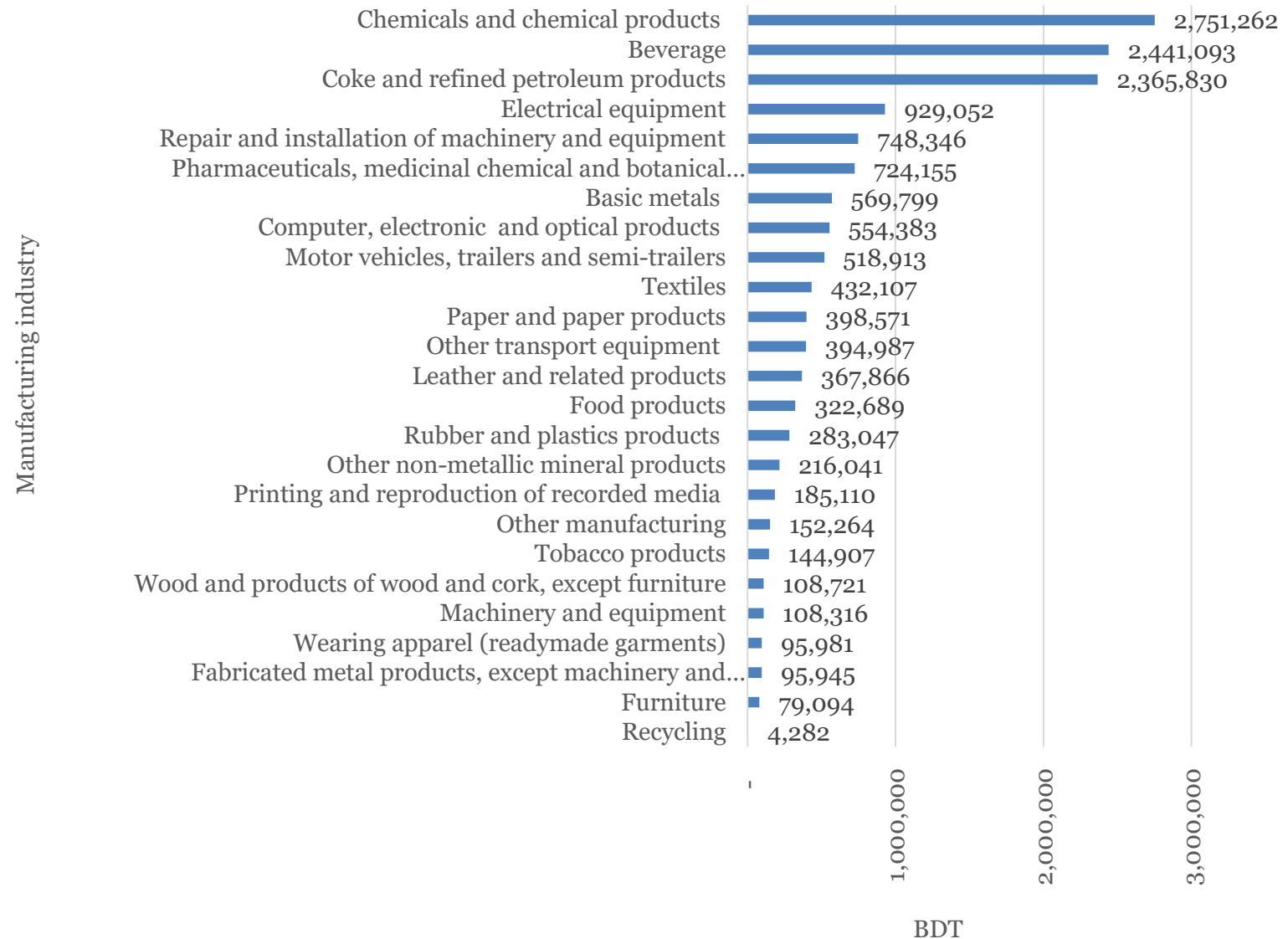
Figure: Worker's education level and firm's R&D spending



4.23 Capital-labour ratio

- The capital-labour ratio was calculated as the machinery and equipment fixed assets per worker (in BDT).
- The chemicals and chemical products industry of Bangladesh is the most capital-intensive in nature when compared to other manufacturing industries and the least capital-intensive industries are recycling, furniture and fabricated metal products industries.

