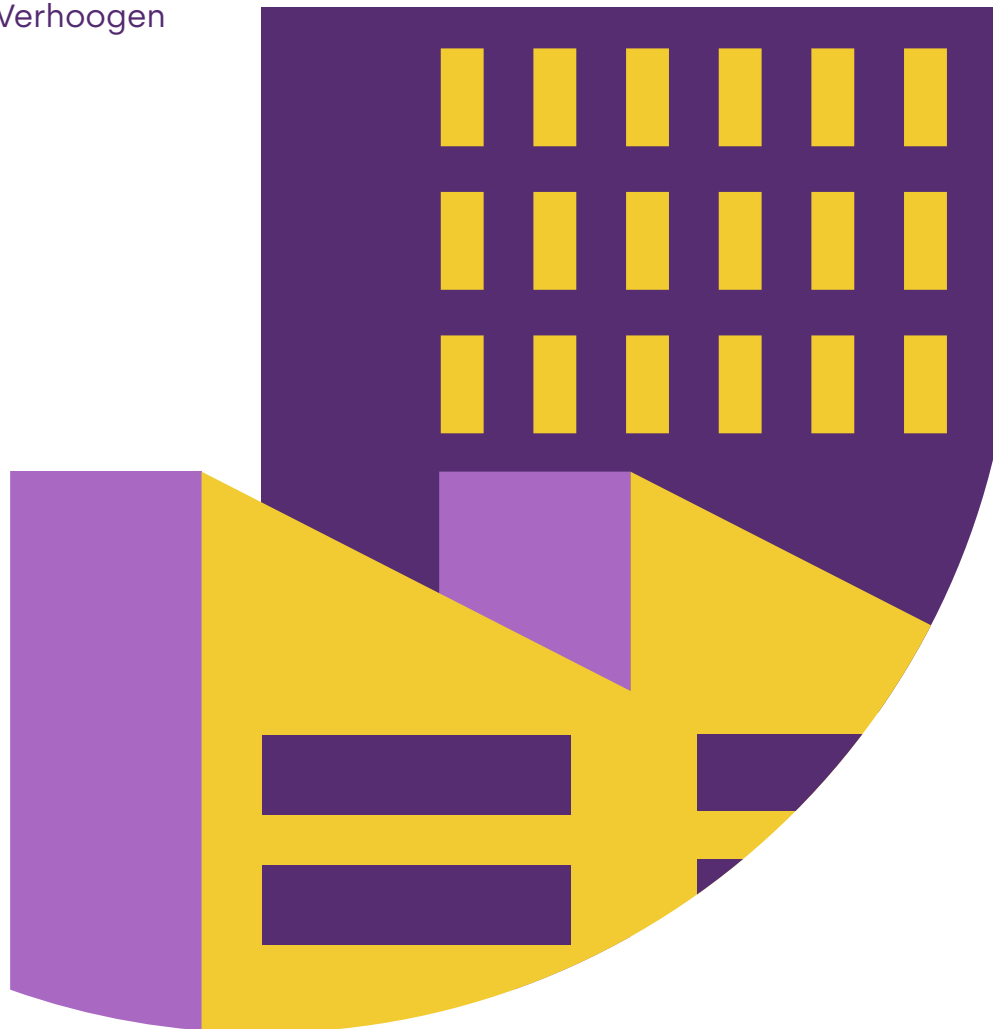# Firms, trade and productivity

David Atkin │ Stefano Caria
Dave Donaldson │ Namrata Kala
Imran Rasul │ Allegra Saggese
Matthieu Teachout │ Eric Verhoogen
Christopher Woodruff

July 2024

Contents

Contents

1. Introduction[1]

Productivity growth is the driving force behind economic development. Development accounting has shown that capital and labour only explain a modest share of differences in per capita income across countries (Hall and Jones, 1999; Caselli, 2005). Understanding the nature of the left-over variation, known as total factor productivity (TFP), therefore matters. Beyond its direct effect on output, TFP growth can have positive feedback effects on human and physical capital accumulation (Hsieh and Klenow, 2010). Productivity growth, however, is not guaranteed and can be prone to shocks such as climate change (Diffenbaugh and Burke, 2019). The central question for research on growth and economic development remains: what can be done to boost productivity?

Productivity growth is a macroeconomic phenomenon born from microeconomic roots. Firms are hence a natural unit of analysis. As firms become more productive, they expand opportunities for employment in well-paying jobs. Sustained increases in productivity deliver long-term economic growth. These increases stem from a large number of micro-level changes, including the reduction of critical distortions that appear more prevalent in low- and middle-income countries. We review the existing evidence on these transformations and highlight the evolving priorities for research.

Two additional realities complicate our story:

1. The increasing likelihood of high-risk climate events now jeopardises some productivity gains.

2. Firm growth, while enhancing economic activity, can cause greater local environmental degradation, such as pollution. These externalities, in turn, can harm productivity.

There is a need for research which coalesces around raising productivity while minimising externalities. We give special emphasis to these sustainable growth issues throughout our review.

Our discussion begins with the most urgent issues facing firms and workers under a changing climate. A growing body of evidence highlights how climate change and a degraded environment decreases firm and worker productivity. High temperatures and polluted air sap the productivity of labour while floods and storms destroy capital and disrupt supply chains. Resilient firms are essential for adapting against shocks. We discuss the impacts of climate change on workers and firms in **Section 2.1**.

We then focus on how economic transformations can drive more productive and higher earning work. To maintain productivity growth in the face of the negative productivity shocks, we see the need for three types of transformations: innovations in firm capabilities, improving the functioning of markets, and integrating firms within global value chains and world markets.

There are widespread differences across and within countries in the capabilities of individual firms. Low and middle-income countries are typically characterised by a large number of small, unproductive firms and a small number of very few large, highly efficient, and disruptive companies (Hsieh and Olken, 2014; Eslava et al., 2019). Large technologically advanced firms may be better adapted to climate change through access to credit and capital to purchase insurance against climate shocks. They can also make investments in energy efficient technologies in addition to providing job-loss insurance to protect workers in climate-exposed sectors or geographies. We still need research on why differences in firm capabilities arise and what interventions are effective in raising capabilities.

> **As countries develop, workers become more likely to do wage labour in more complex and often larger organisations**

As countries develop, workers become more likely to do wage labour in more complex and often larger organisations (Bandiera et al., 2022). **Section 2.2** explores two factors internal to firms: the role of management practices and technology in firm productivity differences. Management practices explain an important part of the overall dispersion in productivity across firms and countries. However, many interventions designed to increase firm performance through upgrading knowledge of management practices have proven ineffective. Interventions may work better if targeted to high-ability entrepreneurs, implying the need for new tools to identify and select such entrepreneurs.

The adoption of technologies at the global innovation frontier is often limited in low- and middle-income countries. At the same time, the first-hand discovery of new products and technologies may also be less than optimal (Verhoogen, 2023). Either of these types of innovation has widespread benefits across firms but requires significant investment from the individual firms pursuing the innovations. We review the evidence on barriers to innovation, with particular interest in green innovation and interventions to encourage firm innovation both through technology adoption and local idea generation.

Section 2.3 reviews the barriers and relative use of critical inputs by firms. We first look at the distortions that inhibit the optimal use of inputs. We then examine the broader market distortions that constrain the availability of inputs. There are significant constraints in the access to skilled workers and capital. Solving this problem is complex. In low- and middle-income countries, programmes to upgrade worker skills vary widely in their impact on firm performance, and programmes to make capital available have, at best, mixed results. We highlight potential avenues for further research on identifying the distortionary effects at the firm-level, and the policy interventions to reduce barriers to optimal input use.

Lastly, **Section 2.4** examines the way inputs, when aggregated across all firms in an economy, may be significantly misallocated. Are factors of production allocated to the right firms? Numerous studies argue that there is significantly more dispersion in the value of marginal products of inputs across firms in low- and middle-income countries than in high-income countries, which can help explain low levels of aggregate productivity. However, there is less evidence on why these distortions happen and their relative quantitative importance. Misallocation can also take the form of output market distortions and frictions such as trade and search costs

that prevent firms from accessing domestic and international markets. We provide evidence on the implications of both input and output distortions between firms and the potential drivers of these differences.

Competitive forces may also be weaker in low- and middle-income countries. For example, there is emerging evidence that agricultural value chains in many countries are controlled by a small number of firms with significant market power. Yet very few low-income countries have antitrust strategies and scarcely any sub-Saharan country has a competition authority.

Industrial policy – a set of government interventions (subsidies, geographic incentives, and infrastructure development) which explicitly seeks to transform the structure of the economy – can raise aggregate productivity by targeting sectors with external economies of scale (Bartelme et al., 2023) and which face distortions (Liu, 2019). State intervention may also promote competition among firms (Aghion et al., 2016) and can be used to promote positive externalities. Industrial policy has also been proposed as a second-best climate policy, whereby policies that raise productivity through promoting agglomeration can lower the emissions intensity of certain economic activities. Further evidence on how effective such policies are in targeting the sectors which face market failures or generate externalities is still needed.

A final set of policies that could raise productivity are related to firms' interactions with world markets. This can be through trade or connections with multinational enterprises (MNEs). We first explore the potential for international trade to exacerbate or alleviate the distortions discussed above. These include production externalities, firm-level and size-dependent distortions, and potential adjustments to existing distortions in factor markets. Research on these questions is still in its nascent phase.

An emerging literature argues that spillover effects from engaging in world markets could be important, but more evidence is needed on the contexts and mechanisms under which they arise. Particularly, MNEs may serve as a channel of technology diffusion and may also yield to pressure to improve the sustainability of their supply chain, improving local environmental conditions. Trade and other supply chain linkages may therefore be a mechanism for sustainable development. How, then, can the state promote trade? The state can be involved in building the infrastructure necessary to conduct trading activities in a cost-efficient way and pursuing export promotion policies where it makes sense to do so.

Lastly, we review the evidence on how international trade affects the distribution of income across the economy. A large number of studies have documented that trade liberalisation increases inequality, at least in the short run, and we discuss opportunities for inclusion in export-led growth.

Two cross-cutting issues emerge from our review of the academic literature. The first is the importance of measuring the size of externalities and market failures that are present in low- and middle-income countries' markets. This is relevant not only for industrial policy but also for a suite of other policies designed to effectively target sectors to raise productivity or reduce externalities. A second issue is the importance of understanding value chains and production networks at both the domestic and international levels. New business-to-business relationships have been shown to create both opportunities and challenges for firms in low- and middle-income countries.

An increased focus on administrative data, such as value-added tax (VAT) records, tax records, supplier/client lists, and matched customs data, will be essential in supporting the research agenda in this area.

Three other distinctive aspects of this review deserve mention. The first is that we seek not only to highlight the gaps in our knowledge of firms and markets in low- and middle-income countries but also to identify the research needed to inform more effective policy design. While understanding the problems is the first step toward finding appropriate solutions, we argue that more research is needed in several areas to determine which among the possible interventions could be effective in this context (and which could not).

The second is our focus on making growth inclusive. Most of the poor populations are informally employed in low-productivity and low-paying jobs. Increasing the productivity of the firms that employ them (**Section 2.1**), giving them the skills to be more productive agents (**Section 2.2**), facilitating their transition to more productive sectors (**Section 2.3**), and enabling the gains from trade to be shared more widely (**Section 3.4**) are all crucial elements of inclusive growth. However, there is heterogeneity in the size of firms and variation in ownership structures in low- and middle-income countries, and the magnitude of the distortions or market failures is likely to be significantly different across firm types. Similarly, age, gender and ethnicity can act as significant barriers and so affect the set of opportunities individuals face as entrepreneurs, managers, and employees.

Finally, while the language used in the paper often refers to the manufacturing sector and the production of tradable goods, many of the issues discussed relate to two other essential sectors of the economy: services and agriculture. Approximately 50% of the value-added in both sub-Saharan Africa and South Asia comes from the tertiary sector; services have the potential to be one of the pillars of low-emissions growth strategies in low- and middle-income countries (Rodrik and Stiglitz, 2024). Productivity growth in agriculture remains a central issue, particularly under the stress of climate change. We focus specifically on how farmers can adopt technology to protect against climate hazards, how to connect farmers to markets and value chains, and the role of intermediaries and agro-businesses.

2. Increasing productivity in low- and middle-income countries

In this section, we first identify and estimate the magnitude of the effects of climate change on firm and worker productivity in low- and middle-income countries. We then explore how firms can improve productivity through three possible channels. The first is to increase productivity within firms by attracting more capable entrepreneurs or facilitating the emergence of disruptive businesses. The second is to provide better primary factors of production (labour and capital) or reduce the frictions which cause misallocation across firms. The last is to improve the functioning of markets by removing other sources of factor misallocation across firms, increasing market access, mitigating the absence of competition, and supporting sectors that generate positive externalities for the wider economy.

