CDC
Investment works

Evidence Review

Insight

What is the impact of investing in manufacturing?

Practical thinking on investing for development

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Foreword

CDC is delighted to publish this evidence review on the development impact created by the manufacturing sector. The importance of the manufacturing sector in contributing to economic growth is well recognised by economists, investors and practitioners globally. The development needs and challenges in Africa and South Asia are constantly evolving and becoming increasingly complex. And, in the light of Covid-19, the fragile nature of globally-dispersed manufacturing supply chains has been exposed. The reinforcement and creation of locally robust and high-quality manufacturing hubs across Africa and South Asia capable of serving the basic needs of their populations has therefore become increasingly important.

There is broad recognition that countries cannot develop without a mature manufacturing sector, just as they cannot 'leapfrog' straight into a service economy. Those that have tried are now realising the need for local manufacturing to deliver productive growth. To maximise the impact of investments into manufacturing, investors need to consider how their investments can contribute to building stronger manufacturing ecosystems, with private sector capital likely to have the greatest impact where government policies are supportive. Investments are particularly meaningful in areas like technology, skills, and innovation capabilities, which have an outsized impact on productivity.

While the manufacturing sector is linked to positive social and economic impact, investors need to recognise the environmental trade-offs associated with growth in the sector. Private sector investors should look for opportunities to enable greener manufacturing to help improve environmental sustainability. The knowledge gap around which technologies are most effective in reducing emissions and material footprint is large, and further research is needed.

This review is undertaken in partnership with the Overseas Development Institute (ODI). ODI is an independent, global think tank that undertakes cutting-edge research and analysis to generate evidence, ideas and solutions. ODI has published more than 300 peer reviewed papers relevant for manufacturing and its role within economic development. The key research team enlisted for this report is part of ODI's Structural Economic Transformation (SET) programme, which looks at supporting economic transformation in our markets.

Contents

This report summarises evidence from more than 240 studies on the role of the manufacturing sector in driving economic, social, and environmental change, with a focus on emerging economies. The aim is not to compare or contrast the contribution from different manufacturing sub-sectors towards development outcomes, but rather to assess the evidence of the sector's overall impact in macroeconomic, microeconomic, social, and environmental areas. The aim is to help investors like us to maximise the positive development impact across our investments.

We hope this review will encourage more private sector investors to focus on growing the manufacturing sector, especially in Africa and South Asia, in recognition of its fundamental role in transforming economies and supporting productive, resilient economic growth. With development finance institutions and other investors still devoting relatively small portions of their investment budgets to the sector, we believe there are tremendous opportunities waiting to be unlocked.

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Introduction

The manufacturing sector is key to our development agenda and contributes to many of the United Nations Sustainable Development Goals (SDGs), either directly or indirectly. We invest across the manufacturing value chain, and across a range of sub-sectors, with a key focus on basic goods that improve people's standards of living, support economic transformation, and contribute to improved environmental sustainability – from manufacturers of pharmaceutical products to electric vehicles.

A large body of literature exists on the role of manufacturing in promoting economic development. We have not tried to capture this in its entirety, but have rather focused on the main linkages through which the manufacturing sector unlocks social, economic, and environmental impacts, to help us and other investors in investment decision-making to optimise for impact. In our review of the literature on the role of manufacturing for development, we have focused on evidence from emerging markets (while recognising the limited number of empirical studies, particularly when it comes to Africa).

In reviewing the evidence, we have sought to extract relevant implications for private sector investors, as well as to highlight any trade-offs investors may need to balance. Based on this review, the impact framework that guides our investment strategy is focused on three long-term impact goals:

- **Improved standards of living:** through our manufacturing investments, we aim to scale businesses that can improve the availability of basic manufactured products and provide economic opportunities by creating jobs and improving income levels. Underpinning improved standards of living, the broader evidence base positively confirms that expansion of the manufacturing sector has led to overall poverty reduction in countries that have expanded this sector.
- **Economic transformation:** through our manufacturing investments, we seek to accelerate the development of the manufacturing sector and broader support ecosystem in our focus geographies. The broader evidence base links greater economic complexity (namely increases in productivity, both within sectors and between sectors) to more diversified, productive, and resilient economies.

Through our manufacturing investments, we aim to contribute to three long-term impact goals: improved living standards, economic transformation, and improved environmental sustainability.

– **Improved environmental sustainability:** notwithstanding some of the inherent trade-offs between greater economic growth through manufacturing and greater environmental sustainability, we want our investments to positively contribute to the decoupling of economic growth from environmental degradation. Specifically, we seek to invest in models that directly contribute to patterns of more responsible production and consumption, thereby supporting greenhouse gas mitigation and more climate-compatible productivity.

The team at ODI conducted an evidence review of academic literature to ensure that our Manufacturing Impact Framework (Fig. 1 below) and investment activity is informed by the latest and best-in-class findings. As part of this process, the team also engaged with external stakeholders including sector experts, investors and academics.