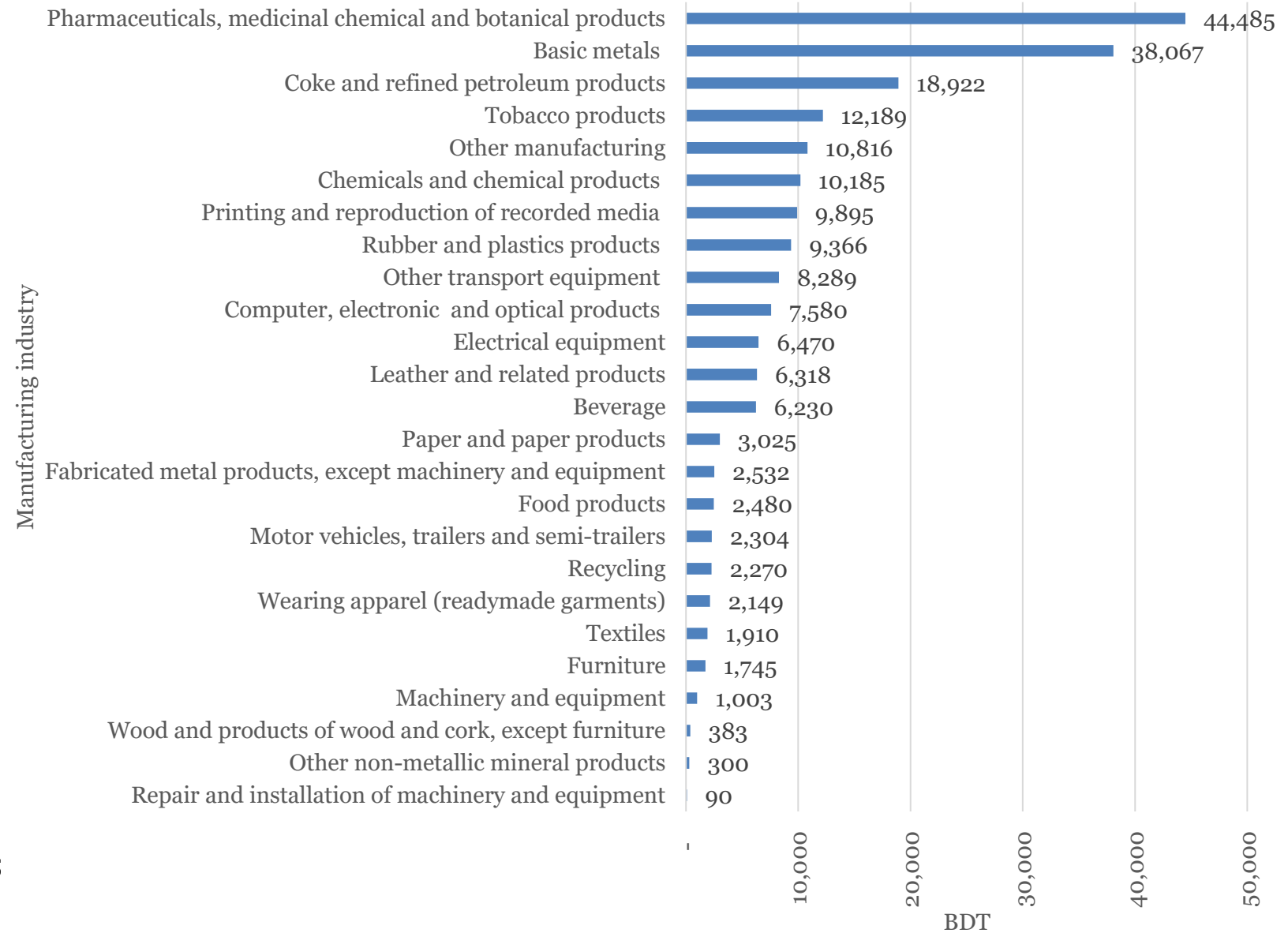
Figure: Machinery and equipment fixed assets per worker (in BDT)



4.24 Computer and software fixed assets

- In terms of computer and software fixed assets per worker, the pharmaceuticals, medicinal chemical and botanical products industry is in lead while the repair and installation of machinery and equipment, the non-metallic mineral products and wood products industry are the bottom three industries.