I. Climate change and productivity

The macro evidence from Stern (2006), Burke et al. (2015), Kahn et al. (2021), and Nordhaus and Barrage (2024) shows that increases in temperature reduce output in a substantial way. This suggests that firms are likely to be negatively affected by climate change. As macroeconomic studies of climate change become increasingly granular, new findings indicate the impact of global temperature rise may be up to six times larger than initial modelling indicates, with a present value of global welfare losses at 31% (Bilal and Kanzig, 2024). Heat may decrease worker productivity, disasters may destroy capital and impede trade, and increases in risk may hamper investment. Currently, there is initial evidence on the first two channels, but overall, more evidence is needed to understand the magnitude and the effects of climate change on firms.

Heat may decrease worker productivity, disasters may destroy capital and impede trade, and increases in risk may hamper investment.

Rising temperatures attributed to climate change will have an adverse effect on worker productivity and firm output, and be felt acutely in low- and middle-income countries (Deschenes, 2023). Temperature can affect both labour and capital productivity in firms. First, heat stress may decrease worker productivity and increase worker absenteeism (Somanathan et al., 2021). Despite these impacts, adoption rates of climate control technologies remain low. In India, the replacement of factory floor lighting with LED light bulbs was found to reduce the temperature within the factory and raise productivity on hotter days (Adhvaryu et al., 2019). More evidence is needed on which technological interventions are effective in reducing heat impacts on workers and worker absenteeism. As workers are likely to face heat stress both in the workplace and at home, there is an additional indirect effect on productivity. Higher wages may allow workers to purchase cooling technologies, such as air conditioning units, at home to reduce the impacts of heat stress. Reduction in absenteeism will require more research, as current research finds that the effect of temperature on overall labour supply depends on multiple factors and may not be the same across

sectors and geographies (Zhang et al., 2018). Second, capital is affected by temperature by harming mechanical and digital processes of equipment, which have not been adjusted for by firms (Zhang et al., 2017). We need a better understanding of how this channel impacts firms.

Extreme weather events like flooding are having severe effects on firm productivity. Balboni et al. (2023) use a combination of flood exposure data and a model of network formation to study how firms in Pakistan respond to flood events. The study finds that with more exposure to flooding, more firms learn how to adapt by changing suppliers and transport to less flood-prone areas. In this vein, Castro-Vincenzi (2023) considers how firms in the car manufacturing sector redesign the organisation of plant networks to hedge against flood risk. Other work by Jia et al. (2022) demonstrates how flood risk affects firm location choice, worker employment, and the aggregate impacts of flood risk. This recent work has focused on both actual damages from flooding and the responses made by firms as a result of flood risk. How firms organise themselves and their networks of buyers and sellers will continue to shift with increasing or new flood risk across geographies.

Both firms and workers will find ways to adapt to (some of) these shocks. For example, firms may increase the demand for credit in the short run (Ponticelli et al., 2021). In the long run, firms may restructure their supply chains (for example, Balboni et al., 2023) and to less exposed sectors, such as non-agricultural work (Colmer, 2016). Relatedly, Patel (2024) finds that households shift out of agriculture, migrate, and invest more in schooling in response to floods. However, the ability of these sectors to absorb new workers may be ultimately limited. Liu et al. (2023) find that higher temperatures in India lower agricultural productivity, which in turn reduces demand for non-agricultural goods and services, lowering employment opportunities outside of agriculture. This can lead to households becoming isolated and less likely to find more productive work. The choice to adapt through moving for labourers may become less possible over time, particularly where credit constraints exist.

One additional area of research is the effect of pollution on worker productivity. Current evidence has concentrated in exposed sectors --outdoor labour settings, such as agriculture (Zivin and Neidell, 2014) – but new evidence has shown that even indoor workers are impacted by pollution (Kahn and Li, 2019; He et al., 2019). There is a growing body of literature testing the impact of pollution on human capital formation and productivity. However, empirical evidence on the efficacy of interventions in different contexts still lags behind. Potential interventions to reduce the level of air pollution exposure include offering personal protective gear to workers, providing information on health and productivity impacts to workers, and adopting air purifiers. Adhvaryu et al. (2022) find that adaptation interventions, including re-matching workers to tasks on high pollution days, can be done to mitigate the adverse effects of pollution, although it depends on the quality of the firm manager.

Another issue is that pollution is often higher in areas of high economic activity in low- and middle-income countries, creating a trade-off for firm managers and workers. Recent work by Bassi et al. (2023) demonstrates that the value of locating in a high-traffic and highly polluted street was higher than relocating workers away from pollution in Uganda. This creates a

challenge for policymakers to better convey the value of clean air to human capital formation and productivity improvements.

Further evidence is needed to identify the magnitude of the effects of temperature, droughts, floods, and pollution across different sectors and tasks by workers. Further research in this area may allow policymakers to better match interventions which mitigate productivity losses, depending on the source. Additionally, research into the efficacy of interventions, including technological upgrading, protection provision, information campaigns and wages, is needed across a wider range of sectors and countries.

RESEARCH PRIORITIES

- How do climate change impacts, such as heat stress and extreme weather events, affect worker productivity and firm output in low- and middle-income countries?

- What strategies can firms adopt to mitigate the adverse effects of climate change on their operations, including supply chain resilience and productivity?

- How does environmental pollution, including air quality, impact worker productivity and overall economic performance, and what interventions are effective in mitigating these impacts?

II. Firm upgrading

Management practices and entrepreneur selection

There is now overwhelming evidence that management practices matter in explaining firm performance across countries and over time (Bloom and Van Reenen, 2010; Bloom et al., 2012; Bloom et al., 2016; McKenzie and Woodruff, 2017). Policy in low- and middle-income countries needs to understand how entrepreneurs' business knowledge and management practices can be improved in order to help people and their businesses grow. McKenzie (2021) identifies two avenues for expanding training research. The first is interventions with more localised training, focused on peers, mentors, and incorporating both heuristics and psychology, while the second considers research on job training programmes at scale.

Training programmes, consulting services, and coaching and mentoring are potential interventions that target information frictions in businesses. The training programmes we consider are primarily targeted at self-employed individuals and small- or medium-scale firm managers who may benefit from skill development. Other constraints to productivity, including credit frictions, require a different set of policy responses.

Before reviewing the literature on each of these below, it is worth noting that there are numerous studies on this issue, each one focusing on the impact of one specific intervention, usually on one type of firm (small, medium, or large) and a single sector. Capturing all of this heterogeneity in this review

would be challenging and so we draw relatively broad lessons from this literature. One possible avenue of research is to aggregate knowledge around this issue and generate predictions specific to the programme, context, firm size, and geography, as outlined in McKenzie et al. (2023).

We first explore programmes that train entrepreneurs by teaching them a set of methods to improve their managerial capacity and business performance (see Fiala, 2014; McKenzie and Woodruff, 2023; and Grimm and Paffhausen, 2015 for a review). Several randomised experiments delivering management training programmes to entrepreneurs have shown minimal effects on business performance. While these types of training tend to have an impact on the creation of new businesses or the survival rate of existing firms in the short run (Higuchi et al., 2017), they have mixed effects on the adoption of best business practices at best. Despite this, a meta-analysis conducted by McKenzie (2021) indicates a modest, positive effect on profits and sales. Other recent sets of experiments have found positive effects on the adoption of better management practices and subsequent increases in employment (Brooks et al., 2018; Higuchi et al., 2019; Martinez et al., 2018; Anderson et al., 2018). Moreover, several studies have found positive and significant effects on business performance when studying such programmes over the medium term (2-3 years) or increasing sample size (Higuchi et al., 2019; McKenzie and Puerto, 2017; Valdivia, 2015). In sum, there is still a lack of consensus on the firm-level effects of training, and further analysis is needed to measure the quality and delivery of said programmes (McKenzie and Woodruff, 2023).

There is currently no experimental evidence on the impacts of management training on environmental performance, use of green energy, or adoption of green technologies and practices. However, recent observational work suggests better managed firms are more resilient to natural disasters (Van Reenen and Norris Keiller, 2024). There is also a substantial gap in the literature on the efficacy of training and skill development for jobs in emerging, green sectors, such as renewable energy development or sustainable agriculture, with only the International Labour Organization (ILO) reporting on the topic. Whether the skills needed for these jobs differ on any pragmatic points will require substantial research. Similarly, how existing managerial training programmes may impact other outcomes – including emissions reduction or adaptive capacity – is an area we support for future exploration. Given the substantial gap in the relationship between management practices and firms in 'green' sectors, research should focus on small-scale studies which identify the channels of impact and begin to measure the efficacy of any existing programmes, particularly on firms' ability to adapt.

Firms also vary in their willingness to take up training programmes, even when proven to be successful for the particular context. Firms in high-skilled sectors in Colombia would rather pay a fine, foregoing the opportunity to train workers, even when returns are high (Caicedo et al., 2020). Further, preliminary evidence from Ethiopia indicates that firms' willingness to pay (WTP) for training does not respond to the canonical incentives of product and labour market competition (Abebe et al., 2024). Further exploration is needed into drivers of firm WTP for training programmes to support better delivery and uptake.

Most of these studies are based on RCTs that use a relatively small sample and can typically only measure outcomes in the short run. Using a very

different approach, Giorcelli (2019) documents that a technical assistance programme in the US in the 1950s had a significant and long-lasting impact on the productivity of participating Italian firms and that this effect was stronger for firms that received both management and technology transfers.

Training programmes can provide the skills necessary to move workers into more productive roles. With barriers to development in sectors that are both high productivity and low emissions, there is a large gap in our understanding of whether vocational training programmes can develop the skills needed for a strong green economy.

A potential explanation for these disappointing observed effects is that many programmes are short-term and under-powered, only following a small group of participants through a short course (McKenzie and Woodruff, 2023). It is also possible that management practice training alone is not enough to spark aggregate growth, as most returns to these programmes accrue privately. Other barriers to growth, such as credit constraints, may prevent entrepreneurs from translating their learned skills into higher business performance. Several recent experiments have offered entrepreneurs a combination of business training programmes and cash grants (see, Berge et al., 2014 and Karlan et al., 2015). While we now know that these programmes have some positive effect on sales and profit, there was no evidence they increased employment.

Training programmes can provide the skills necessary to move workers into more productive roles. With barriers to development in sectors that are both high productivity and low emissions, there is a large gap in our understanding of whether vocational training programmes can develop the skills needed for a strong green economy.

There are three other factors that could explain the poor performance of business trainings and should be the subject of further research. These are typically low-cost programmes. The costs per entrepreneur is typically around US$ 200. As such, the programmes may not be of a high enough quality to generate significant changes in business practices of manager training. A competing explanation is that in most studies, business training programmes were offered for free to treated entrepreneurs. For that reason, entrepreneurs' motivation may be too low to allow them to fully grasp the contents of the class. Having entrepreneurs pay at least a fraction of the programme's cost may be a way to increase the adoption of better business practices and should be tested experimentally. Finally, business training programmes that gather entrepreneurs from a wide range of sectors or cover a wide range of topics in a limited period may prioritise general management skills over sector- or function-specific skills (for example, marketing, finance, human resources). A series of recent studies have attempted to offer more focused training programmes (Anderson et al., 2018) or show that the way trainings are delivered matters (Drexler et al., 2014; Campos et al., 2017).

These results on the generality versus specificity of training programmes provide a motivation for a second solution to improving productivity within the firm: consulting services. Management consulting services are, by nature, firm-specific. A team of highly skilled advisors analyses a firm's operations and makes recommendations on where improvements could be made. Bloom et al. (2013) and Bruhn et al. (2018) offer free consulting firm services to large and small firms, respectively, and both find positive outcomes on firm performance. In Bloom et al. (2013), treated firms saw their profits increase

by an average of US$ 300,000 after one year of consultation, corresponding to a 130% rate of return. Eight years after the programme was delivered, the improvements persisted, although some management practices were no longer maintained, likely due to the loss of key managers (Bloom et al., 2020).

This evidence raises an important follow-up question. Since consulting services or even some training programmes generate a positive return on investment, why aren't firms willing to pay for these services themselves? A number of potential reasons should be examined in future research. First, firms may be unaware of the positive returns that these programmes generate. A similar explanation, compatible with the mixed evidence on the impact of training programmes, could be that the market for management support is subject to adverse selection: firms are unable to identify providers offering sufficiently high-quality services. Second, management consulting typically requires that firms share internal data, production processes and information about their clients for efficiency's sake, and companies may not trust many of the potential providers in that regard. Third, consulting services are usually very expensive, and firms may not have the liquidity or sufficient access to credit to pay for them. Willingness to pay for these services has been found to be far below the actual costs (Maffioli et al., 2020).