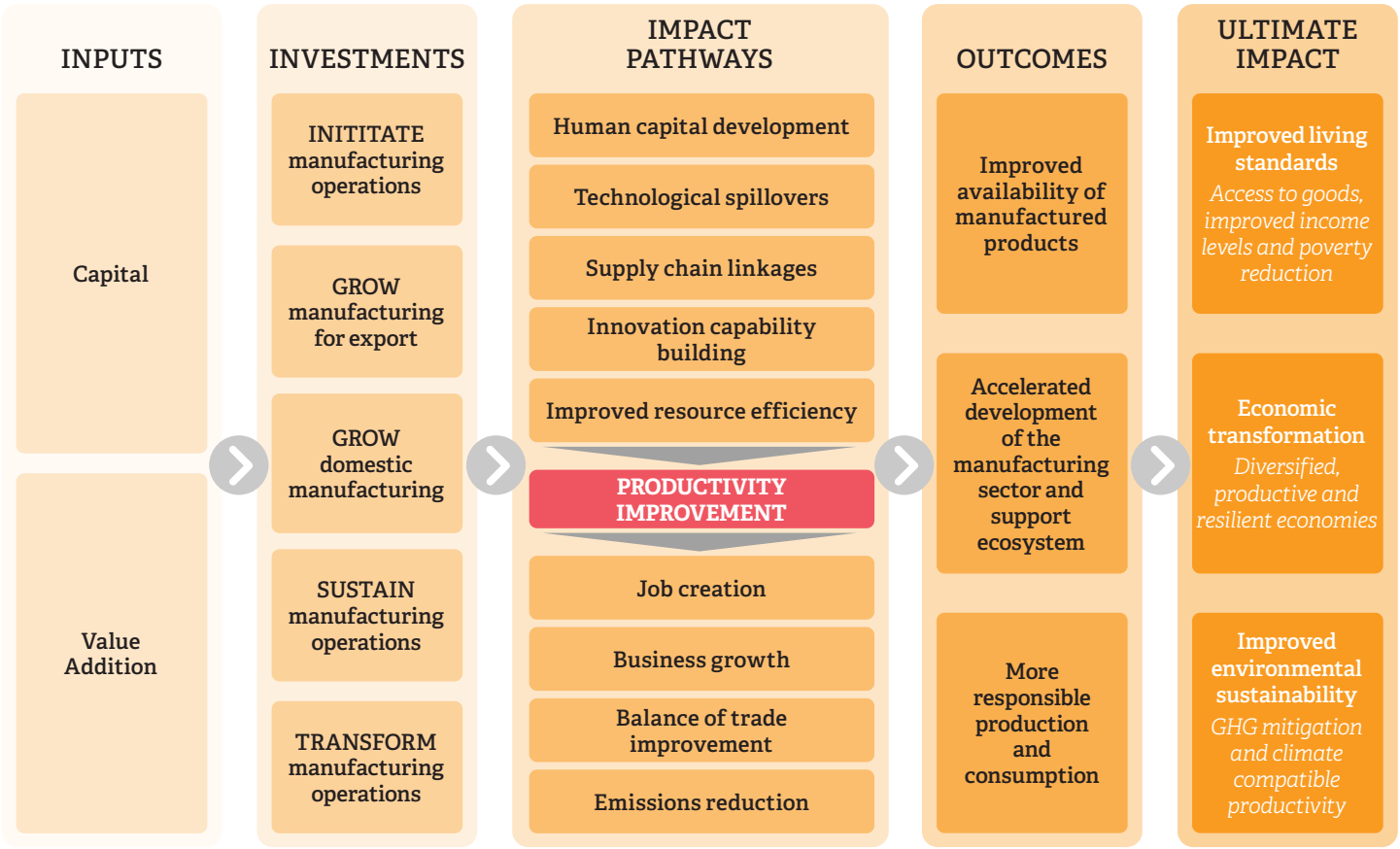

Figure 1: CDC's Manufacturing Impact Framework

Studies that examine the manufacturing sector's role for development often assess impact pathways based on their link to productivity (the ratio of output produced per unit of input, where increasing output per unit input is viewed as a productivity improvement). For example, studies on technological spillovers and supply chain linkages often apply a productivity lens. We have, therefore, established our impact framework to reflect which factors in particular are found to lead to productivity gains. We call them 'first order impact pathways'. These include technology, skills, and innovative capability that all result from capital injection and have a direct positive impact on productivity. We then outline the 'second order impact pathways' that are affected by increases in productivity. Examples include business growth, job creation, and balance of trade improvement (through greater export-oriented output or import substitution). Together, they form the impact pathways that lead to impact outcomes, and eventually longer-term ultimate impact.

These pathways do not exist in isolation. Our evidence review shows there are feedback loops between many of these impact pathways, as well as between some of the outcomes and impact pathways. We have therefore not sought to further disentangle how each of the pathways individually contribute to improved standards of living, economic transformation, and improved environmental sustainability, respectively, as the impact pathways all contribute to these impacts in aggregate. The disaggregation merely serves as a conceptual, analytical framework that supports how to understand investments in the sector – and their alignment with specific impact pathways as levers to deliver ultimate impact.

Before describing the evidence base and assumptions underpinning this framework in more detail, the review identifies three overarching points:

- Any manufacturing investment needs to be considered as part of a dynamic and inter-linked system. A systems perspective helps to step away from linear thinking about causalities, and allows for interdependencies, reverse causalities and trade-offs. Any investment will bring change, and should be analysed for both direct and indirect impacts, as well as impact risks. We also call out the inherent feedback loops between many of the impact pathways that are influenced by investments in the manufacturing sector; for example, the concepts of technological spillovers, innovation, and supply chain linkages are heavily interlinked and have been separated out for the purposes of structuring this evidence review.
- While the evidence may support a certain approach to investing for impact generally, what works in one place may not work in another and context-specificity is key. It is, therefore, important to assess and monitor the impact of each investment individually, both pre-investment through impact due diligence and post-investment through impact monitoring and management.
- It is important to consider the wider enabling environment needed to support any investment. For example, there may be deficiencies in the regulatory and legal framework at a market or country level, or other constraints that need to be addressed for a thriving manufacturing sector to grow in any one country. Private sector parties need to collaborate with other stakeholders to optimise the impact performance of their investments.

In the subsequent sections of this report, we summarise the evidence for each of the impact pathways that underpin the delivery of our three ultimate impact objectives. We conclude with a summary of opportunities and trade-offs that investors may encounter, and point to areas for further research. Examples from our portfolio help to bring this to life.

What is CDC's approach to impact?

Sector impact frameworks are aligned with CDC's overarching Impact Framework. In line with the Impact Management Project's dimensions of impact, we analyse the impact of each investment in terms of:

- *What* is the type of impact?
- *Who* ultimately benefits in terms of people and planet?
- By *how much* in terms of scale and depth?
- What is the likelihood the impact will be different than expected (*impact risks*)?
- What is our role in achieving the impact (*contribution*)?

In addition, we analyse how this impact is achieved through short-term outputs and medium-term outcomes including:

- The *direct* impact of our investments;
- The *indirect* impact of our investments, e.g. through economic enablers; and
- The impact of our investments on shaping and *catalysing markets*.

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Mapping the evidence

The next section summarises the evidence base underpinning the impact pathways outlined in our Manufacturing Impact Framework. We have not presented the sections according to whether the pathway is a first- or second-order pathway in our framework. Instead, we have grouped them thematically and where the evidence base between them is overlapping.

It is important to note there is not a linear relationship between any one of the impact pathways and the ultimate impact we are seeking to deliver. While there is a clear and direct link between emissions reductions and improved environmental sustainability, human capital development and innovation is just as important for the delivery of improved environmental sustainability. The impact pathways in aggregate drive the delivery of ultimate impacts.

- **Human capital development:** accumulation of technical and managerial skills
- **Job creation, including job quality improvements:** contribution to net employment and improved job quality
- **Productivity improvement:** the effectiveness of productive effort, especially in industry, as measured in terms of the rate of output per unit of input
- **Business growth:** increase in individual firms' sales, revenues, employment growth
- **Technological spillovers:** the beneficial effects of new technological knowledge on the productivity and innovative ability of other firms
- **Supply chain linkages:** creation of linkages with upstream and downstream businesses; buyer-supplier relations etc.
- **Balance of trade improvements:** changes to volumes of exports and imports; production for the domestic market
- **Innovation capacity building:** implementation of new or significantly improved technologies, products or processes that are 'new to the country' or 'new to the firm'
- **Emissions reductions:** mitigation or absolute reductions in greenhouse gas (GHG) emissions
- **Improved resource efficiency:** production factors that contribute to resource efficiency in manufacturing.

Table 1 lists the different impact pathways. The final column represents the quantity of studies and prevailing findings about the role of manufacturing in driving each impact pathway. This column shows where overall positive findings are observed and where findings are mixed or inconclusive.

Impact pathway	How manufacturing affects...	Strength and quantity of evidence
Business growth	Investing in manufacturing has positive impact on firms' growth (measured as sales, revenues) and survival.	
Productivity	Manufacturing drives productivity levels up in developing countries, acting as a significant driver of economic growth.	
Technological spillovers	Technological spillovers positively impact productivity and spread horizontally if carried out domestically, vertically if initiated by foreign firms.	
Supply chain linkages	Manufacturing firms form linkages with firms in manufacturing, as well as with other sectors.	
Trade balance	Investing in manufacturing contributes to export growth and to domestic production; dynamic, long-term effect through learning increase value of exports.	
Innovation	Innovation in manufacturing is linked to small, incremental changes – imitation, adaptation and experimentation.	
Emissions reduction	More productive and globally-integrated manufacturing firms produce less emissions but if the manufacturing sector grows, so do total emissions.	
Improved resource efficiency	New technologies (e.g. 3D printing, digitalisation, etc.) reduce the use of resources in manufacturing.	
Human capital development	Manufacturing has a positive impact on skills creation among shopfloor workers. More specialised technical and managerial skills take longer to be built.	
Jobs (growth and quality)	Growth in higher-value and higher-productivity manufacturing will result in the creation of higher income jobs than in lower value/productivity sectors. There is no conclusive evidence on the impact of manufacturing on job quality	

Table 1: Evidence summary – impact of manufacturing

Direction of findings: positive, negative or inconclusive

- Positive impact or relationship (>60% of studies): The results suggest that there are net benefits (economic, social, environmental) associated with manufacturing in the interested intervention area.
- Negative relationship (>60% of papers): The results suggest there are negative impacts (economic, social, environmental) associated with manufacturing in the interested intervention area.
- Inconclusive or mixed findings (no clear majority in any direction): The results are inconclusive in terms of the directionality of impacts.