Figure: Computer and software fixed assets per worker (in BDT)

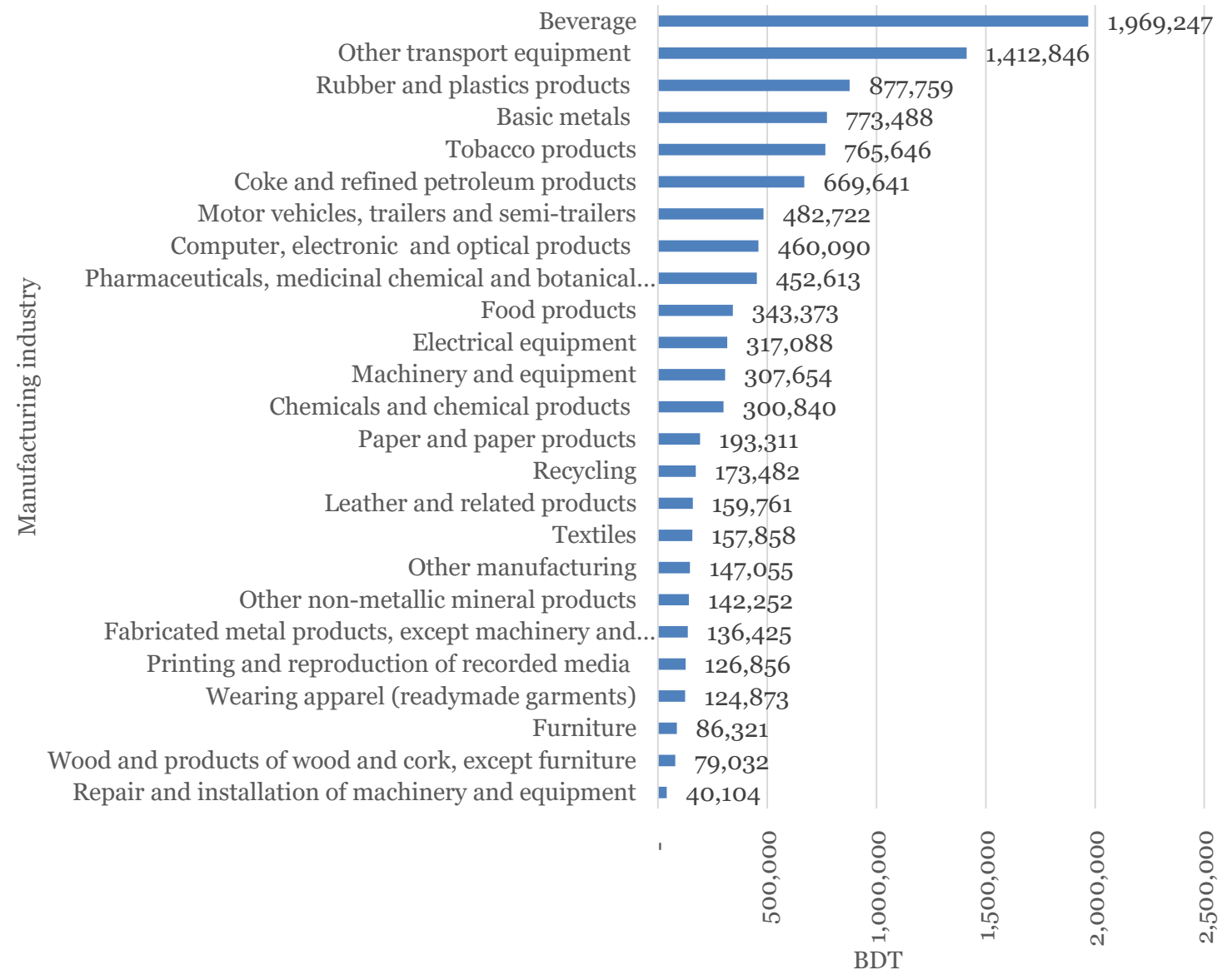


Source: Bangladesh Survey of Manufacturing Industries 2019, BBS

4.25 Gross output per worker per month

- The gross output per worker per month was calculated as the gross output divided by the number of workers employed.
- The gross output per worker per month is the highest for beverage manufacturing followed by rubber and plastic products manufacturing and basic metal products and tobacco products.
- The repair and installation of machinery and equipment sector has the lowest gross output per worker per month.