Iacovone et al. (2022) provide an alternative setting to solve this last issue. They provide consulting to small groups of firms in Colombia at approximately one-third the cost of one-on-one consulting. In terms of impact, this alternative approach performed better than individual consulting. It is unclear, however, whether these positive results came from the consulting services themselves or the fact that the programme allowed the group-treated firms to interact with one another, an intervention that has shown encouraging results in other settings. Focusing on this approach, coaching, mentoring, and peer interaction programmes could be an alternative solution to helping small businesses grow. Cai and Szeidl (2017) and Fafchamps and Quinn (2018) bring entrepreneurs together to generate networking opportunities among business owners.

Fafchamps and Quinn (2018) show that linking firms or providing them with information about one another has a positive effect on knowledge of some business practices. Cai and Szeidl (2017) show that entrepreneurs who participated in randomly formed business associations see an improvement in their knowledge of management practices but also an increase in revenues and profits through acquired knowledge about business-relevant information (for example, on suppliers or clients). This last intervention is particularly promising, as its impact is similar in magnitude to the very expensive consulting services offered in Bloom et al. (2013) but obtained at a much lower cost. Finally, one-on-one mentorship programmes for microenterprise owners (Brooks et al., 2018) generated a positive effect on profits, though this effect faded away as the relationships dissolved.

As the review presented above shows, the literature on ways to improve management practices of business owners is already extensive. Nonetheless, it leaves a number of questions to be addressed on business training programmes. First, the mixed effects observed in training programmes need to be rationalised. Why do they work in certain instances but not in others? Are there ways to deliver these trainings in a more effective and cost-efficient way? Should the materials covered be broad or very specific? Plausibly, the appropriate training may depend on the context. Personal

initiative training (for example, Campos et al., 2017) may be more effective for subsistence entrepreneurs than for owners of medium-sized businesses, for instance. By contrast, individual consulting may be more cost-effective for larger firms.

Second, while mentorship and business associations have shown promising results, the external validity of these results still needs to be explored. Are these programmes more likely to succeed in specific sectors or environments? Cai and Szeidl (2017) show that in their setting in Nanchang, China, learning was more likely to happen between firms that were not competing in the same sectors. Evidence from Anderson and McKenzie (2020) and Anderson et al. (2020) show that government-subsidised consulting firms had a positive effect on sales, but the cost-effectiveness and longevity remain unclear.

Third, there is very limited evidence on the general equilibrium effects of business training, consulting services, or mentorship programmes. Any programme that generates a competitive advantage for some set of firms is likely to generate negative spillovers for other firms, as demand is unlikely to be highly elastic (except when it comes to highly tradable goods). These programmes are rarely implemented on a large scale, and the identification challenges that come with large-scale, non-random treatment of firms reduce researchers' incentives to focus on this question. However, this question cannot be ignored; if these programmes have the potential to be cost-efficient, governments may want to implement them at scale.

Fourth, while Bloom et al. (2013) argue very convincingly that certain management practices are intrinsically better across environments, other practices may be preferable in some settings and not in others, depending on culture and traditions. Gaining understanding on the boundary between management practices that are inherently better and those that may only prove effective within specific environments is another interesting potential avenue for research.

Finally, to return to the first point made in this section, the fact that the use of best management practices is positively correlated with firm performance may be driven by variation in other factors, such as entrepreneurial ability, with high ability being a requirement to implement best practices. Evidence from the business training programmes highlighted above—where despite the adoption of best management practices, businesses failed to increase sales or profits—suggest that this alternative interpretation for the observed patterns may be important. As such, business training programmes or management consulting services may be more efficient if offered only to high-ability entrepreneurs. To be able to target programmes in this way, of course, one needs to be able to identify and select such business owners.

A great deal can be learnt from the literature on business plan competitions (Fafchamps and Woodruff, 2017; Fafchamps and Quinn, 2017; McKenzie, 2017) and accelerator programmes (Gonzalez-Uribe and Leatherbee, 2018), whose main purpose is to identify high-potential entrepreneurs before offering them services. The evidence on this issue so far shows that identifying such entrepreneurs is, to say the least, a challenging endeavour. Additionally, many entrepreneurs who self-select into these programmes are more driven, and subsequently perform well in the programme without an effect from the actual provisions by the accelerator.

Kahneman and Klein (2009) show that expert predictions on business performance are more accurate if they have extensive experience making similar judgments and access to feedback on the accuracy of their predictions. McKenzie and Sansone (2017) show that when entrepreneurs who are participating in a business course make predictions about the performance of a business plan, their predictions are uncorrelated with actual business performance. However, modern machine learning methods using administrative data do not offer noticeable improvements, as even the best models do not have strong predictive power.

A promising alternative could be to delegate the identification to peers within the entrepreneurs' communities. Rigol et al. (2017) show that randomly distributed cash grants to entrepreneurs generate higher returns to capital for entrepreneurs ranked highly by their peers. In other words, community rankings perform better than machine learning predictions. However, one of the policy implementation challenges posed by this strategy is that peer ranking is likely to be much more costly than machine learning techniques.

Whether panels are composed of experts or members of the community, the role of discrimination biases in these selection processes is worth exploring. For example, gender-prescribed roles and social norms may prevent high-ability entrepreneurs from being selected and meeting their potential.

Identifying high-potential entrepreneurs in a cost-efficient way is a challenge that requires more research. Other predictive techniques could be studied, such as psychological testing of entrepreneurs (Dlugosch et al., 2018; Bryan, Karlan, and Osman, 2023). It is important to remember that developing methods to select entrepreneurs have been used mainly to provide them with financial support and reduce misallocation across individuals and firms. However, there are other barriers besides access to capital that might prevent businesses from growing; we will discuss this further in **Section 2.3**. However, developing tools to identify high-potential entrepreneurs for a cost-efficient provision of other services would be an interesting area for further research.

RESEARCH PRIORITIES

- What types of entrepreneurs benefit from training programmes?

- Can training programmes provide the skill development needed for workers to adapt to a changing climate? Should the government use vocational programmes to support workers within these roles?

- How can managerial training or consulting services play a role in mitigating productivity losses from high heat?

- In which contexts are mentorship and peer interaction programmes effective? What mechanisms enable them to work?

- What are the general equilibrium effects of entrepreneurship programmes?

- How can the delivery of training programmes be improved? How will the use of technology or 'edutainment' in trainings weigh against traditional training programmes?

- Should entrepreneurs be selected for training programmes? Can governments identify and support gazelles?

- Do gender-prescribed roles and social norms prevent high-ability entrepreneurs from being selected in support programmes?

- How can consulting services be offered to increase uptake and scale programmes?

- What is the role of incubators? Do they promote disruptive entry?

Technology adoption and innovation

Another important dimension of productivity improvement within firms is the adoption of new technologies and innovation, both around process (finding better ways to produce existing products) and product (creating new products). Firms in low-income countries sometimes patent inventions created through research and development (R&D), but the vast majority of innovative activities are oriented toward adopting existing technology, rather than pushing the world technological frontier forward.

In theory, firms in low- and middle-income countries would enjoy what Gerschenkron (1962) calls the 'advantages of backwardness'—in particular, the fact that many new technologies and products have already been invented in high-income countries. However, many countries have had difficulty capitalising on these advantages, and the process of technology diffusion may take decades to materialise (Comin and Hobijn, 2010). A recent review by Verhoogen (2023) identifies the key issues that continue to permeate in empirical analysis of the question of why firms in low- and middle-income countries have trouble catching up. Firstly, the demand-side matters, as integration into global supply networks or sales to richer buyers is associated with technology upgrading. Next, high-quality inputs drive adoption of technologies, and finally, information barriers and other frictions exist, making the issue of upgrading less about individual managers or firms, and more about the market and existing frictions.

This question becomes ever more urgent, given firms, as they grow, are responsible for a growing share of environmental externalities. In low- and middle-income countries, emissions are on the rise (Our World in Data, 2021). Combustion of fossil fuels and the application of fertilisers have driven growth in the industrial, transport, and agriculture sectors. External pressure to reduce these emissions are being accelerated both voluntarily by direct consumers (Aghion et al., 2023) or other buyers in importing economies, and policy through trade mechanisms like carbon border adjustments (Clausing and Wolfram, 2023) and other unilateral policies (Hsiao, 2023). In response, whether firms in low- and middle-income countries can adopt 'green' technologies which mitigate the environmental impact of production should be further explored. We will review the mechanisms and the scale of green technology adoption by firms in low- and middle-income countries.

Technology can be embedded in inputs, machinery, and equipment, or simply in production know-how. In this section, we focus on why firms may or may not adopt more advanced inputs or machinery.

1. Barriers to technology adoption

The main challenge in studying the adoption of more advanced practices is defining variables and metrics that describe the use of technology. This may be why the literature on this issue has mainly focused on agriculture. Yields are a straightforward measure of fields' performance over time. Similarly, it is easy to track the use of high-yielding variety (HYV) seeds or fertilisers, at least in a binary way or through surveys. By contrast, direct measures of the use of technology by manufacturing firms are rare. A metric of how technology-intensive a production process is, or a vertical classification of machinery are hard to define, especially across sectors.

To properly identify technologies to combat issues of productivity, climate models assessing the impacts of climate change on agriculture outputs are increasingly advanced and localised (Rosenzweig et al., 2014; Christoph et al., 2021; Hultgren et al., 2022; Barrett et al., 2023; Costa et al., 2023). Estimates on the impact of agriculture productivity on country-level comparative advantage and trade have determined low- and middle-income countries with high vulnerability will need to increase trade openness to adapt, discussed further in **Section 3.2** (Costinot et al., 2016; Nath, 2022). With these advances in combined climate and economic modelling, more evidence is now available on the potential challenges to productivity growth under climate change, and the technologies necessary to rectify them.

The rationale behind studying the barriers to technology take-up in agricultural markets relies on the hypothesis that the returns to technology use in low- and middle-income countries are high, but a number of factors prevent farmers from adopting. However, documenting high positive returns for a specific technology is difficult. First, farmers' profits can be difficult to appraise; estimates typically rely on survey recall data, which is imperfect by nature. Second, the costs of adopting a technology are challenging to evaluate, as they typically comprise more than the financial costs of buying inputs or machinery (for example, commuting to market to purchase them). Third, a number of identification challenges arise when estimating the marginal return of a technology (see Foster and Rosenzweig, 2010 for a thorough discussion on this issue). For example, farmers may respond to adopting a new input by re-optimising other inputs (Beaman et al., 2013), which makes it hard to isolate the effect of the introduction of the new technology. Duflo et al. (2008) find evidence that small quantities of fertiliser generate important output gains but are not able to draw conclusions about the profitability of the investment given the lack of cost data. Suri (2011) develops a structural methodology to measure profits and finds heterogeneous returns across farmers, with those facing the highest gross returns also confronting the highest costs of acquisition due to poor infrastructure. But more recently, Caunedo and Kala (2022) estimate the changes in labour supply, farm productivity, and labour demand in response to a subsidy to rent mechanical farm equipment. This study finds that greater mechanisation saves labour downstream, and welfare improvements accrue mainly to saved labour time. While outcomes from technology upgrading in agriculture are studied across a number of outcomes, more research is needed to understand the direct private returns.

Climate-smart or sustainable agriculture practices are considered low-intervention technologies which may yield protection against climate shocks, but are presently not well studied in the economic literature. There is still

substantial underinvestment in basic research on how farmers can adapt under a variety of climate shocks (Antle et al., 2010), even as evidence indicates the returns to research remain high (Rao et al., 2019). Significant heterogeneity in returns to agriculture technologies across African countries are a main driver of low adoption, and this presents a significant challenge for adaptation in the agriculture sector (Suri and Udry, 2022). Auffhammer and Carleton (2018) find that increasing crop diversity on Indian farms can result in improved drought resilience and improve net revenues. Yet some evidence, such as, Hultgren et al. (2022) show that while some adaptation efforts may help during high heat periods, yields are depressed during moderate seasons. As uncovered in Kala (2017), many farmers lack information on weather predictions and climate shocks present an ever-growing uncertainty in decision-making on technological adoption.

A large literature documents that farmers lack the knowledge about technologies available elsewhere. This shortage of information can take the form of not being aware of the existence or economic returns of a particular input or machinery, or not knowing how to use the technology (Foster and Rosenzweig, 1995; Hanna et al., 2014). This observation has led to the development of studies on the channels through which technology diffuses across social networks or through neighbours (Munshi, 2004; Conley and Udry, 2010; Bandiera and Rasul, 2008; Duflo and Suri, 2010; Dar et al., 2018).