Quantity of evidence

- Large body of evidence (>19 studies)
- Moderate body of evidence (10-19 studies)
- Small body of evidence (<10 studies)

Note: the size of the circle does not represent the size of the effect or impact, but rather the number of studies reviewed that produce a finding in this category.

1 Human capital development

Manufacturing activities contribute to developing skills of the workforce. There are various types of skills involved in manufacturing processes, from simple shop floor activities to more advanced technical and managerial skills. The evidence review finds that the manufacturing sector has a positive impact on skill creation among shop floor workers, while recognising that more specialised technical and managerial skills take longer to develop.

Skill creation through manufacturing is mostly concentrated at low-skilled levels, pointing to broader opportunities for skilling interventions

In developing countries, there is evidence that manufacturing contributes to building shop floor skills needed to carry out simpler operations of the production process. This often comes in the form of training, made necessary by the fact that manufacturing skills are often lacking among the local population. Differences exist according to the size of firms, with large firms more likely to provide training (Bhorat and Lundall, 2004; Biggs et al., 1995).

In our geographical focus regions, foreign direct investment plays a significant role in determining human capital development in the manufacturing industry. Foreign investors in manufacturing often provide some training, either formal or more commonly on-the-job, thus contributing to skilling factory workers mostly concentrated at the low- and semi-skilled levels (Oya and Schaefer, 2019). External training is often reserved for managers and skilled workers.

In Bangladesh, for example, on-the-job training accounts for the single most important source of skills development, ranging from 80 per cent in furniture making to 100 per cent in food manufacturing. Proactive investors are often a key enabler in ensuring companies invest to support training and upskilling across their entire workforce.

Managerial training and upskilling takes longer to develop, but would significantly benefit the sector's further development

Managerial skills are harder to develop, but are key to supporting the maturing of a sector. Several studies of the garment sector in Bangladesh highlight how the first foreign firm partnering with a Bangladeshi businessman contributed to transferring technical and managerial skills to domestic staff. This, in turn, was a key factor in the rapid development of the sector (Mottaleb & Sonobe, 2011; Rhee, 1990; Yunus & Yamagata, 2012). Case studies across electronics manufacturing in South East Asia also supported the finding where domestic firms adopted cutting-edge HR practices from FDI firms.

Opportunities for investors include targeted skill building and skill transfer through a pro-active approach towards management training, either through formal training programmes or even secondment of management staff in other firms where possible.

2 Job creation and job quality

Overall, there is a large body of evidence showing that growth in the sector leads to more sector jobs. However, the literature is inconclusive on whether employment creation effects are overall additional to the economy or displacing existing jobs in other sectors. To date, there has been limited empirical evidence on the sector's ability to deliver job quality improvements.

The manufacturing sector is a key driver of job creation across markets

In the long-run, economic complexity depends on the ability to create jobs in sophisticated (that is, high technology or skills-based) sectors in both manufacturing and services industries. There is a large body of evidence supporting the positive link between growth in higher-value or productivity manufacturing sectors and the creation of jobs (Wang & Chanda, 2018). Evidence from Nepal shows that an increase of 1 per cent in gross value added in the agriculture and manufacturing sectors has the greatest direct employment-

There is a large body of evidence supporting the positive link between growth in higher-value or productivity manufacturing sectors and the creation of jobs.

generating effects for disadvantaged groups, including rural and female workers (Lemma and te Velde, 2017). In Cambodia, the garment manufacturing sector has helped directly create jobs for the poor, with outsized impact for women (Dasgupta et al., 2011).

Manufacturing firm innovation can improve job duration and skills

There is a moderate body of evidence that innovations in either production processes or innovation in products (such as bringing new products on to the market) can have positive employment creation effects. Process innovation has a positive effect on employment through growth in sales of existing products. While improved efficiency of the production process leads to fewer new jobs being created (Zhu et al., 2020), greater degrees of human capital specialisation seem to lower the degree of job losses in technology-intensive firms (Castro Silva & Lima, 2017). Employment growth rates and the sustainability of job creation increase as product innovation is persistently maintained (Bianchini & Pellegrino, 2019). There is inconclusive evidence as to which type of innovation has a greater employment creation effect.

Job quality improvements in the manufacturing sector is an area where private investors can help set standards and drive positive change

Investment opportunities in high-value manufacturing or upgrading of local manufacturing firms' sophistication and level of technology adoption are a driver for better or higher income job opportunities within an economy. Although early days, investors can play a positive role through standard setting and acting as the stewards of decent quality jobs.

Case study: supporting local fertiliser production and job creation

Located in Port Harcourt, Nigeria, Indorama Eleme Fertiliser & Chemicals Limited (Indorama) is the world's largest urea fertiliser manufacturing plant. As part of a syndicate of international finance institutions, led by the IFC, we have supported Indorama's development with loans of $165 million to date.

Having previously depended on imported fertiliser, Indorama contributes to a significant domestic production, reducing production costs for Nigerian farmers and improving food security for a rapidly-growing population. More than 3,600 people are working on the construction of the second line, while the first line of the plant employs 470 people. In a potentially dangerous working environment, Indorama puts great effort into environmental health and safety through staff training, ensuring decent job quality standards are upheld.

3 Productivity improvement

There is clear evidence that investments in the manufacturing sector allow firms to grow and help increase productivity. Productivity improvement is measured by the rate of output per unit of input. Increased productivity in the manufacturing sector is a driver of national-level economic growth. Shifts towards more technologically-intensive products and methods of production, increases in firm turnover rates (including the speed at which new firms enter the market and incumbent firms exit the market) and increased firm size further positively affect productivity in manufacturing.

Manufacturing is a key driver of macroeconomic growth

The role of industrialisation for driving growth is widely acknowledged (McMillan et al., 2014; Rodrik, 2011). The manufacturing sector is closely associated with growth impacts at the macroeconomic (national) level driven by the sector's ability to increase aggregate level productivity.

While a de-industrialisation trend in both developed and developing countries in recent decades has been observed (Rodrik, 2016), post-2000 growth in productivity across Africa can be increasingly attributed to structural transformation – driven by an increased share of GDP in the manufacturing

sector away from lower productivity agriculture and services (Gollin et al. 2014; McMillan and Harttgen, 2014). There is still significant potential to develop the sector in a large majority of developing countries (Haraguchi et al. 2017).