Figure: Gross output per worker per month (in BDT)

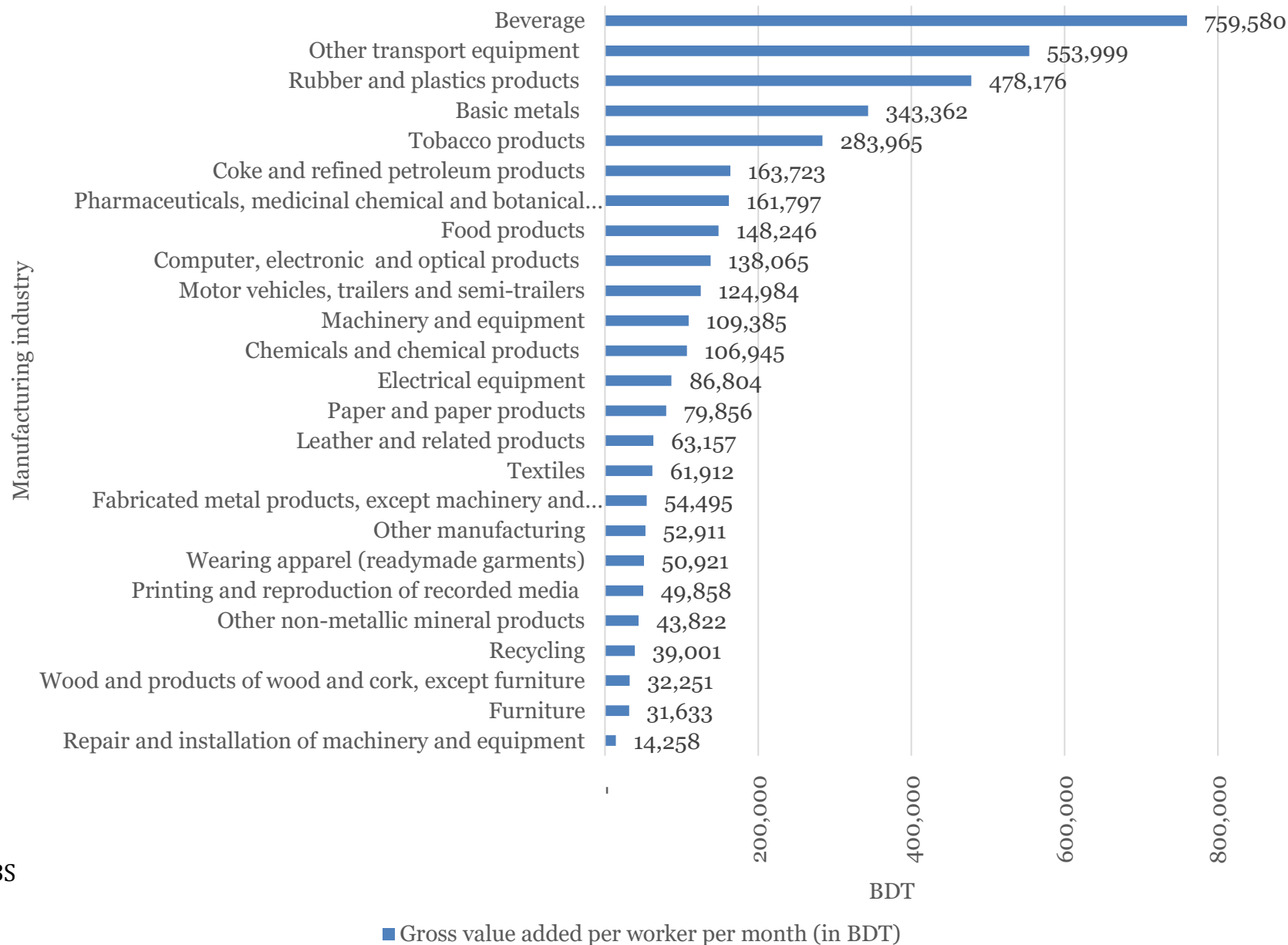


■ Gross output per worker per month (in BDT)

4.26 Gross value added per worker per month

- The beverage manufacturing industry has the highest gross value added per worker per month while the repair and installation of machinery industry has the lowest gross value added per worker per month.