A second potential constraint to technology diffusion in agriculture is access to credit (Gine and Klonner, 2005; Miyata and Sawada, 2007). Farmers may be aware of new technology that would generate positive returns but lack the liquidity necessary to acquire it. We further discuss the issue of access to capital in **Section 2.2**. In contrast, Aker and Jack (2023) find that training for farmers was the main driver of adoption, increasing uptake of adopters by over 90 percentage points, in contrast to no effect from conditional or unconditional cash transfers. Therefore, credit may serve as a barrier, but lower cost interventions should be explored as first-order policy prescriptions.

Risk aversion and a lack of insurance markets can also contribute to low technology adoption in low- and middle-income countries (Islam et al., 2018). New seed varieties may be more sensitive to weather conditions and so generate a higher volatility in yields, despite greater returns on average. Acquiring new technology also requires a high investment up front, prior to the realisation of uncertainty (Dercon and Christiaensen, 2011). Farmers in Rwanda who use irrigation can increase profits by 43-62%, but adoption of irrigation techniques remains at 30%, given labour costs (Magruder et al., 2022). Moser and Barrett (2006) show that farmers with a more stable source of income are more likely to adopt new technologies. Emerick et al. (2016) find the adoption of flood-resistant rice varieties reduces downside risk for farmers, leading to productivity gains and the crowding in of private investment. The benefits to adopting new agriculture technologies are documented in many cases, yet farmers still require additional mechanisms to shield themselves from risk.

Additionally, of course, these three constraints to technology adoption may interact. The lack of yield insurance mechanisms may worsen credit constraints. Similarly, lack of access to information poses an additional uninsurable risk for farmers (Magruder, 2018). Even with the availability of insurance for crops, uptake remains low (unless provided for free), and

outcomes for farmers are mixed (Suri et al., 2022). Given this gap in adoption of technology for productivity improvements in agriculture firms in low- and middle-income countries, we see this as a significant area for further research, to better grasp how private and public incentives can be designed.

In the manufacturing sector, the literature on technology adoption and diffusion is thinner. Atkin et al. (2017) introduce a new waste-reducing technology for cutting soccer balls in Pakistan. Despite the high potential returns, only a handful of firms initially embrace the technology. The researchers document another potential constraint to technology adoption: organisational barriers. In this case, the performance incentives set by the firms for the cutters (the workers whose primary task is to pre-cut the soccer ball pieces) aim at increased speed, with no reward for reducing waste. As such, the initial slowdown in production that would follow the adoption of the new technology discourages cutters from using it. De Rochambeau (2017) documents how intrinsic motivation and employer-employee relationships prevent the adoption of a monitoring technology for truck drivers in Liberia. Hardy and McCasland (2019) randomly introduce a new weaving technique across the network of garment producers in Ghana and subsequently place orders for which the technology is needed. Technology diffusion is negatively correlated with competition at baseline. Firms who receive training on the technique and an order are more willing to teach other firms about the technology than firms who only receive the technique. Additionally, new evidence on indirect externalities by Higgins (2022) show that shop owners delay the adoption of a new debit card payment system until there is a sufficient number of adopters in the market. This evidence suggests there can be coordination failures which make firms hesitant to adopt.

Technology upgrading may also generate important benefits when improving the productivity of support functions inside the firm. Dalton et al. (2019) conducts an experiment where restaurants and pharmacies in Kenya are randomly given an opportunity to sign up for a new mobile payment technology. More than a year after the intervention, treated firms had better access to finance through the mobile loan network, and had not reduced their demand for loans granted by other financial institutions. They also experience less variability in their sales over a full year of operations.

Green technology upgrading in non-agriculture firms face similar barriers to other forms of technology, yet green technology may be in particular need of incentives as some of the benefits do not accrue privately. Despite the barriers, green technology uptake may also facilitate both mitigation (lowering of emissions per unit of output) and adaptation. In Achyuta et al. (2020), LED lighting in manufacturing firms actually improves productivity on high-heat days. With productivity co-benefits, technology upgrading, such as switching to LED lighting, may have a substantially quicker cost recovery rate. Consideration of how green technology can both reduce negative externalities and shield against productivity losses is an important area of research.

Firms in low- and middle-income countries often suffer from a substantial energy-efficiency gap. There exist both information barriers and non-market failures, such as inconsistent returns to adoption, which inhibit firms from adopting energy-saving alternatives (Jaffe and Stavins, 1994). The largest barrier to adopting these technologies is a lack of information to the consumer, resulting in investment inefficiencies, and policies to increase adoption should target the different types of consumers to avoid further market distortions (Allcott and Greenstone, 2012). However, a striking number

of households and businesses refuse to adopt an energy-saving programme, leading to concerns that non-monetary costs of adoption are higher than previously thought (Fowlie et al., 2015). Another study by researchers in the US found that cost savings from an energy savings programme was half of the initial upfront investment, demonstrating the mismatch between estimates and actual returns (Fowlie et al., 2018). We recommend further investigating the non-monetary costs of adoption and the realised returns to energy savings technologies in a low- and middle-income countries.

Overall, existing evidence points to significant barriers to technology diffusion in low- and middle-income countries. While information, credit and insurance are well-documented sources of low adoption rates in agriculture, more research is needed to understand the main obstacles to upgrading technology, particularly in the manufacturing sector. In large industrial firms, organisational barriers and competition can also act as significant barriers, but little is known about the relative importance of each factor. In some cases, large firms who are suppliers may face weak incentives to innovate if they have multiple, competing buyers (Dugoua and Dumas, 2021). This can lead to bottlenecks and fail to deliver on technological innovation along the supply chain, we now turn to possible interventions to increase technological diffusion in low-income countries.

2. Policy interventions

Increasing technology adoption in low-income countries is a challenging task, but there are a number of potential interventions to consider and evaluate.

First, governments could provide financial support to businesses to acquire more technology-intensive equipment. Increasing access to capital could be done through indirect interventions such as loan guarantees (Arraiz et al., 2014) or tax rebates that incentivise upgrading. An alternative could be the direct provision of funding for acquiring new technologies, such as cash or grants (De Mel et al., 2008), credit (Gine and Yang, 2009; Crépon et al., 2015), insurance (Mobarak and Rosenzweig, 2012) or in-kind transfers of equipment (Atkin et al., 2017; de Rochambeau, 2017; Kelley et al., 2018; Fafchamps et al., 2014). Now, credit, cash, or insurance provisions might not necessarily incentivise firms to innovate and might instead lead them to spend elsewhere, particularly if a lack of information about available technology is the main constraint they face. However, these methods are more flexible than direct machinery or input donations, which may not be perfectly suited for firms' specific needs.

The barriers to the uptake of technology by agriculture firms include access to credit, a lack of risk insurance programmes, and information. With rising temperatures and decreased predictability in rainfall and weather, the expected returns from technology grow more heterogeneous.

The barriers to the uptake of technology by agriculture firms include access to credit, a lack of risk insurance programmes, and information. With rising temperatures and decreased predictability in rainfall and weather, the expected returns from technology grow more heterogeneous.

Carter et al. (2013) report low take-up for vouchers providing a 73% discount on HYV seeds and fertilisers. Karlan et al. (2011) and Beaman et al. (2014) document a 35% and 12% increase in the use of chemical inputs, respectively, from their interventions offering farmers the chemicals at a

discounted rate. While there is an extensive literature on reducing credit constraints at the firm level (see **Section 2.3**), there is much less evidence on how reducing these frictions impacts technology upgrading specifically.

Second, more direct interventions to incentivise technology upgrading could be tested. These include information provision—which, in the case of agriculture, is generally referred to as extension services (Cunguara and Moder, 2011; Ali and Rahut, 2013; Kondylis et al., 2017; Beaman et al., 2018)—or consultancy services and trainings (see the previous section for an extensive discussion on this point). Communication infrastructure can also facilitate technology diffusion. Gupta et al. (2019) shows that rural Indian communities that received mobile phone network access early on due to geographical constraints were also more likely to adopt HYV seeds and fertilisers. They provide evidence that farmers made phone calls to a major call centre to get advice on the use of specific seed varieties and fertilisers. Finally, accelerator or incubator programmes—which are common for start-ups in high-income countries could also promote innovation in low-income countries. However, there is limited evidence on the impact of these services. Indeed, Gonzalez-Uribe and Leatherbee's (2017) analysis suggest that all of the positive effects of accelerator programmes could be attributed to the ability of the entrepreneurs selected into these programmes. By contrast, Roberts et al. (2017) report that entrepreneurs value the network incubator programmes typically provide, a fact that resonates with the results from Cai and Szeidl (2017), discussed above.

Third, governments set laws which can create an enabling environment for upgrading. These regulations can take the form of allowing a wider set of labour contracts that facilitate technology adoption inside the firm (Atkin et al., 2017) or reforming lending policies (Banerjee and Duflo, 2004). In the case of adopting clean technologies, the state can intervene to set minimum production standards, or offer subsidies to firms to adopt these technologies. Overall, the state's management of the macroeconomy can also influence technology diffusion (Crouzet et al., 2018).

RESEARCH PRIORITIES

- Uncovering evidence on the type of barriers to technology adoption. Are there specific sectors or firm types for which they are stronger?

- Which policy interventions are most effective in reducing barriers to technology adoption?

- Are the barriers to adopting externality mitigating technologies different? If so, how?

- How do firms learn about the development of new technologies for adoption?

- What sort of regulation fosters technology advancement?

III. Barriers to input use

Firms produce output by employing labour, investing in machinery and other capital, and buying materials and other inputs (such as electricity). Technology, another input—which is either embedded in capital or material inputs or in the form of a production process—determines their productivity. This section discusses the extent to which firms in low- and middle-income countries are constrained by their access to specific factors of production, and how these constraints lead to firms deploying a less-than-optimal combination of inputs for production. Studying the availability of essential inputs to production is particularly important for policy. We look at the markets for these inputs first, and assess if any distortions exist in creating and delivering these inputs to firms. Next, we evaluate how firms choose to allocate these inputs relatively across operations, and whether or not it is optimal. **Section 2.3**. will review the implications of these distortions and how resources may be misallocated across firms in aggregate.

Labour

There is a small but growing evidence base studying whether firms in low- and middle-income countries are constrained in accessing labour. In Africa, only about 30% of adults have regular, salaried jobs, and the typical firm hires no labour (Bandiera et al., 2021). Additionally, labour market flows are two to three times higher in low-income countries (Donovan et al., 2020). A key question is thus whether firms are simply unable to hire or retain more workers at prevailing wages.

Overall, the evidence for 'unskilled' workers does not support the view that firms may have limited access to labour. In a field experiment in Sri Lanka, De Mel et al. (2019) provide substantial wage subsidies to support microenterprises to increase their labour force. They find high take-up of wage subsidies in the short run, showing that firms are capable of expanding low-skilled employment but have no lasting impact on employment, profits, or sales. Furthermore, Blattman and Dercon (2018) and Menzel and Woodruff (2019) find that large firms in Ethiopia and Bangladesh face high turnover rates and constantly hire new workers to replace those who leave, suggesting again that finding low-skilled labour is not a first-order constraint. Concurrently, Lagakos et al. (2018) show how the growth rate of wages over a worker's life cycle is lower in low- and middle-income countries. Slow wage growth over the course of a worker's career indicates lower-skilled tasks are more available and for longer in low- and middle-income countries.

Access to 'skilled' workers, on the other hand, may be more restricted. Menzel and Woodruff (2019) show that the least skilled workers are likely to gain initial promotions by moving across firms, but that promotions among more highly skilled workers are almost entirely within the factory. This pattern illustrates that the Bangladeshi factories they study understand how to retain workers but choose to do so only on the more skilled end of the spectrum, perhaps because the cost of finding highly skilled workers is greater than finding low-skilled ones. Additionally, Hardy and McCasland (2017) show that Ghanaian firms' revenues and profits increase when they are assigned an apprentice, but screening constraints prevent firms from hiring more apprentices in the open market. We return to the issue of screening skilled workers below.

The challenge of finding workers may be augmented by three major challenges under sustainable development - potential losses in productivity due to climate shocks, inefficient spatial allocation of workers and firms in certain sectors, and a lack of skills necessary for emerging industries. The first issue, productivity losses due to indoor air pollution (Kahn and Li, 2019; Change et al, 2019), outdoor air pollution (Graff Zivin and Neidell, 2012) and heat (Sudarshan et al., 2015) are well-documented. There is also evidence that managers play an important role in mitigating these impacts (Adhvaryu et al., 2016). Quantifying the distorting nature of climate change on the relative quantity of labour used by a firm is an essential area of future work.

On top of simply higher search costs for skilled workers, there may be a lack of supply of skilled workers in low- and middle-income countries. Thus, a broader research agenda could include an exploration of how workers can be better equipped with essential skills that benefit host firms. This issue is also related to the design of more efficient education systems in low- and middle-income countries—systems that meet the needs of firms and the economy as a whole. While the entire education ecosystem is important, in this section we focus primarily on professional education (such as vocational training, apprenticeships, and on-the-job training), which can enable workers to develop skill sets applicable to firms.