Increased firm sophistication through management practices and technology adoption drives productivity

The characteristics of manufacturing firms play a role in determining the macroeconomic impacts of the sector (Bartelsman & Doms, 2000). Bloom et al. (2010) attribute low levels of firm productivity in developing countries to three factors: inadequate management practices, lack of financing, and lack of decision-making practices. Not surprisingly, these practices become increasingly important as the firm grows.

Particularly, technology transfer and innovation have been identified as two sources of productivity growth within the manufacturing sector (Timmer and de Vires, 2013). Increased levels of in-house research and development (R&D) expenditure (acting as a proxy for higher technology capabilities within a firm) have positive impacts on productivity, and introduce the possibility of diversifying into new products (Chudnovsky et al. 2006).

Opportunities exist to boost productivity levels through investments into R&D, more technologically advanced equipment, and broader support for human capital development – in the form of better management practices and providing workers with the skills and knowledge required to effectively use any new technologies or production systems.

The private sector plays a key role in boosting productivity levels through investments into R&D, more technologically advanced equipment, and broader support for human capital development.

4 Business growth

Overall, there is a moderate body of evidence that investments in manufacturing have positive impacts on business growth and survival. Firm growth also has positive (though seemingly less-than-proportional) impacts on employment growth for the firm itself. Finally, manufacturing has positive impacts on exports – while the evidence for this is strong for Asian countries, it is moderate in the case of African countries, which have struggled to develop a strong export-led manufacturing model.

Manufacturing drives firm growth, but with less-than-proportional impact on job creation

Specific firm characteristics (such as size, age and sector) determine their likelihood to survive, to become fast growers and increase their exports. Manufacturing firms' employment growth is mostly less-than-proportional to firm growth. For example, if a firm's financial size doubles, its workforce will increase but it may not double (Bhorat and Rooney, 2017; Kesper, 2001; Teal, 1999). Considering data from both developed and developing nations, Shiferaw and Hailu (2016) find that developing countries need atypically high rates of value-added growth (about 10 per cent) to increase manufacturing employment considerably (about 4 per cent).

Looking at studies focused on the African continent, factors that seem to be positively driving firm growth are: labour productivity, capital intensity, and location of firms in and around the capital city (Bigsten and Gebreyeesus, 2007). Firms engaged in product innovation – that have their own transport means and are connected to the internet through their own website – are also characterised by higher growth rates (Goedhuys and Sleuwagen, 2010).

Export growth in Asia driven by diversification, government incentives, and foreign direct investment

The literature shows positive impacts of manufacturing on increasing exports, with positive feedback loops between exporting and productivity. The evidence is strong for Asian countries, where export-led manufacturing has taken place, but is inconclusive for African countries.

The economic success of North Asian countries, such as Japan, Taiwan and South Korea, seems to be driven by their ability to promote export-led manufacturing supported by government policies that provided the right set of

incentives (Studwell, 2013). Asian export growth and diversification has been underpinned by a combination of entry into completely new products (Papageorgiou et al., 2015), prevalence of Special Economic Zones exports (Aggarwal, 2012; Aggarwal et al., 2009), and foreign direct investment (Mottaleb and Sonobe, 2011; Yunus and Yamagata, 2012).

Export growth in Africa still constrained by high transaction costs, infrastructure challenges and high costs of production

In contrast with Asia, manufacturing exports have not yet boomed in Africa. Few countries in Africa have successfully diversified into export-oriented manufacturing. Most have small, underdeveloped manufacturing sectors, and export mostly to nearby countries rather than to developed economies.

Compared to other regions, exports in African countries are constrained by high wages, infrastructure challenges and higher costs of production (Clarke, 2012), rather than by limited labour productivity. Exchange rates, a high-risk environment and high transaction costs are identified as further constraints (Soderbom and Teal, 2001). While private sector capital alone cannot solve all of these issues, there is an evident need for both capital and governance to work in tandem, to continue to back both greenfield and brownfield manufacturing companies to build track records on the continent, and further de-risking the sector.

5 Technological spillovers

Technological spillovers are defined as the beneficial effects of new technological knowledge on the productivity and innovative ability of other firms. There is strong evidence of positive productivity spillovers that occur within the manufacturing sector, with knowledge permeating both vertically within value chains as well as horizontally (between competitor firms). Innovation is fostered through small, incremental changes.

Building technological capabilities of firms drives ability to absorb and positively benefit from spillovers

There is a large body of evidence supporting the positive impact of Foreign Direct Investment (FDI) on technological spillovers, which in turn has positive impacts on firm-level productivity through both vertical and horizontal linkages (Bitzer et al. 2008; Chang and Xu, 2008; Liu, 2008).

In India, technological spillovers are higher in particular industries such as products, textiles, chemicals, drugs and pharmaceuticals and non-metallic mineral products (Behera et al., 2012). Productivity improvements through FDI-driven technological spillovers mainly occur through backward linkages. Manufacturing firms in high technology industries benefit more from spillovers than low technology firms, noting that technological capabilities within firms are the main factor contributing to their capacity to absorb any spillovers (Malik, 2015).

Investing in R&D is a key driver to influence technological spillovers, in turn positively affecting productivity

For developing countries, there is strong positive evidence of the link between R&D and productivity-increasing technological spillovers. At the aggregate level, foreign firm-led R&D has the largest positive impact on domestic productivity and value-added growth, as evidenced by an evaluation of how FDI in technology upgrading affects the manufacturing sector in 32 developing countries between 1965 and 1992 (Savvides & Zachariadis, 2005). Investments into R&D and technology have a significant positive impact on the output of manufacturing firms (Dutse, 2012; Franco & Sasidharan, 2010; Saxena, 2011).

While the promotion of all forms of R&D (whether domestic or imported through FDI) would be generally economically beneficial, the promotion of local research and development capabilities will likely have the largest impact in proliferating positive technological and knowledge spillovers. The main reason is that locally generated R&D is more likely to be spread across competing firms through skilled worker movements (rather than skilled workers mainly

concentrated in a few FDI firms), with positive productivity (and growth) impacts throughout the targeted manufacturing sub-sectors. This can be achieved by supporting local research institutions linked to manufacturing firms or, where they are not present, support their creation, as well as directly investing into bolstering companies' R&D spend and capabilities.

6 Supply chain linkages

Manufacturing firms are likely to form supply chain links both with other firms in the manufacturing sector and with firms outside of the sector, as well as internationally, which facilitates both the production and the sales of goods. Through linkages with their buyers and suppliers, manufacturing firms generate benefits that expand beyond the sector, such as employment creation and value-add in other areas of the economy. Sourcing goods and services domestically can contribute to stronger local supply chains. In some cases, this will be either encouraged by host country governments – through incentives or required though regulations. Where not available locally, training potential suppliers to bring them up to speed with the required specifications would be a way to strengthen local ecosystems.

There is a large body of evidence that supports a positive effect of the manufacturing sector on vertical linkages (Aggarwal, 2014; Lavopa and Szirmai, 2012). Vertical (or inter-industry) linkages refer to the connections made by a firm with upstream businesses, providing inputs, or downstream businesses, buying the firm's outputs to use as inputs. Such linkages are more conducive to spillovers than horizontal linkages between firms in the same sector, and are one of the main channels through which firms expand their business opportunities, upgrade and gain knowledge.

Special Economic Zones (SEZs) and Export Processing Zones (EPZs) combine attractive features, such as good infrastructure and policy and tax incentives, to facilitate investment in manufacturing, either for exports or for the domestic market. The overall role of SEZs in supporting the creation of linkages depends on characteristics of the economy and of firms, such as the presence of supporting policies.