Figure: Gross value added per worker per month (in BDT)

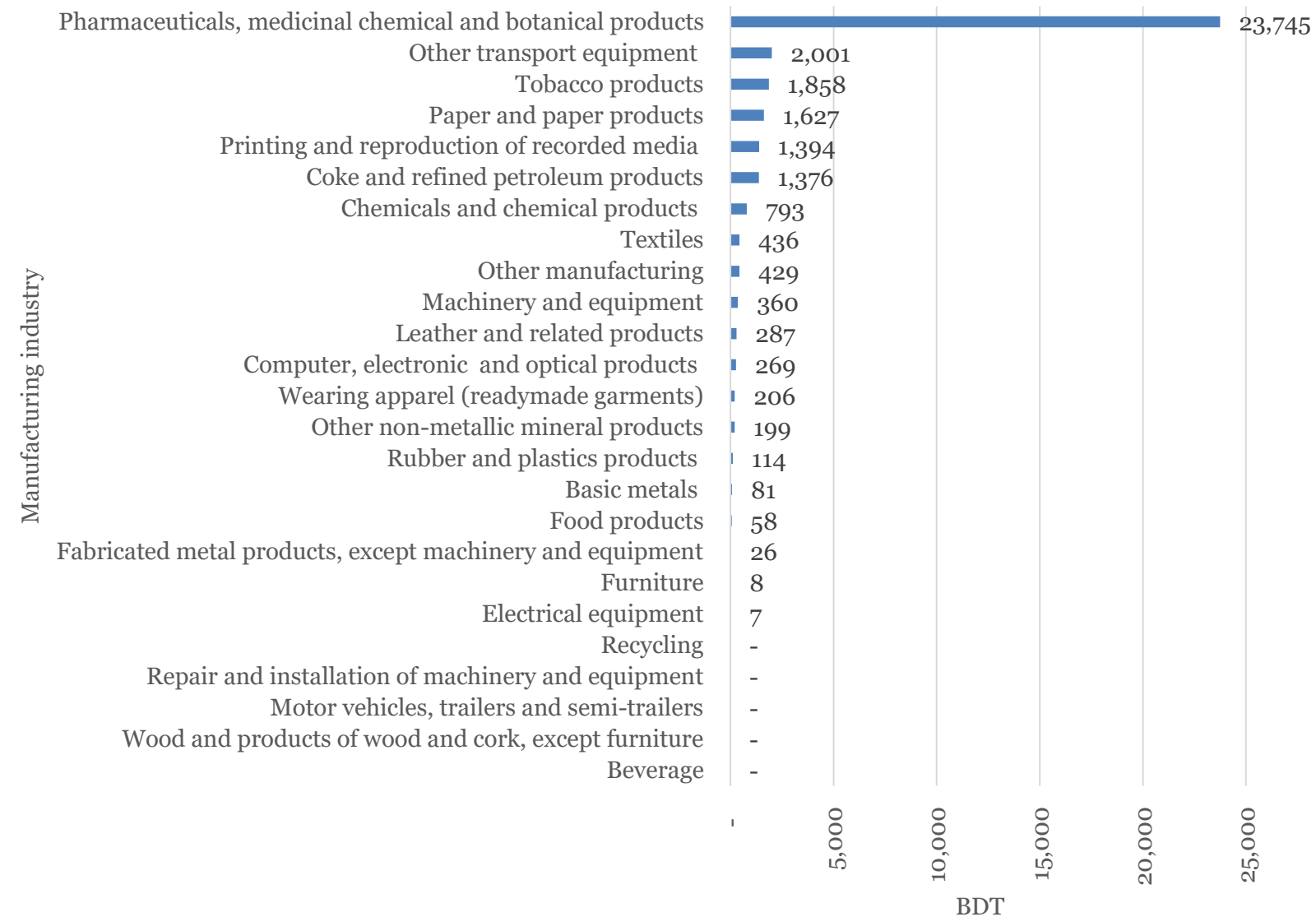


Source: Bangladesh Survey of Manufacturing Industries 2019, BBS

4.27 RnD expenditure per worker across industries

- The pharmaceuticals, medicinal chemical and botanical products industry has the highest R&D expenditure per worker among all industries.
- We can also observe that most industries spend less than BDT 500 in R&D expenditure per worker per year, which is an alarmingly low amount.