Vocational training programmes provide a formal certificate for the skills acquired. As a result, the labour market mobility of vocational trainees is higher in the longer term, allowing them to jump back onto the job ladder more quickly.

Vocational training programmes provide a formal certificate for the skills acquired. As a result, the labour market mobility of vocational trainees is higher in the longer term, allowing them to jump back onto the job ladder more quickly.

Card et al. (2011) conducted a job-training programme experiment in the Dominican Republic. The programme targeted low-income youth with less than secondary education, combined training on basic skills (to strengthen the participants' self-esteem) and vocational skills (to match the needs of local employers). The authors find that the programme had a significant impact on employment outcomes for women. By contrast, Attanasio et al. (2011) found a positive and significant impact on employment and earnings among women who were offered a subsidised vocational training programme in Colombia. The same outcomes were not significantly impacted for men. In follow-up work, the authors find that these impacts persist over the long run.

Subsidised apprenticeships could also be an effective way to upgrade the skills of a young and inexperienced labour force. On top of raising a worker's productivity, apprenticeships can offer them the opportunity to acquire early labour market experience, and participation signals information about their skills to future prospective employers (Pallais, 2014). On the firms' side, subsidising apprenticeships could ease the credit constraints that prevent companies from hiring and training workers on their own. However, it is worth noting that even when fully subsidised, apprenticeships involve significant time costs for managers and other employees engaged in training apprentices. Additionally, there is hesitation by some firms to pay for a vocational training programme Evidence from Colombia shows that 58% of firms would rather pay a government fine than train their workers (Caicedo et al., 2022). Decreasing the cost of training could be important for eliciting further uptake.

Alfonsi et al. (2019) compare the relative performance of vocational training versus apprenticeship for unemployed youth in Uganda. They find that both vocational training and apprenticeship programmes, which were provided over a six-month period, lead to significant upticks in skills and improvements in employment rates and other labour market outcomes. However, vocational training outcomes are almost twice as large as those for apprenticeships. The difference is that vocational training programmes provide a formal certificate for the skills acquired. As a result, the labour market mobility of vocational trainees is higher in the longer term, allowing them to jump back onto the job ladder more quickly if they fall into unemployment relative to those workers who have experience as apprentices but no credibly certified skills.

If vocational training exhibits a positive return on investment for youth, why don't more people sign up for such programmes on their own? A first and natural explanation is that the youth are credit constrained and cannot afford these human capital investments. Indeed, Bandiera et al. (2024) find that an income-sharing scheme to recuperate the cost of training programmes expanded participation in a training programme offered by BRAC.

A second explanation, explored by Jensen (2010), is that the perceived returns to vocational training programmes are lower than their actual returns. A final reason could be adverse selection in the market for vocational training. As Alfonsi et al. (2019) note, their programmes may have had such an impact because they selected high-quality providers from the crowded market for vocational training in Uganda. Thus, simply lifting the credit constraint faced by the youth by providing, for example, cash transfers that match the value of the training may not generate the same impact in the long run if young workers are unable to rank potential providers correctly. Understanding this degree of information asymmetry in the market for vocational training can be a key part of a future research agenda.

More generally, while the literature on vocational training programmes and apprenticeships is well established, large knowledge gaps remain in several areas. First, while the focus of this literature is generally on improving labour market outcomes for unemployed youth, there is little evidence as to what type of programmes benefit firms the most. In particular, understanding firms' demand for skill upgrading programmes is an important area for further research (Macchiavello et al., 2015). Second, the focus of training programmes and their impact on their efficiency is an area that needs more research. Should vocational training programmes be sector-specific rather than job-type specific? Or should they aim at improving soft skills rather than hard skills (Adhvaryu et al., 2018)? Should they target just unemployed youth, women who are at disadvantage in labour markets, or only individuals with secondary education? Finally, just as with entrepreneur training programmes, there is little evidence on the general equilibrium effect of these programmes.

Lower quality schooling, if it does not provide the right set of tools to acquire skills on the job, could be the responsible underlying factor. Discrimination on the job could also explain this pattern as individuals who get promoted or get access to training may not be the most capable. Macchiavello et al. (2015) document that while the majority of workers in garment factories in Bangladesh are women, very few of them are line supervisors. Following a supervisor training programme, workers initially tend to judge women workers as being less effective, which in turn decreases the performance

of the production line; but after four months of exposure, the gap closes. Finally, employee-employer matching frictions could be higher in low- and middle-income countries, and hence the slow rate of learning on the job could simply reflect the poor quality of matches. We return to this issue in **Section 2.3**.

RESEARCH PRIORITIES

- What is the magnitude of search frictions for skilled workers?

- What programmes can upgrade the skills of the workforce effectively?

- Is skill development in emerging, green sectors a barrier to firm productivity in these sectors?

- Why don't more people sign up for vocational training programmes? Is there adverse selection in this market?

- What schemes can lower the cost of vocational training programmes for firms, governments, and individuals?

- Why is wage growth smaller in low- and middle-income countries? Does discrimination prevent the most capable individuals in a firm from being promoted?

Capital

Access to finance has long been viewed as a particularly severe constraint to firm growth in low- and middle-income countries. A large body of evidence indeed suggests that the marginal return to capital is large for microenterprises in low- and middle-income countries (De Mel et al., 2008; De Mel et al., 2009; Fafchamps et al., 2014; McKenzie and Woodruff, 2008). However, the evidence on the longer-term effect of capital is more mixed, with De Mel et al. (2012) finding continued high returns and Blattman et al. (2019) finding that initial high returns dissipate after nine years.

A number of papers have found that cash or in-kind grants offered to self-employed entrepreneurs can generate large returns in the short run (De Mel et al., 2008; Fafchamps et al., 2014; McKenzie and Woodruff, 2008). By contrast, traditional microcredit typically does not have transformative effects on recipients (Meager, 2018). This is first because the demand for microcredit, when offered to a representative population of eligible borrowers, is generally modest or at least lower than expected (Angelucci et al., 2015; Banerjee et al., 2015; Crépon et al., 2015). Second, increases in profits for treated entrepreneurs are typically not significant (see Loiseau and Walsh, 2015 for a review) and sometimes even lead to a decrease in household consumption (Tarozzi et al., 2015). New evidence has shown that hybrid debt-equity microfinance contracts perform better than traditional instruments, as they offer a risk-sharing mechanism (Cordaro et al., 2022).

A potential explanation for these conflicting results may be that business owners adopt riskier but higher-return projects when they receive a cash grant, but they take on safer and lower-return investments when given a loan

(Fischer, 2013). As such, the terms of the loan contract can have important consequences on the impact of a given loan size on business outcomes (Field et al., 2013).

A new area of research has emerged on this issue over the last few years, shifting the attention from loans to equity. Lenders may not be particularly attracted to loans, as they take a loss when a project fails but do not capture the upside when investments are more successful than expected. Micro-equity contracts could be a solution for this, but they pose a number of implementation challenges, given poor accounting and auditing standards in low-income countries (De Mel et al., 2019). A number of experiments aimed at using micro-equity to lift credit constraints are underway in Kenya, Indonesia, and Pakistan, and their results should shed light on whether micro-equity could be a reliable solution for improving entrepreneurs' access to capital in low- and middle-income countries.

Reducing transaction and monitoring costs could also potentially increase access to finance, but from the supply side. The process of identifying and vetting applicants is particularly costly, and delegating these tasks to the community could significantly reduce the cost of granting a loan (Rigol et al., 2018). Similarly, a simplified or automatic decision process using credit scores could increase the profitability of lending (Paravisini et al., 2015). Digital information, such as phone data, could also be used to decrease the cost of assessing an individual's creditworthiness. Several experiments testing how these technological improvements affect firms' access to credit are currently underway.

The literature on credit constraints for larger firms is more limited. Banerjee and Duflo (2014) use a change in policy that affects the threshold at which Indian firms are eligible for a directed credit. They show that newly eligible firms expanded production, which provides evidence that these firms were credit constrained prior to the reform. Another notable exception is Macchiavello and Blouin (2019) who study strategic default for very large working capital loans for coffee mills.

In sum, the literature on access to finance is very well developed for small firms, but it is lacking for medium to large firms. This is particularly important, as the impact of an increase in the supply of microcredit for small businesses would arguably deliver very different results than increased access to capital for larger firms. Given the growing involvement of development finance institutions in financing, directly or indirectly, large businesses in low- and middle-income countries, in particular through private equity, we believe this area deserves particular attention.

A possible area of further research for small firms could be how to design new and innovative contracts to address the challenges presented by identifying, vetting, and monitoring small firms in low- and middle-income countries. A model for angel investors and venture capital, which play an important role in funding innovation and market disruption in high-income countries, could also be adapted for low- and middle-income countries. Additionally, even for small firms, existing studies may not sufficiently differentiate how specific markers such as gender and ethnicity affect the magnitude of credit constraints.

Material inputs

Firms may also have limited access to specific inputs that are necessary to upgrade their outputs. Global value chains have become important over the last few decades (World Development Report, 2020), and a large fraction of firms' inputs or potential inputs may now derive from imports. For example, a large body of research studies the effect of major trade liberalisations in the late 1990s and 2000s. The liberalisations removed barriers to imports imposed by import substitution policies between the 1950s and 1980s. This will be discussed in more detail in **Section 2.4**.

The quality of inputs can impact both the profitability of firms and productivity. In the case of agriculture, the quality of capital goods, such as tractors, can explain a significant amount of variation in agricultural labour productivity growth.

The quality of inputs can impact both the profitability of firms and productivity. In the case of agriculture, the quality of capital goods, such as tractors, can explain a significant amount of variation in agricultural labour productivity growth (Caunedo and Keller, 2020).

Inputs can be expensive due to high transport costs and low population density (Suri et al., 2022). In the agriculture sector, fertilisers can be nearly double the price as in the US (Cedrez et al., 2020). A lack of infrastructure can lead to higher input prices. Although evidence has shown an association between rural road construction and economic growth, there is a high level of endogeneity in road placement. Asher and Novasad (2020) find that rural roads do not lead to an increase in agricultural activity, and instead work to reallocate labour out of agriculture without significant economic growth. This poses a further question on whether rural roads alone can decrease the cost of inputs or whether other constraints, such as transportation access are necessary and complementary investments to improve input efficiency.

Finally, inputs such as water are essential for farmers in low- and middle-income countries. Under climate change, the risk of water scarcity or drought and flood episodes decreases the predictability of rainfall and available water for crop growing. What happens when farmers lose access to an essential input? Blakeslee et al. (2020) find that when wells in India dry up, farm income declines, yet reallocating to off-farm employment can maintain income. This begs the question of how policy should support the intensification of agriculture if non-farm employment offers an equal or better opportunity. More research is needed into the interaction between input availability for agriculture firms and non-agriculture productivity and labour gains.

Energy services

The World Bank Enterprise Survey reveals that 75% and 66% of firms in sub-Saharan Africa and South Asia, respectively, experience power cuts. The average number of hours without electricity per month is 66 hours in sub-Saharan Africa and 46 hours in South Asia

Energy and access to a reliable source of electricity is also key for firms in low-income countries. The World Bank Enterprise Survey reveals that 75% and 66% of firms in sub-Saharan Africa and South Asia, respectively, experience power cuts. The average number of hours without electricity per month is 66 hours in sub-Saharan Africa and 46 hours in South Asia. These outages are often cited by entrepreneurs as the most important constraint to their growth.

The effect of electricity shortages could vary across firm size and differentially impacts firms' productivity, employment, and output. Large firms may have the potential to source electricity from generators or re-optimise production with other inputs, whereas small firms are likely to just stop production. Hardy and McCasland (2019) indeed show that blackouts are particularly costly for single-person firms, with each cut corresponding to a 10% drop in weekly revenues. Allcott et al. (2016) document important economies of scale in the self-generation of electricity, which in turn creates a distortion in firm-size distribution, giving large firms an advantage. By contrast, Fisher-Vander et al. (2015) find that Chinese firms do not shift to generators in response to electricity scarcity. Instead, they substitute material inputs for energy by buying energy-intensive inputs from other manufacturers. While re-optimisation strategies reduce the impact of power cuts, shortages could remain costly to firms. Using variation provided by an electricity rationing programme in Ghana, Abeberese et al. (2019) estimate that electricity outages in Ghana are equivalent to a 10% loss in productivity. While these microeconomic estimates provide an understanding of importance, Fried and Lagakos (2023) estimate the macroeconomic effects of unreliable electricity could have much larger implications. Without reliable electricity, firms are less likely to invest in complementary technologies, leading to chronic under-investments.