7 Balance of trade improvements

There is a large body of evidence supporting the positive effects of manufacturing on the trade balance. Manufacturing can have a positive impact on a country's trade balance in two ways: it can help a country increase its exports compared to its imports, and it can help a country reduce its import bills by producing goods domestically.

Exports encourage learning and upgrading, which positively impacts productivity

Particularly for countries involved in processing trade, and in assembly operations, manufacturing often entails importing materials and components, processing and re-exporting them, with limited value-added captured in the country. Countries that are net importers of manufactured goods tend to suffer trade deficits, whereas exporters of manufactured goods tend to enjoy trade surpluses.

Exporting is not only beneficial in the short-term, providing foreign exchange benefits. In the long term, competing in international markets also supports learning and upgrading, which is crucial for firms to increase value added (Fu, 2011). A study covering four sub-Saharan African countries shows that exporting positively impacts on productivity, supporting the 'learning-by-exporting' hypothesis (Bigsten et al., 2004). [1]

The private sector can play a role in supporting firms in upgrading their products and processes to increase the sophistication and the value of their exports. Encouraging increased participation in global value chains further enables companies to acquire new knowledge and production skills. This can help not only improve the trade balance by ensuring that more value is retained in the manufacturing host country, but also boost learning and upgrading of the broader ecosystem.

The private sector can play a role in supporting firms in upgrading their products and processes to increase the sophistication and the value of their exports.

1 The 'learning by exporting' hypothesis refers to productivity gains experienced by firms when they export. These productivity gains are the result of the new knowledge gained when interacting with, and learning from, competitive players in international markets.

Manufacturing for local markets can improve the trade balance while improving availability of critical goods

Goods produced domestically can replace imports, thus improving the trade balance. There is strong positive evidence that investment in manufacturing, both in Africa and Asia, contributes towards making goods available for the domestic market, thus reducing the need for imports.

In addition to the ability of local manufacturing to promote greater affordability, as seen in examples from Angola, where local production of cement and construction materials decreased prices of these materials and overall imports (Wolf, 2017), manufacturing for local markets has been found to contribute to the creation of downstream industries. This was observed in Ethiopia, where the local development of cement manufacturing drove new downstream industries (Oqubay, 2017).

Pharmaceutical production is receiving increased attention, in particular because of the potential public health implications of producing medicines domestically. A pharmaceutical sector review carried out on the African continent found that manufacturing medicines in African countries can improve responsiveness to local needs and improve access to medicines for rural populations (Mackintosh et al., 2017). In East Africa, while physical properties and packaging of locally-produced medicines were found to be of lower quality than international competitors, with varying prices, locally produced medicines have much better distribution in rural areas, and are deemed to help in case of emergency needs (Mackintosh et al., 2018).

As India re-introduced product patent protection in pharmaceuticals in 2005, Indian generic companies can no longer produce and export new patented drugs. Therefore, African countries will no longer be able to purchase these medicines at competitive costs (Chaudhuri et al., 2010). Producing medicines in Africa may be more costly, but it has the advantage of flexibility to meet local demand and allows local authorities to implement better quality and standard controls.

Case study: providing access to low-cost, high quality medicines across Africa

In 2020, we invested $100 million into an ambitious pan-African platform focused on the manufacturing and marketing of generic versions of pharmaceutical speciality products.

Access to low-cost, high quality medicines remains constrained throughout Africa, due to the lack of competition in these markets. By bringing together a specialist generics manufacturer with oncology and critical care capabilities and a local generics manufacturer with extensive market access, our investment will introduce lower-cost generic drugs into North Africa. The investment aims to increase affordability and access to high-quality critical care medicines, while generating significant healthcare system savings and accelerating the development of the regional pharma manufacturing sector.

8 Innovation

Innovation is defined as the implementation of a new or significantly improved product (good or service) or process (a new marketing or organisational method in business practices, workplace organisation or external relations). Innovation is often associated with R&D activities, taking place within firms and in the public sector. In reality, innovation is much broader and includes product, process and managerial innovation (Calabrese et al., 2020). The latter is particularly useful to understand how innovation occurs in developing countries.

There is a large body of evidence underpinning the positive impact of manufacturing on innovation, which in turn is essential to boost productivity (Franco & Sasidharan, 2010; L. Wang et al., 2016; López-Pueyo et al., 2008).

Investors can boost incremental innovation by supporting skill development and knowledge transfer

Studies of the manufacturing sector in Africa and Asia find that because R&D is often less prominent within companies, innovation occurs through the introduction of products and processes that are new to the market, or to the firms, and is linked to smaller, incremental changes.

An early study of the manufacturing sector in Ghana, Kenya and Zimbabwe found that a very small proportion of (mostly large) firms in these countries engage in R&D, but a good deal of imitation, adaption and experimentation takes place (Biggs et al., 1995) as well as product and process innovation (Robson et al., 2009). Firms' capacity to innovate is found to be related not only to the quality of the institutions in the surrounding environments, but is also driven by the social capabilities or competences of the managers within the firm (Murphy, 2002).

A study on multi-national corporation (MNC) subsidiaries in Malaysia found evidence of substantial incremental innovation, geared in particular towards continuous improvement, including technical process and organisational and managerial innovations. Foreign MNCs transferred skills and technology for commercial reasons, to enable the rapid and efficient expansion of capacity and to meet the need for higher productivity, operating cost reductions and flexibility of response to market changes (Hobday, 1996).

Innovation is nurtured if the 'ecosystem' facilitates knowledge and technology transfers, but also if firms have the capacity to absorb and learn new technologies and processes. Private sector investors can play a crucial role here, prioritising skills development and supporting knowledge diffusion.

Innovation can play an important role in driving new job creation

Innovation within manufacturing can affect employment, particularly through product innovation. A study of European manufacturing firms found that product innovation is accompanied by employment growth, but process innovation does not seem to have the same effect (Bianchini and Pellegrino, 2019). Similarly, Avenyo et al. (2019) noted a positive relationship between product innovation and total employment in five sub-Saharan African countries. In the context of innovation, proximity of firms in regional and local clusters has further been found to facilitate knowledge transfer.

Innovation can boost productivity and contribute towards new employment creation.

Given the role innovation plays – not only in boosting productivity but also contributing towards new employment creation – private investors should consider how they can support various forms of innovation. Depending on the relationship with the company, support can take many forms, ranging from strategic and operational involvement to encouraging local innovation efforts, to targeted investments into industries and firms that form part of a cluster.

9 Emissions Reductions

While the more productive and globally integrated manufacturing firms generally produce lower emissions relative to their peers, as the manufacturing sector grows, so does total emissions. There is a moderate body of evidence looking at how the manufacturing sector impacts GHG emissions. For the purposes of this insight, we will not examine the link between manufacturing sector emissions and the national energy mix in detail, but we note the direct link between national fuel shares in energy provision and GHG emissions in the manufacturing sector (Chontanawat et al., 2020; Hang et al. 2019; Yan and Fang, 2015).

Investments that aim to contribute to more environmental sustainability should focus on the introduction of lower emission production systems, with a focus on both the actual technology and the worker skills required to operate the technology.

Adoption of good production techniques is a key lever to lower manufacturing emissions

There is moderate body of evidence showing that improved production methods (such as technology or new processes) play a key role in the level of GHG emissions in the manufacturing sector (Barrows and Ollivier, 2018; Levinson, 2015; Majumdar and Kar, 2017).