Figure: R&D expenditure per worker across different industries (in BDT)





5. Conclusions

5.1 Conclusions

- The majority of manufacturing firms, spanning all regions of the country, do not have a digital presence in the form of websites.
 - This highlights the potential for growth and the need for further digitization efforts, particularly among small and medium-sized enterprises
- Firms engaged in international trade are more likely to embrace digital tools, reflecting the necessity of a robust online presence for global business engagement.
- Firms with a higher share of educated workers exhibit a stronger tendency to adopt technology.
 - This underscores the significance of investing in education and skill development to facilitate broader digitisation in the manufacturing sector.
- The majority of sales still occur through traditional channels.
 - This presents an opportunity for firms to expand their digital footprint and capitalise on the growing e-commerce trend.

5.1 Conclusions (continued)

- Environmental sustainability has gained prominence, especially in the garment sector, due to pressures from international buyers.
 - The link between export orientation and CO₂ emissions monitoring emphasises the importance of adopting eco-friendly practices as a means of staying competitive in the global market.
- In terms of R&D spending, the research uncovers a stark gap, with even large firms dedicating only a small portion of their resources to research and development.
 - This highlights a need for a more comprehensive R&D strategy and increased investment in innovation to enhance competitiveness.
- While the manufacturing sector in Bangladesh largely focuses on low-tech products, it continues to be a significant contributor to GDP growth.
- However, the decline in the contribution of the manufacturing sector to total employment necessitates a focus on upscaling production capacity and job creation.

6. Recommendations

6.1 Recommendations

- **Empowering workers**

- Building the capacity of the workforce using measures to increase labour productivity through investment in science, technology, engineering, and mathematics education and technical training
- Ensuring that the training provided to workers is up to date and relevant to the skills required for the current state of technology
- Building core technical and organisational capacity at the management level of manufacturing firms

6.1 Recommendations (continued)

- **Expanding support to SMEs**

- Facilitating firms access to finance for technology adoption by strengthening the banking sector's capacity to allocate credit efficiently and in a way that is inclusive for firms of all sizes
- Providing special technology financing schemes for SMEs.
- Negotiating for special intellectual property rights waivers for SMEs to increase licensed technology use in SMEs, especially technology licensed from foreign companies
- Increasing SME's awareness of available government schemes and spreading awareness about how these schemes can help firms to adopt new technologies
- Improving access to capital required to support firms with innovation and technology adoption
- Providing technology targeted grants and fiscal incentives to promote innovation

6.1 Recommendations (continued)

- **Engaging international partners**
 - Diversifying exports by building the technical capacity of medium and high-tech industries to transform them into exporting firms
 - Adopting measures to move up the manufacturing value chain by shifting the manufacturing industries focus from low value-added manufacturing to high value-added manufacturing, potentially through FDIs and foreign partnerships
 - Engaging in diplomatic efforts to ease movement of workers across borders so that they may receive training in foreign technology use and can act as vehicles of technology transfer
 - Encouraging big-tech MNCs to open offices in Bangladesh so that they can disperse technology along the supply chain

6.1 Recommendations (continued)

- **Ensuring a conducive environment for investment**
 - Developing technical infrastructure, ensuring high speed internet access at affordable prices, and providing consistent electricity supply
 - Reducing uncertainties on a macro level by refraining from frequent change of energy policies and fuel prices
 - Enhancing the ease of doing business and creating a conducive environment for FDI, joint ventures and partnerships that can facilitate technology transfer
 - Decreasing barriers to doing business and adopting technology, such as legal regulations, bureaucratic red-tape, bribery, and corruption

6.1 Recommendations (continued)

- **Establishing a knowledge driven economy**
 - Increasing collaborations and partnerships between universities, research institutes and industry so that technological breakthroughs and innovations get enough investment and funding support so that they may be commercialised
 - Implementing the ‘observe and learn’ approach for technology adoption to learn from foreign technologies used in MNCs
 - Expanding government and private sector investment in R&D in order to establish a solid infrastructure base for R&D in Bangladesh
 - Upscaling research facilities of universities for more manufacturing technology related innovations and increasing government collaboration with universities to facilitate research
 - Shifting business mindset and policy from competing on low wages to competing on productivity through technological innovation

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