Figure 1: Average number of outages experienced by a firm

Power outages are the average number of power outages that firms experience in a typical month.
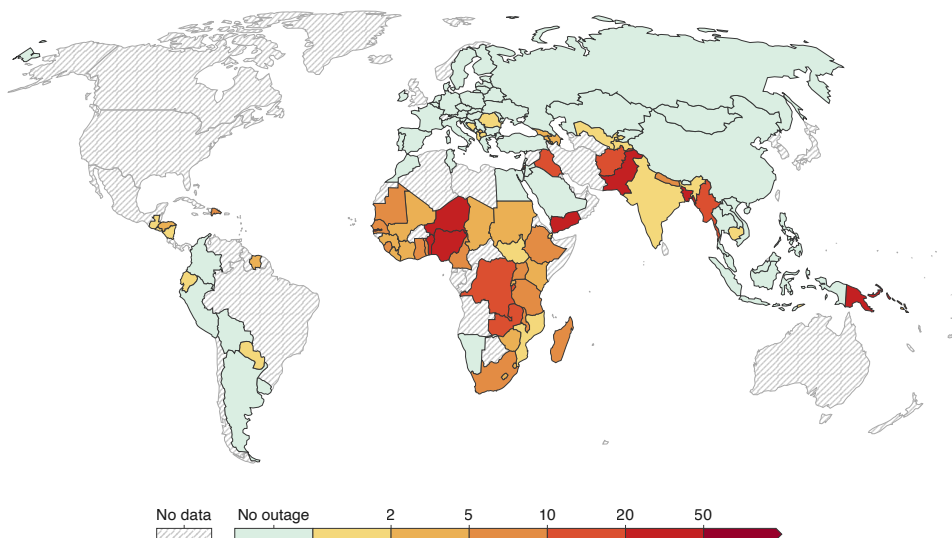
Data source: Multiple sources compiled by World Bank (2024)　　　OurWorldInData.org/energy | CC BY

Notes: The effect of electricity shortages could vary across firm size and differentially impacts firms' productivity, employment, and output. Source: Our World in Data, 2022.

While shortages can impact production, electricity prices also matter in determining the composition of inputs used and the sectoral structure of the economy (Abeberese, 2017). The production of renewable energy in tandem with the construction of grid transmission and a competitive market has been shown to lower the price of electricity for consumers (Gonzalez et al., 2023). It is essential for research to identify the linkages between energy policy in terms of enhancing competition, expanding access, and firm

development. With plummeting costs of renewable energy, the relationship between increasing generation of renewable energy and improvements to firm-level productivity could prove to be an interesting avenue for future research.

Figure 2: Share of firms experiencing electricity outages
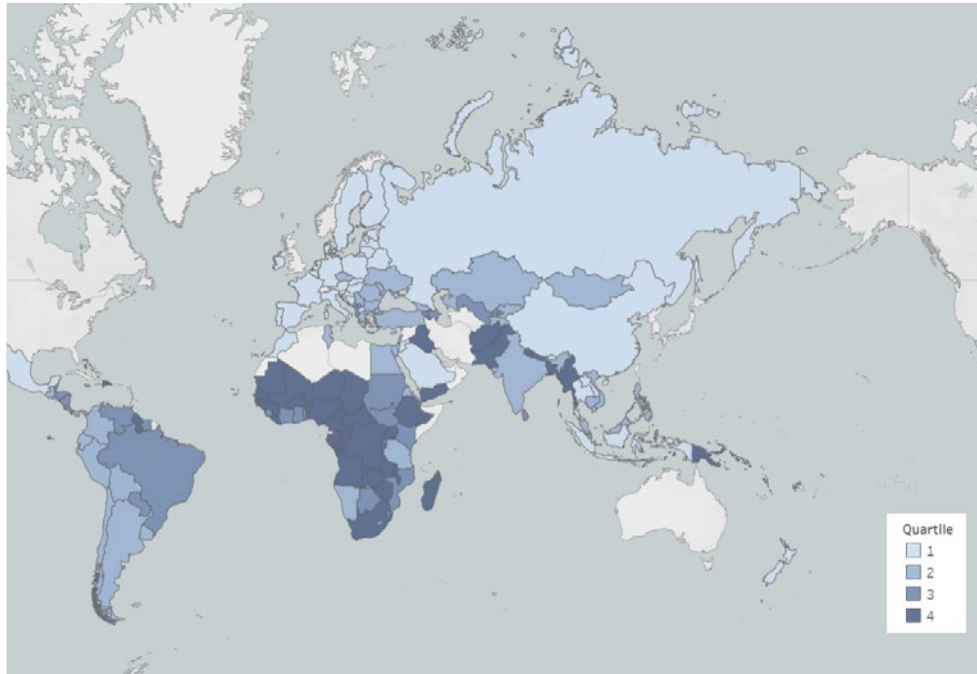
Notes: The World Bank Enterprise Survey reveals that 75 and 66% of firms in sub-Saharan Africa and South Asia, respectively, experience power cuts. Source: World Bank Enterprise Survey, 2024

Finally, in the rural parts of low- and middle-income countries, the main constraint is not power cuts but electricity access (Dinkelman, 2011). However, current empirical studies present a puzzle. Electricity access has been found to be a driver of human capital development (Vidart, 2022), additional labour hours (van de Welle, 2022), and industrial development (Kassem, 2021); while also failing to demonstrate significant impacts on income, labour, or behaviours in low- and middle-income countries (Burlig and Preonas, 2021; Lee, Miguel, and Wolfram, 2020).

Given the importance of energy services in firm productivity, research has also focused on the level of complementarity it has with other inputs within a firm. This relationship deserves further disentanglement by researchers. Ryan (2018) finds that introducing energy consulting services to Indian manufacturing plants designed to reduce the energy use per unit of output needed was useful in unlocking productivity gains. Energy use in these plants is complementary to high-skilled labour and allows firms to operate at a higher capacity. Similarly, in a cross-country analysis, medium- and high-technology manufacturing exhibits a negative correlation with emissions, in contrast to low-technology manufacturing which has the inverse relationship (Avenyo and Tregenna, 2022). This indicates that increasing the productivity of energy can actually lead to a long-run decrease in the energy intensity of growth.

Land

Land as an input is essential for agriculture firms in low- and middle-income countries. Given land is one of the key inputs for farmers, the laws which govern it, the price, and the productivity matter significantly to the overall performance of agriculture firms. The rural poor populations in low- and middle-income countries often own small plots of land, and they are highly vulnerable to climate shocks (Barbier, 2010). Without the mechanisms to acquire additional land or inputs or agriculture, they risk becoming trapped in a poverty cycle. Similarly, an improvement in firm productivity, for example, through improved contracts with suppliers, expands cultivated land (Macchiavello and Miquel-Florensa, 2019). Therefore, a tension exists between improving agricultural firm productivity and the destruction of high-value ecosystems, such as forests or mangroves. More research is needed firstly on whether land is a complement or substitute in agricultural productivity - a review by Balboni et al. (2023) demonstrates results are mixed. Barrett et al. (2023) find that capital and land are substitutable, which implies the negative externality associated with the conversion of forests to agricultural land to maintain productivity growth in the sector is not always required. Second, researchers should prioritise investigating the trade-off between extensive land production for agriculture and the productivity benefits of local ecosystem services, such as pollinators, soil protection, nutrients, and flood prevention.

Another key area in improving the efficiency of land as a firm input for agricultural producers is the impact of property rights on firm productivity. Property rights allow farmers to buy land or production at the market price and encourage efficient use of the parcels. We encourage further research in this area.

Finally, maintaining the productivity of land under climate change will likely remain a growing challenge (Costa et al., 2022). There is growing evidence that when productivity in the agriculture sector wanes, farmers then increase the extensive margin by planting on more land to increase output. More research is needed into firm-level responses to productivity shocks on land use decisions.

In sum, there is a large literature on how input constraints reduce productivity in low- and middle-income countries. There is less evidence, however, on the relative quantitative importance of each factor. This is particularly relevant for policymakers who need to prioritise their actions around removing constraints where they are impacting firm growth the most. Similarly, evaluating the effect of specific policies aimed at reducing barriers in access to inputs remains an important area of research.

RESEARCH PRIORITIES

- Investigating the magnitude of credit constraints for large firms. How can development finance institutions design innovative contracts for large businesses in low- and middle-income countries?

- How can policy help overcome search frictions in matching workers and labourers within countries that display a high level of worker turnover?

- What is the impact of removing credit constraints for larger firms, particularly in upstream and downstream sectors?

- Can new forms of capital provide a solution for access to finance in low- and middle-income countries?

- What are the long-run effects of unreliable electricity (or blackouts) on firm development?

- Is renewable energy, as an input, a more productive factor for firms in low- and middle-income countries?

- What is the relative quantitative importance of low access to each input factor in reducing firm productivity?

- In agricultural firms, how do productivity shocks from climate change affect the choice of inputs for firm owners?

IV. Improving factor allocation by improving market functionality

While improving access to material inputs, capital, and equipped labour is a powerful force for per-capita output growth at the aggregate level, making sure that the existing stock of inputs is allocated to the right firms is also vital in raising aggregate output. Aggregate total factor productivity (TFP) is affected both by the distribution of firm productivity and the allocation of resources across establishments. An efficient, or distortion-free, allocation would be one in which the marginal value product of inputs is equalised across production units. In this section, we discuss a number of potential sources of such misallocation.

Factor misallocation

1. Implications of input distortions

Recent work has attempted to quantify the extent of dispersion in the marginal value products of inputs across firms, as well as the resulting consequences of that dispersion for aggregate productivity (see, Hopenhayn and Rogerson, 1993; Banerjee and Duflo, 2005; Guner et al., 2008, Hsieh and Klenow, 2009 and 2014; and Restuccia and Rogerson, 2008). The underlying distortions can take the form of specific policies that favour small firms at the expense of larger and more productive firms (for example, taxes and regulations) or restrict labour mobility across firms or sectors (for example, firing costs). Additionally, informal firms typically do not have to bear the costs of certain regulations that large compliant firms must abide by. Political connections, friend networks, family relationships, or social status can also favour certain firms at the expense of others (Banerjee and Munshi, 2005; Hnatkovska et al., 2012). Market power in output or input markets, as well as non-market power resulting from the poor enforcement of property rights or inefficient institutions (Brandt et al., 2017; Chen et al., 2017), can also create sizable distortions.

In a seminal paper, Hsieh and Klenow (2009) argue that resource misallocation may be stronger in low- and middle-income countries. They estimate considerable gaps in the marginal products of labour and capital and claim that misallocation can explain approximately a third of the TFP differences between China or India and the US. Removing these distortions could, in principle, lead to high gains in per capita output due to resource reallocation. Between 1998 and 2005, the researchers document a decrease in misallocation in China following the implementation of various policies aimed at reducing distortions. This study and the vast literature that followed (Buera et al., 2011; Bartelsman et al., 2013; Busso et al., 2013; Kalemli-Ozcan and Sørensen, 2016) do not attempt to identify the origin of distortions but instead focus on providing a framework and tools to quantify the consequences of the distortions that appear to exist.

Other recent work has, however, questioned the empirical basis for this consensus. For example, Haltiwanger et al. (2018) suggest that model misspecification can lead to sizable biases in the measurement of misallocation wedges. Using a new framework, they argue that most of the variation observed in Hsieh and Klenow (2009) could be attributed to demand shifts. Rotemberg and White (2017) point to differential amounts of measurement error across countries as another factor that possibly contributes to the literature overstating misallocation's role in explaining the relative extent of international aggregate productivity differences.

The broad view emerging from this literature thus far is that misallocation distortions are great and tend to be tilted in the direction of a tax on large, productive firms—or, equivalently, a subsidy to small businesses (see Hopenhayn, 2014 for a review). Although these recent developments are helpful in quantifying the role of misallocation in productivity growth, they do not clarify the origins of the distortions for policymakers, nor the type of specific and targeted interventions that could address them.

To this end, several papers explore the misallocation consequences of specific policies in low- and middle-income countries. For example, Garcia-Santana and Pijoan-Mas (2014) study the impact of small-scale reservations in India. Adamopoulos and Restuccia (2019) measure the impact of a land-holdings ceiling reform in the Philippines. However, the majority of these studies find that the policies have only a small impact on aggregate productivity, which contrasts with the more agnostic and reduced-form approach taken by Hsieh and Klenow (2009) and follow-up studies. One possible interpretation is that the agnostic approach overestimates the influence of resource misallocation. Yet, the list of plausible sources of misallocation is long; each may have a small contribution, and many are likely to be country or sector-specific.

Researchers could make progress in this literature by taking a more middle-ground approach, using a broad classification of sources of misallocation (for example, policy versus market power versus political connections, or capital versus labour) and attempting to quantify the importance of these different categories of distortions.