A survey of 14,000 firms in Malaysia's manufacturing sector found that firms with better energy management practices, including management commitment, energy awareness, energy knowledge, and energy audits, exhibited better energy efficiency; energy audits were also found to positively contribute to emission reductions at the firm level (Fernando and Hor, 2017). Xu and Lin (2016) show that firm energy efficiency played an important role in emission reductions within the Chinese manufacturing sector, notwithstanding the role of the country's energy structure as a major driver of overall manufacturing emissions.

While intuitively logical, the evidence shows the vital role of good production techniques in lowering relative emissions from manufacturing. Investors looking to foster greater environmental sustainability should seek to understand whether the firms they invest in use best-in-class production equipment and techniques; where sub-standard techniques are used, which is likely to be the case for most developing economies, opportunities exist to upgrade the production techniques used. While up-front investment is often needed for upgrades, prioritising such upgrades will not only reduce emissions but will often also result in cost savings in the long run (and mitigate against negative externality risk and environmental fines as regulation tightens).

10 Improved resource efficiency

Overall, there is a large body of evidence linking the manufacturing sector with improved resource efficiency. New technologies (e.g. 3D printing, digitalisation etc.) are examples of reducing the use of resources in manufacturing. This report does not include results from technical engineering papers that evaluate different types of productions techniques and their role for driving resource efficiency; rather, it focuses on the broader economics literature around resource efficiency. There is no distinction between e.g. land, water, or material resource use in this part of the literature, so resource efficiency should be understood in broad terms for the purposes of this review.

Technology upgrading is a key investment priority to unlock resource efficiency

There is a large body of evidence showing that technology innovation or upgrading has the potential to positively influence increased resource efficiency (Dong et al., 2017). The level of economic development also matters: higher levels of eco-efficiency are observed in manufacturing firms in more economically developed regions, which are also broadly and positively affected by environmental regulation and technological innovation (Zhang et al. 2017).

At the microeconomic level, there is evidence that more environmentally sustainable productivity is fostered by technological improvements (Shi and Li, 2019), increased levels of R&D and higher worker education levels (Chen et al., 2018; Solnørdal and Thyhold, 2019). However, while firm-level green productivity measures are improving the relative resource efficiency of a firm, increases in energy consumption and undesirable environmental outputs (pollutants) at the aggregate sectoral level mean that industrial growth overall will result in an environmental opportunity cost (Chen et al., 2018).

Investors need to recognise this trade-off and seek to support companies with targeted support where possible for ensuring companies can technologically catch-up, increase their levels of R&D, and improve their worker skilling.

Energy efficiency at the firm level plays an important role in reducing emissions.

New technologies and digitalisation will play an increasing role for delivering resource efficiency

There is a relatively recent subset of studies that focus on new technologies and their role within driving greener, more resource efficient manufacturing. These studies focus on areas like additive manufacturing (e.g. 3D printing) and digitalisation and their impact on resource efficiency and environmental sustainability. The review finds that there is strong positive evidence between the adoption of these new technologies and reduced use of resources in manufacturing.

There is a positive relationship between digitalisation, resource efficiency and the development of new products (Dalenogare, et al., 2018; Li et al. 2009; Neligan, 2017). However, there may be an employment opportunity cost as new technologies replace existing jobs in the manufacturing sector (Beier et al., 2017). Evidence also suggests that in relation to traditional processes there is a higher energy consumption level for some automated processes (e.g. 3D printing) compared to standard manufacturing production processes (Kellens et al., 2017).

Case study: expanding low-carbon technologies

In 2016, we partnered with LafargeHolcim, a global leader in building materials and solutions, to create 14Trees. The mission of 14Trees is to take affordable and sustainable construction innovations from labs to the field. With present-day activities in Malawi, Kenya and Ivory Coast, 14Trees started with the production, promotion and sale of Durabric, their alternative to clay-burnt brick, in Malawi. Durabric is better for the environment than clay-burnt brick, as the bricks are produced from a mixture of earth, sand and cement, compressed in a mould, and left to cure naturally without firing. By avoiding the firing phase, Durabric reduces GHG emissions and avoids deforestation, saving on average 55 tonnes of carbon dioxide and 14 trees for every house built.

Our investment has helped the business to strengthen the local construction industry by accelerating the adoption of green building standards and partnering with local builders who are able to improve their construction skills and benefit from employment opportunities. The company is now also piloting 3D printing construction technology in Malawi and Kenya.

More resource-efficient practices may positively increase business growth

There is a small but emerging body of evidence of the positive impacts of resource efficiency on business growth. There seems to be potential profitability gains for manufacturing firms if they can improve their eco-efficiency practices for resource use (Kamande and Lokina, 2013); furthermore, studies have found a positive relationship between resource efficiency and manufacturing sector SME growth performance (Özbuğday et al., 2020).

Given the growing concern for our natural environments from public and private actors, as well as the clear benefits that new production technologies offer, investors in the manufacturing sector should look for opportunities to increase the diffusion and adoption of new technologies that can help increase productivity while reducing the net impact on the environment. Related worker skills should be prioritised, while technical assistance should be provided to help firms generate an effective (and realistic) resource efficiency strategy.

02

Investing in manufacturing to drive social, economic, and environmental impact

The manufacturing sector underpins the delivery of higher living standards, economic transformation, and improved environmental sustainability. Many investors recognise the transformative potential of the sector in delivering against the SDGs while creating more productive, diversified and resilient economies.

A major challenge across our markets, particularly in Africa, is how to sustain double-digit growth in the decades to come, while at the same time generating enough decent jobs, expanding the export sector, and resolving the balance-of-payments constraint. Investments that build and expand local, best-in-class production capacity – for both exports and domestic markets – while building human capital and looking for opportunities to invest in cleaner, more resource-efficient production models can support economies in meeting this vision.

2.1 Improved standards of living

Manufacturing plays a dual role in improving standards of living. It does so directly, as improved standards of living are underpinned by the availability of (and access to) basic goods that provide individuals with shelter, nutrition, health, and sanitation. But more fundamentally, the manufacturing sector delivers improved standards of living through the role it plays in improving income levels across societies. There are evident links between the growth of a country's industrial development income levels and associated poverty reduction.

Growth in the manufacturing sector means the potential to invest in new products, new export sectors, improve capabilities and establish local R&D capacity, creating new employment and income opportunities. The job creation effects of the manufacturing sector are linked to improved economic opportunities, particularly for the poor in developing countries, as new higher-income jobs become available and the body of evidence linking manufacturing to poverty reduction is large.

Labour-intensive manufacturing has employed millions of poor people from rural areas, increasing their wages and significantly reducing household poverty levels (CPAN, 2019; Keane and te Velde, 2008). Analysis assessing 104 developing countries over two decades found that a 1 per cent increase in employment-intensive manufacturing decreases poverty by between 5 per cent and 7 per cent (Gutierrez et al., 2007).

The evidence for the impact of the manufacturing sector on reducing income inequality is mixed. While some studies find an unambiguous reduction in income inequality when workers move into the manufacturing sector (Baymul and Sen, 2019/2020), other studies suggest manufacturing may not have as relatively large an income inequality reducing effect now as it did in the past (Felipe et al., 2014).