Echoing some of the discussion previewed in **Section 2.2**, we explore further potential capital and labour-related misallocation factors below.

Capital misallocation may come from preferential access to credit or firm-size-dependent constraints that disproportionately discriminate against

small firms. However, credit constraints can be lifted or access to capital can be improved for small firms in a way that generates employment, profits, and growth. Recent evidence from Ayyagari et al. (2021) suggests the introduction of an increase in the supply of credit through the opening of credit bureaus, has led to an increase in employment across micro, small, and medium firms. Dalton et al. (2019) conducted an experiment on mobile payment technology in Kenya. More than a year after the intervention, treated firms had better access to finance through the mobile loan network. Even with some literature, this remains an important area of research, as existing interventions have not demonstrated sustained growth. The existing evidence points to the idea that large firms are at a disadvantage, as they face a higher marginal product of capital. This suggests that these distortions may not be responsible for the misallocation of capital. Instead, other policy-imposed constraints—such as taxes, regulations, or other social norms—may prevent capital from being reallocated to more productive firms. We encourage further research in this area.

On the input side, Nishida et al. (2017) argue that current approaches for quantifying the relative importance of reallocation and internal productivity in aggregate TFP growth tend to underplay the importance of misallocation of materials. The role of material input misallocation has not been the topic of many studies in the literature and should be the focus of more research.

On a related note, there are concerns that factor misallocation, particularly towards smaller or less regulated enterprises, may result in productive activities that diminish the quality of land as input for agriculture. For example, in the case of farmers in Brazil, an increase in capital can accelerate intensive farming practices, leading to a rapid amount of deforestation (Jayachadran, 2022). While the main impact here is the generation of an environmental externality, increasing intensive farming practices and use of land on the extensive margin by unproductive firms could be categorised as a distortion. Larger, more productive firms may substitute other inputs with lower negative externalities than land where capital becomes available. This poses an interesting question for the relationship between increased capital access to farmers and the adoption of technologies along the extensive or intensive margin, and the overall output of agriculture in countries with large, forested areas.

On the labour side, firing costs may prevent firms from adjusting labour supply in response to shocks. Many governments around the world impose restrictions on worker layoffs, at least for firms above a certain size. Similarly, the role of hiring and matching frictions also deserves more attention (see Caria and Orkin, 2024 for a review). Gender or ethnicity-based discrimination may lead to an inefficient allocation of labour across firms and sectors.

Many countries provide resources that allow jobseekers to better signal their skills or directly help firms match with the unemployed workforce. Such policy interventions include skill certification programmes (Abebe et al., 2021a; Carranza et al., 2021; Bassi and Nansamba, 2022), job fairs (Abebe et al., 2021; Beam, 2016), transport subsidies (Franklin, 2015; Abebe et al., 2021a), or CV-based interventions (Abel et al., 2020). Certification interventions appear to be particularly cost-effective. A recent meta-analysis shows that their average impact is a 3 percentage point increase in employment (Krefft, 2024). For comparison, training interventions have an average impact of 6

percentage points, for a typical cost that is approximately 10 times larger (Caria and Orkin, 2024).

While these studies demonstrate reductions in search frictions, there are still very few studies attempting to measure the impact of these interventions on firm productivity. As such, taking the perspective of firms rather than workers in analysing the impact of labour market policies is a promising avenue for research. Hardy and McCasland (2017) study whether search and matching frictions restrain firms from hiring the optimal number of workers. They conduct an experiment where unemployed young people are randomly placed as apprentices within small firms in Ghana. Apprentices' cost of voluntary participation served as a screening device for firms. Firms given apprentices by the programme typically hired and retained them for at least six months, which suggests that firms face binding search costs. Moreover, revenues and profits of treated firms increased by is 7-10% per assigned apprentice, providing evidence that the marginal product of labour is positive and significant in these small enterprises, at least in the short run. Fernando et al. (2023) find that online job portals are greatly underutilised in India, and when firms use the portals in combination with targeted advertising, the number of skilled labourers hired increases. Hensel, Tekleselassie, and Witte (2023) find that vacancy posting subsidies lead small firms to try to recruit white collar workers, but that small firms are ultimately unable to attract these workers. Abebe et al. (2020) find that employers in Ethiopia can attract better jobseekers by offering a small monetary incentive, which reveals the cost of making an application for skilled workers to be large. In small firms, policy pushes can create more opportunities for efficient search and matching. We conclude there is evidence of search frictions, yet more evidence is needed on how to best address these frictions for firms.

Incorrect labour market perceptions also require more attention. There is a growing literature documenting that jobseekers hold biased beliefs that distort job search decisions (see Banerjee and Sequeira, 2023; Bandiera et al., 2024; Abebe et al., 2024a). There is less work focusing on the beliefs of firm managers. Abebe et al. (2024) show that firms in Ethiopia also have incorrect perceptions of the distribution of worker skills, while Caria and Falco (2024) show that entrepreneurs in Ghana are overly pessimistic about worker trustworthiness. Finally, Abebe et al. (2024b) show evidence that Ethiopia firms hold unexpected mental models related to competition in product and labour markets. More evidence is needed on beliefs and mental models, and how these shape firms' decisions.

Labour may also be misallocated across sectors. In many low- and middle-income countries, the government and NGOs offer better employment opportunities than the private sector (Finan et al., 2017). Even Ethiopia, which is arguably one of the only African countries that has been through significant structural transformation over the past decade, has over 50% of its skilled labour force working in the public sector. While wages in the public sector or international organisations are high, the marginal product of labour in these sectors may be lower than in firms. High wages may instead reflect the optimal screening strategy of these organisations (Macchiavello, 2008) or provide incentives against corruption. The private sector faces a wide variety of shocks - such as greater risk of job loss or reallocation - that could affect workers' flow of income, and which may be the reason more stable employment opportunities are preferable.

Moreover, within the private sector, costly mobility barriers may prevent labour from being allocated to the most productive sectors in the economy (Gollin et al., 2014). When sectoral movement requires geographical movement, high transport costs may act as a barrier to productivity growth (Morten and Oliveira, 2019). Bryan and Morten (2019) estimate that reducing migration costs to the US level in Indonesia would spur a 7% increase in aggregate productivity. Lagakos et al. (2019) show substantial welfare effects of promoting rural-urban migration. Using data on migration from the MNREGS programme in India, Imbert and Papp (2019) argue that hard living and working conditions in cities, rather than transport, make up the largest fraction of the costs of migration. Finally, the lack of opportunities for later-life job training may prevent workers from understanding the growth possibilities in other sectors.

The allocation of labour across sectors traditionally relates to the topic of structural transformation and the potential gains of pulling workers out of subsistence agriculture into plausibly more productive urban sectors (Gollin et al., 2002). In high-income countries, the share of labour in agriculture is lower than in low- and middle-income countries. Additionally, data from national accounts indicates that the productivity gap between low- and high-income countries is wider in agriculture than in other sectors (Caselli, 2005), in part due to farm-size distortions (Adamopoulos and Restuccia, 2014). Using microdata, Gollin et al. (2014) confirm a large within-country productivity gap between farming and other sectors. By contrast, Hicks et al. (2017) document how controlling for individual characteristics in Kenya illustrates that 80% of the productivity gap can be attributed to selection. The most productive workers migrate to cities to work, while the least productive remain in agriculture. Labour movement between agriculture and manufacturing can also take place at a much higher frequency, with workers switching constantly from one to the other depending on earnings opportunities (Zane, 2018).

There is also emerging evidence on the impact of climate change on agricultural productivity and labour movement and subsequently, the pace and scale of structural transformation. For example, risk-averse households are likely to reallocate labour out of agriculture toward non-farm livelihoods; and in some cases, households must compensate for lost agricultural output with increased non-farm labour (Barrett et al., 2023). Depending on trade openness, migration and trade may serve as substitutes for adaptation to climate change (Desmet and Rossi, 2021). However, in some cases, most rural poor populations may be locked into agriculture jobs, as the demand for non-agriculture labour decreases as high temperatures reduce the buying and selling of non-agricultural goods in rural areas (Liu et al., 2023). Overall, the impacts of climate change on the allocation of labour are a high priority area of research.

The traditional view of structural change is that productivity growth in the manufacturing sector drives the shift of the labour force out of agricultural activities and into industrial jobs. However, many countries in sub-Saharan Africa and South Asia have experienced very low growth in manufacturing in recent years. Relative to high-income countries when they were at similar levels of development, low- and middle-income countries today have lower shares of manufacturing output but higher shares of services. As such, structural transformation may involve more than simply moving labour from agriculture to manufacturing. Services, or other more generally productive

sectors in cities, also seem an adapted target that could promote aggregate productivity growth. To facilitate these structural changes, the state will likely need to provide complementary services to labour mobility (see Bandiera et al., 2019).

In a similar vein of research, research to understand the barriers to moving people into good jobs that support second-order policy goals such as the development of clean energy or transportation is growing in interest. From anecdotal evidence, there is a lack of skilled workers to support a 'green transition.' If a government is seeking to prioritise the development of these nascent industries, skills training may be a necessary step to transition workers into emerging, green industries. To date, there is no literature assessing the skills gap in any sectors that contribute to a sustainable development agenda - including solar, wind, or healthcare. Strategically, a government may use a vocational training programme to promote the development of green skills, but the evidence on the scale of labour in these sectors is greatly understudied. Understanding how governments can foster both a sustainable and structural transformation remains a key question for economic development.

2. Output distortions

While improving access to material inputs, capital, and equipped labour is essential for per capita output growth at the aggregate level, making sure that the existing stock of inputs is allocated to the right firms in the right quantity is also critical. Improvements in the factor productivity across all firms can have significant macroeconomic effects. Access to high-quality capital can drive differences in firm productivity. In a cross-sectional analysis, the difference in the quality of capital equipment in agriculture is significantly related to the overall growth in agriculture labour productivity in the last 25 years (Caunedo and Keller, 2020).

Beyond accessing inputs and allocating them efficiently across more productive firms in the economy, there is a need to understand how the market and regulatory environments may inhibit productivity growth. Distortionary effects which can impede production include tariffs or taxation (that can drive up the price of inputs) as well as market controls (such as price caps) and may be inefficient. For our purposes, we focus primarily on trade tariffs and taxation.

While India's trade reforms in the 1990s primarily reduced tariffs on imported inputs, they also led to a huge spike in varieties that were not imported pre-reform. Goldberg et al. (2010) show that this reform increased the range of products manufactured domestically. In many industries and countries, domestic inputs are only imperfect substitutes for imported inputs (Halpern et al., 2015). In turn, if some inputs can only be imported at a high cost, domestic firms may use domestic inputs more intensively, at the expense of a wider product scope or quality upgrading. Kugler and Verhoogen (2012) theorise and document the importance of input quality in producing output quality. VAT and transaction-level customs data could deepen our understanding of these phenomena. Bas and Paunov (2019) directly observe inputs and outputs at the firm-level and confirm that cuts in import tariffs lead Ecuadorian firms to use a wider range of inputs and expand product scope.

A large literature has also shown that lower import tariffs increase firm performance. Amiti and Konings (2007) in Indonesia and Topalova and Khandelwal (2011) in India, show that firms more exposed to input tariff cuts exhibited greater productivity growth. De Loecker et al. (2016) show that lower tariffs in India led to a decrease in output prices but that these price drops were small relative to the decline in marginal costs, a fact they attribute to firms increasing their mark-ups. Mirroring these results for lower tariffs, Gopinath and Neiman (2014) demonstrate that the 2000-peso depreciation, which effectively increased the cost of imported inputs, generated large productivity losses, reduced firms' scale, and raised output prices.

Despite this mounting evidence that lower tariffs increase firm performance, many governments in low- and middle-income countries may be reluctant to eliminate tariffs, as tariff duties might make up a substantial share of their revenue. As such, an interesting area of future research could be how to minimise distortions from tariff duties. Given a country's output product scope and trade performance, is there a set of products for which import tariffs may have a lower impact?

Finally, while this section focuses on the static misallocation of factors of production, firm dynamics should not be ignored. Hsieh and Klenow (2014) show that firms in low- and middle-income countries typically grow slower and reach a plateau after 20 years of operations. Eslava et al. (2019) argue that this pattern could be explained by the high survival rate of underperforming firms but also by the lack of firms experiencing exceptional growth. While the issue of competition likely plays a role in explaining how low-productivity firms sustain themselves, understanding why disruptive entry is less common in low- and middle-income countries remains a puzzle for further exploration.

RESEARCH PRIORITIES

- What factors are responsible for the misallocation of factors of production across firms? Quantifying the relative importance of each factor, particularly the importance of specific policies and regulations.

- Do matching frictions and firing costs prevent the optimal allocation of labour across firms?

- What barriers constrain the optimal allocation of labour across sectors? How can structural transformation be promoted?