2.2 Economic transformation

The concept of economic transformation, as defined by McMillan et al. (2017), describes increases in productivity in the economy, both within sectors and between sectors. The former stem from productivity-enhancing investments, while the latter comes from a movement of resources from low- to high-productivity activities, such as a shift of the workforce from subsistence agriculture to manufacturing (structural transformation).

The role of the manufacturing sector for driving economic transformation is well recognised. Convergence in labour productivity between poorer and richer countries has been fastest when investment has moved into manufacturing, because of the exceptional scope for the acquisition of new technological capabilities found in manufacturing activities (McMillan et al., 2017).

Economic transformation entails not only an increase in GDP, but also job creation and diversification of the activities undertaken in an economy. As such, economic transformation embeds a concept of resilience for individuals, firms and the economy, as it allows for economies to be less reliant on one manufacturing sub-sector for its growth. Supporting economic transformation involves shifting resources from low-productivity to high-productivity uses, diversifying a country's productive capabilities, generating new sources of export competitiveness and expanding formal-sector employment.

Supporting opportunities to build and enhance production complexity and backward integration to materials are particularly impactful areas for the private sector to focus on. Examples include diversification of products and increasing efficiency in production processes via technology, as well as equipment upgrades and automation.

2.3 Improved environmental sustainability

With the effects of climate change most prevalent in developing economies, particularly Africa and South Asia, mitigating GHG emissions – and building climate compatible productivity – has become more important than ever. With the manufacturing sector's inherent contribution to emissions, through its energy use and production process, finding ways to mitigate against the sector's negative environmental footprint has proven timely and critical. Along with many other investors, we have stepped up to the challenge by prioritising investments towards more responsible production patterns that ultimately improve the environmental sustainability of their sector, and deliver climate compatible productivity.

The evidence review finds that although total emissions increase as the manufacturing sector grows, the more productive and globally-integrated manufacturing firms tend to produce lower emissions than similar non-integrated firms. Furthermore, new technologies (such as 3D printing and digitalisation) can reduce the use of resources in manufacturing.

Through investments, financiers can shift focus towards lower emission production systems, through the technology itself and the technical skills required to operate it. Technical assistance can often be a useful mechanism to support firms to generate an effective (and realistic) resource efficiency strategy.

1%

A 1 per cent increase in employment-intensive manufacturing decreases poverty by between 5-7 per cent.

Economic transformation embeds a concept of resilience for individuals, firms and the economy, as it allows for economies to be less reliant on one manufacturing sub-sector for its growth.

03

Private sector focus areas and trade-offs

The evidence review has highlighted some cross-cutting areas that are particularly relevant levers for how private sector investors can positively influence the impact of investments in the manufacturing sector. We summarise them here and highlight some inherent trade-offs that arise when investing in the sector.

3.1 Technology and research

Technology enjoys the position of a key enabler for the manufacturing sector. Technological spillovers have significant vertical linkage effects, hence investment into technological upgrading or R&D capabilities at one firm tends to have broader productivity enhancement effects.

Technological upgrading increases firm productivity, can help lower emissions and can drive more sustainable jobs. Long-term investments aimed at increasing the technological capabilities and technological level of goods produced by manufacturing firms will eventually result in significant gains in economic complexity, creating niche spaces in the international goods markets. Although country-level improvement is a long-term process (often decades), firm-level results may be visible within shorter investment timeframes.

3.2 Worker skills and education

The review has highlighted the importance of developing appropriate skills for workers, both at the operational and managerial level. It has also shown that while manufacturing contributes to the development of technical skills, managerial skills are harder to develop. The development outcomes of private sector investment would, therefore, be strengthened by considering investments that ensure managerial and technical skills are transferred to local workers.

3.3 International linkages

The manufacturing sector promotes the creation of linkages between firms. These linkages are conduits of knowledge and technology transfers, productivity and spillovers. Investments should focus on supporting the creation of these linkages, for example by bridging the gap between more technologically advanced firms and potential suppliers.

3.4 Trade-offs

Any manufacturing investment will be part of a wider interlinked, dynamic and interactive system and cannot be viewed in isolation. Investments contribute to positive impacts in some areas while contributing to negative impacts in others. It is important to identify and weigh up the potential trade-offs and impact risks – to analyse the net effect on the wider manufacturing ecosystem, identify opportunity areas, and develop risk mitigation strategies where possible.

Economic growth vs. environmental sustainability

While improvements in production processes, technology and human capital can lead to reduced firm-level emissions, aggregate growth in the manufacturing sector will inevitably lead to increased emissions. Future technological developments may eventually allow the sector to become carbon neutral, but until then, any current investments in manufacturing that are not entirely offsetting their emissions via resource efficiency will contribute to an emission increase through production growth. Private sector investments can help improve the relative environmental sustainability of firms they invest in, through targeted interventions within R&D, technology, processes, or operations. The review also found that firms with international linkages tend to adhere to better environmental standards.

Any current investments in manufacturing that are not entirely offsetting their emissions via resource efficiency will contribute to an emission increase through production growth.

While there may be an immediate, short-term trade-off between firm competitiveness and environmental improvements, due to the direct costs associated with system or process upgrades, implementing resource efficiency measures can result in a range of business benefits over the short, medium and long term (particularly if the focus is on those most closely related to a company's core business activities).

Opportunities include lower operating costs (as a result of lower consumption of resources) and reduced generation of emissions, waste and wastewater per unit of energy, output and product. This can allow companies to be better prepared for resource shortages, increase resilience to shocks, better preparedness for regulatory changes (such as carbon tax implementation) and more stringent emissions standards, and finally enhanced corporate reputation, better stakeholder relations, and opportunities to secure financing.

Automation vs. jobs

A central, and still unresolved, debate relates to the future of manufacturing and how the trade-off between productivity benefits from automation and other technological advancements and job opportunities will play out. Whether technological advancements and automation will be a societal net gain or loss in the long run is unclear.

For basic human tasks within manufacturing, and often the ones carried out by low-skilled workers, technology upgrades and automation may have a short-term, negative impact in the form of immediate job losses. These immediate job losses are, however, likely to be offset to some extent by new job opportunities created within higher skilled jobs as well as the long-term gains derived from a more efficient and productive manufacturing sector. Finally, new technologies and automation will likely impact employment in terms of working conditions; for example, advanced automation in manufacturing plants can improve overall job quality and safety by taking over hazardous and physically heavy tasks carried out by humans today.

Given the shifts within types of jobs and skills needed, ensuring adequate higher education rates in combination with upskilling and re-skilling initiatives broadly will be key priorities to support, not just for the private sector, but especially for local governments. Ensuring that workers with less education and lower skills do not become losers of the transition will be essential in order to reap the benefits of wider technological upgrades of the sector.

Importing vs. domestic manufacturing

Whether the most beneficial choice for a country is to import a good or produce a good domestically depends on several factors. Particularly for African countries, the small scale of many domestic markets does not allow to exploit the economies of scale that allow increased efficiency in industrial production. However, domestic market production may make sense where there are large-scale markets to serve (within Africa, Ethiopia and Nigeria are examples); for smaller countries, domestic production may be beneficial where production at scale is focused on serving regional markets and neighbouring countries. In Africa, for instance, the African Continental Free Trade Area and numerous regional blocs offer these opportunities.

Being clear on the target market is thus important in the context of evaluating whether to support manufacturing aimed at serving the domestic market.

As country regulations change, this may affect the extent to which it is more beneficial for countries to manufacture locally rather than import. India's re-introduction of a product patent protection in pharmaceuticals in 2005, no longer allowing generic drug manufacturers in India to produce and export new patented drugs, is an example where African countries' ability to import these drugs at competitive costs was consequently affected. While local production may be more costly, it has the advantage of insulating countries from supply chain shocks, allowing countries to respond to local demand more rapidly and with greater flexibility, and allowing for local authorities to better monitor quality and standards. This may be particularly important for basic goods and services.

04

Directions for future research

4.1 Decent jobs

Although there is a large body of literature focused on the employment impacts of manufacturing, evidence is non-existent on job or employment quality. Recent years have seen a push in the importance of 'decent jobs' in the development sector, as part of Goal 8 of the SDGs. Given the increased focus of impact investors, and particularly development finance institutions, in measuring decent employment, there is a clear opportunity for such investors to be stewards and set standards through responsible investing practices. They can also make a significant contribution to the empirical knowledge base by systematically tracking and evaluating changes in employment quality through their respective portfolios.

4.2 Inequality reduction

Most academic studies on the impacts of manufacturing on poverty alleviation look at aggregate effects at the macroeconomic (national) level, but its link to the impacts of individual firms on poverty is unclear and not covered by evidence today.

The evidence base around the impact of manufacturing on reducing inequality is currently limited. More data on firm-level employment stratification would significantly help to fill in the gaps. Anonymous data on worker household income levels, gender, geographic origin and education level when hired would help determine whether poor people (particularly female workers) benefit from employment in manufacturing. Turning this exercise into annualised panel data would then help understand how manufacturing worker incomes change over time.

4.3 Emissions

The body of evidence looking at how the manufacturing sector drives emissions has several knowledge gaps that could be further investigated. A broader geographical representation is needed to affirm how investments can balance economic and environmental aspirations.

In many of the markets in which we invest, emissions data for firms is unavailable. Without this coverage, emissions data by manufacturing sub-sectors cannot be reasonable calculated to understand the environmental opportunity costs (as compared to the economic benefits) of investments in specific manufacturing sub-sectors. Further research could look at supply chains as a whole, and whether emissions reductions could occur by locating sources of production closer to their target markets (thereby potentially reducing emissions from extend transport routes).

4.4 Firm and sectoral variation

Most studies included in this evidence review consider the manufacturing sector at an aggregate level, and do not differentiate between sub-sectors. Moreover, the few studies that do provide disaggregated sub-sectoral views rarely provide a clear picture of the specificity of each sub-sector (one exception is pharmaceuticals).

Given that sectoral variation is likely to be important in explaining the performance of manufacturing sub-sectors, more research is needed at the disaggregated sub-sector level. Further research would also help private sector investors in their capital allocation decisions, in understanding how sub-sectors drive impact across both economy-wide, socio-economic and environmental dimensions.

Appendix 1

Methodology for literature review and analysis

Assessing the impacts of manufacturing investments requires an analytical framework and sufficient empirical evidence. There exists an extensive body of literature on the role of the manufacturing sector for development, both in the form of historical accounts of industrialised countries and in studies on the efforts of late industrialisers and the challenges they encounter in promoting the development of manufacturing.

For this evidence review, more than 240 studies, including books, journal articles and reports, were reviewed. These were subsequently narrowed down to the included selection through various stages of analysis. Our review does not claim to be a systematic review[2] although findings have been triangulated through expert interviews and the peer review process, which ensures that the main issues and dynamics within the literature are correctly captured.

As much as possible, we have tried to select evidence focused on Africa and South Asia. However, it has to be noted that much of the literature on the impacts of manufacturing is focused on high-income countries and emerging economies. Second, the historical experience and long-term view can only be considered for countries that have already gone through an industrialisation process. Where possible, we have highlighted the distinctions between the different geographic areas.

This summary report is based on an evidence reviewed of a total of 244 studies, divided into the ten impact pathways shown below:

Impact pathways	**Studies**
1 Business growth	38
2 Productivity	61
3 Technology spillovers	62
4 Supply chain linkages	44
5 Trade balance	36
6 Innovation	33
7 Emissions reduction	20
8 Improved resource efficiency	16
9 Human capital development	17
10 Job quality	22
Total reviewed	244*

* *Some studies may cover more than one theme*

Typologies of Impact Papers – A Caveat

The review was approached by dividing the evidence base into three typologies where possible. The first, least prevalent, look at the impact of manufacturing on the relevant impact pathways either in absolute or relative terms compared to other sectors. The second, and most prevalent, typology of studies within the evidence base examine characteristics or factors that influence firms in the manufacturing sector. It is important to note that this prevalence in the literature is mainly because most studies examining the impact of manufacturing on development do not compare manufacturing sector impacts with impacts of other sectors, nor the impacts of manufacturing firms themselves on the relevant 'impact pathways'. Instead, they tend to draw comparisons between different segments of the manufacturing sector (such as firm size, age and innovation rate) and the impact these characteristics have on firm productivity, growth, emissions etc.

2 A systematic review is a type of literature review that involves identifying, synthesising and assessing all available evidence, using a systematic approach and a codified methodology to identify said evidence.

Stakeholder discussions

The literature review was accompanied by key stakeholder discussions using ODI's and CDC's extensive knowledge network. Stakeholder interviews were carried out remotely, through either videoconference or telephone calling facilities. The discussions were used to fill any potential gaps and further nuance our understanding of the subject matter in question.

The following individuals were consulted in chronological order:

- Aradhna Aggarwal, Professor, Department of International Economics, Government and Business, Copenhagen Business School
- Arne Bigsten, Professor, Department of International Economics, Government and Business, Copenhagen Business School
- Axele Giroud, Professor of International Business at Manchester Business School, and Visiting Professor with the University of Gothenburg
- Douglas Zhihua Zeng, Senior Economist, Trade and Competitiveness Global Practice, World Bank
- Jaap Voeten, Researcher, Tillburg University
- Jostein Hauge, Research Associate, Institute for Manufacturing, University of Cambridge
- Julian Frede, Senior manager, Department for Corporate Strategy and Development Policy, DEG
- Justin Lin, Dean of Institute of New Structural Economics at Peking University
- Kunal Sen, Director, United Nations University (UNU-WIDER)
- Micheline Goedhuys, Senior research fellow, United Nations University (UNU-MERIT)
- Sabine Schlorke, Global Head of Manufacturing and Global Portfolio Manager Manufacturing, Agribusiness and Services, International Finance Corporation

Evidence gathering and quality scoring methodology

The evidence review used a combination of relevant databases and search engines to find research papers, journal articles and grey literature. Emphasis was given to literature that focuses on, and provides compelling evidence for, manufacturing impacts in Africa and South Asia, prioritising evidence from our target countries where possible. The paper only gathered evidence that specifically refers to the manufacturing sector. The evidence gathering also includes literature reviews, although it does not weigh these as heavily as empirical studies. We discarded theoretical studies such as simulations as these were not based on actual evidence.

Example Search Databases

Search Engines

- Google Scholar
- Scopus
- JSTOR
- IDEAS/RePEc
- International Bibliography of the Social Sciences
- International Political Science Abstracts
- Social Science Research Network (SSRN)
- Science Direct

Journals

- World Development
- Journal of Development Studies
- Journal of Development Economics

Subsequently, papers were assessed on relevance. Non-relevant papers were discarded before rating the quantity of evidence identified for each pathway.

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