- How will climate shocks impact agriculture and non-agriculture labour allocation (across sectors and geographies)?

- Why is there less disruptive entry in low- and middle-income countries?

Role of firm-level demand and market access

The main barriers to firm growth presented thus far have been on the supply side—either through internal capacity and capability, access to factors of production, or misallocation of these same factors across firms. However, firms may face constraints on the demand-side as well. The enterprise maps of John Sutton (2010; 2012; 2014) suggest that the capability of firms may be derived from their ability to understand local demand as the majority of the top firms in Ethiopia, Ghana, and Mozambique started as traders and importers. Additionally, a new conceptual approach to understanding growth by Goldberg and Reed (2023) identifies that poverty reduction as a result of growth can only occur once demand - domestic or international - is high enough to allow firms to overcome the cost of adopting these productivity enhancing technologies. The existence of frictions on the demand-side also relates to the misallocation section above. In their seminal paper, Hsieh and Klenow (2009) introduce a wedge on inputs and on the demand side, both of which are responsible for the misallocation of factors of production across firms.

The existence of frictions on the demand-side would have important consequences for policymaking. While the majority of aforementioned programmes aimed at improving firm performance were focused on the supply-side, demand-driven support of small and medium firms may be just as necessary to stimulate sustained business growth (Tendler and Amorim, 1996). Moreover, the observed poor performance of supply-side programmes (such as management training) on sales and profits discussed in **Section 2.1** could be explained by firms' inability to fully grasp the benefits of these programmes if they remain constrained on the demand-side. As such, combining supply-driven and demand-side interventions may be the optimal design for promoting growth among small businesses.

Such interventions are only justified if firms' limited demand is the result of distortions or market failures. We review existing evidence on these potential distortions below. First, poor infrastructure and high trade costs in low- and middle-income countries can significantly lower the demand that firms face. This may particularly be critical for farmers, whose production location is by nature far—in distance and in cost—from cities and the markets they (could) serve (Atkin and Donaldson, 2015). A number of studies have recently documented the positive impact of improvements in physical infrastructure (Brooks and Donovan, 2017; Casaburi et al., 2013; Donaldson, 2018; Ghani et al., 2014) or better access to digital marketing tools (Couture et al., 2018) on economic activity. In contrast, there is also evidence that physical infrastructure alone is not enough to support local, rural economic growth (Asher and Novosad, 2020), and roads in tandem with agriculture extensive services support local growth in India (Gebresilassie, 2023). Infrastructure may not consistently produce the benefits theoretically assumed. Allen and Atkin (2016) find that a reduction in trade costs may come with downsides as well. Better access to global markets reduces the negative correlation between yields and local prices, reducing the insurance price movements provided to small-scale agricultural producers.

Second, searches for potential buyers may be subject to significant information barriers that prevent firms from knowing about market conditions elsewhere or even knowing that it is feasible for them to sell to distant markets. For example, these frictions could take the form of farmers

not knowing about prices in other locations (Allen, 2014) or consumers not knowing about the range of products available outside of local markets (Jensen and Miller, 2018). However, when a firm matches with a high-income buyer, the domestic firm can increase local wages and improve skills (Demir et al., 2023). In this case, firms are willing to improve their productivity if they know they can match with another productive firm as a buyer. In the case that it is not a matching failure, access to technology can also help firms alleviate the information constraint (Jensen, 2007). There exist economies of scale in development to achieve poverty reduction through trade openness, particularly for countries with small populations (Goldberg and Reed, 2023), which we will discuss further in **Section 3.2**. Identifying buyers, and enough buyers, for firms to invest in productivity enhancing technology is a significant area for future research.

Third, contractual frictions, partly driven by poor contract enforcement in low-income countries, can significantly reduce opportunities for deals between buyers and sellers. Firms typically resort to relational contracts to solve these challenges, but these take time to form (McMillan and Woodruff, 1999). Moreover, in an environment where quality is not contractible, reputation plays an important role. A firm surrounded by low-quality producers then faces challenges in signalling the quality of its own products to potential buyers (Bai et al., 2017). Thus, it also takes time for buyers to learn about the quality of a given supplier's products (Macchiavello, 2010). Consistent with this theory, Macchiavello and Morjaria (2015) use evidence from the Kenyan rose market to show that compliance increases with the length of the relationship but that once the relationship is established, suppliers care less about damaging their reputation. Similarly, trust plays an important role in business relationships, and attributes other than just performance, quality, or price—such as ethnicity—may be important factors determining the allocation of demand across firms (Schoar et al., 2008). For example, Bai (2018) explores the use of laser-cut labels to solve the asymmetry of information in the quality of watermelons in China but shows that the benefits of using the technology do not outweigh the costs for producers; regardless of the use of quality stickers, customers are more likely to work with vendors they already trust. Hansman et al. (2019) show how vertical integration can solve quality-based contractual frictions with suppliers. As many of the studies cited above highlight, the existence of reputational and contracting frictions opens the scope for a wide range of policy interventions.

Fourth, firms may lack the marketing capacity necessary to increase sales. The market for acquiring such skills may be subject to some of the same failures as the market for consulting services discussed earlier. Managers' perceptions of the returns of marketing training programmes could be lower than their actual returns. Alternatively, firms may be unable to identify the quality of potential providers for these trainings or may face credit constraints that prevent them from making an investment in these skills. Evidence across multiple settings reveals that skills training can be successful, and potentially as cost-effective as other programmes, such as external consulting services. Anderson et al. (2014) document a significant impact of marketing training on sales and profits for small business owners in South Africa, while Hjort et al. (2024) find marketing training successful in increasing the number of contracts by managers who receive the training in Liberia. Anderson and McKenzie (2022) add to the literature with their findings. The researchers found that small firms in Nigeria who received

access to a market to either contract out or hire a marketing specialist for their firm were as successful and nearly half the cost of business consulting.

The benefits of increased market access at the firm-level appear to be clear. Failure to access markets is often attributed to high trade costs or information costs - distortions which make matching buyers difficult. Addressing the frictions that small businesses face in growing demand for their products can significantly improve performance. Moreover, firms in low- and middle-income countries—and even more so in remote areas—potentially face more of the frictions noted above than firms close to large cities or in high-income countries. As such, concentrating more effort on increasing market access for businesses reduces market distortions faced by firms in low- and middle-income countries.

While there is growing evidence that the sources of potential distortions listed above exist and are quantitatively important, there is limited evidence on how they can be reduced. However, a number of recent studies show that one-off interventions could have long-lasting effects on firm-level demand. Ferraz et al. (2015) show that demand shocks impact firm dynamics. Although Aghion et al. (2022) study this in the case of French manufacturing firms, they find that a positive export demand shock can drive productivity in domestic firms through increased innovation (measured in patents). Companies that win government procurement contracts in Brazil grow by 2.2% in total size, and these effects persist for several years beyond the execution of the government contract. Atkin et al. (2017), in work discussed further in **Section 3** of this review, randomly allocated foreign demand to rug producers in Egypt. They show that a single reduction in matching frictions between foreign buyers and local suppliers produces long-lasting effects on producers' profits and productivity. Bernstein et al. (2018) also document significant increases in entrepreneurship in response to local demand shocks.

Other mechanisms have been proposed to improve market access for firms. One suggested mechanism is the introduction of a market-maker agency—which, by centralising and providing information on all suppliers in the economy and their products or the requirements for serving specific markets, can significantly reduce matching frictions (Steenbergen and Sutton, 2017; Spray and Steenbergen, 2018). Arraiz et al. (2012) evaluate CORFO, a supplier development programme in Chile aimed at matching small suppliers with larger firms and find that recipient firms benefited from the initiative. The programme not only raised sales and employment of small and medium-sized suppliers, but it also increased the sales of buyer firms and increased their likelihood of becoming exporters.

A number of important questions remain to be explored in this literature. Despite the evidence on the four potential sources of distortion presented above— and in part because most of that evidence comes from (sectoral) case studies—there is limited research on which sectors, countries, or markets are most likely to be subject to these inefficiencies. Infrastructure is costly to build; mechanisms to make information about firms more transparent require coordination and reducing contractual frictions demands significant effort. Thus, it is critical that policymakers in low- and middle-income countries understand better where lifting firms' barriers to market access is likely to generate the highest returns before planning their next steps.

Moreover, there is no clear evidence as to whether the inefficiencies in demand presented above impact all firms the same or differently. If some firms face more significant barriers to market access than others, it will have important consequences for competition and aggregate productivity. Hardy and Kagy (2019) document that women entrepreneurs in Ghana are relatively more demand-constrained than their male counterparts. Roberts et al. (2017) document substantial variation in firm-level demand among Chinese footwear manufacturing firms. Understanding the factors that may create variation in firm-level demand conditional on product characteristics would be an interesting avenue for future research. Researchers will need to collect more data on supplier-buyer relationships to move forward on these issues. Most of the data used in this literature was obtained either through surveys or administrative records but typically limited to specific industries. Administrative data, such as VAT or mirrored customs records, is now becoming available for many low-income economies. Such data will allow researchers to better understand which suppliers match with which buyers— and more generally, the quantitative importance of demand constraints for business owners in low- and middle-income countries.

RESEARCH PRIORITIES

- Are there market failures that reduce market access for firms? Are there sectors where they are more prevalent?

- What is the magnitude of search frictions between exporters and foreign buyers?

- Can participation in global value chains (GVCs) alleviate demand constraints?

- What mechanisms of the GVC can enhance market access and increase demand for firms in low- and middle-income countries?

- How can contractual frictions be reduced? What mechanisms improve (collective) reputation?

- Are firms in low- and middle-income countries likely to innovate as a result of demand shocks? Are there interacting barriers which prevent export-driven firm productivity?

- Do firms in low- and middle-income countries lack market capacity?

Intermediation and competition along value chains

Value chains, particularly in agriculture, are often at the centre of policymakers' concerns. How can farmers get higher incomes while consumers pay low prices for commodities? Trade integration has made value chains mainstream but also more sophisticated. They typically affect a wide range of actors from multiple countries and often involve interactions between different sectors. However, in many cases, at specific levels of value chains, a handful of players dominate. Particularly in agricultural markets, a few big companies with significant monopsony or oligopsony power buy their product from a large number of small farmers. Oxfam (2012) documents that 90% of global grain trade is controlled by four major

trading companies. Similarly, the World Bank (WDR, 2012) estimates that the concentration ratio of the top four trading companies was about 40% for cocoa and coffee in 2012. In parallel, the share of the retail price going to producing countries is only 10% for coffee and 28% for cocoa.

A large economic literature confirms that downstream price increases or positive shifts in world demand are not passed on to farmers. For example, McMillan et al. (2003) show that economic liberalisation did not lead to significant benefits for cashew farmers in Mozambique. Similarly, Fafchamps and Hill (2008) document low pass-through from international prices to Ugandan coffee farmers. Part of this difference could be attributed to high trade costs in low- and middle-income countries, given their poor infrastructure. We discuss this hypothesis further in **Section 3.3**. An alternative explanation is that intermediaries in value chains charge high mark-ups. Arndt et al. (2000) measure a domestic margin of 111% on basic food crops and 300% on cassava in Mozambique. Atkin and Donaldson (2016) develop a methodology to separate trade costs from mark-ups and use barcode-equivalent price data from Ethiopia and Nigeria to show evidence for high mark-ups in the trading sector, particularly in remote locations. There may be a rationale, however, as to why these margins are so high, which does not necessarily involve low levels of competition or even collusion. For example, Casburi and Reed (2019) document that traders pass value to farmers not only through output prices but also by providing credit. Accounting for these two channels, they find limited evidence for market power.

Competition patterns could arguably be very different in small domestic markets as opposed to international value chains. Looking at pass-through from costs to markets in Kenya, Bergquist and Dinerstein (2020) show that only 22% of an experimentally induced drop in buying price is passed on to consumers.

While some of the studies cited above tend to paint a picture of intermediaries taking a large part of the surplus with little effort, a few studies document the importance of intermediaries in facilitating trade. Blum et al. (2009) show that intermediaries are essential in connecting an economy to international markets (between 25-45% of all imports and 10-15% of all exports in Chile). They suggest intermediaries must contribute in some way to reducing trade costs, otherwise buyers and sellers would begin to bypass them over time. Farmers or small businesses in manufacturing typically do not have the capacity to reach out to buyers and sell on world markets themselves. Consistent with that hypothesis, Ahn et al. (2011) show that intermediaries help small firms in China overcome the fixed costs of exporting while large firms engage in export activities directly. Intermediaries may also serve as a reputation intermediary to overcome information asymmetry on product quality, or other contractual frictions discussed in the previous section (Bardhan et al., 2013).

The issue of imperfect competition in value chains is not necessarily limited to intermediaries and traders. While farmers often rely on traders to sell their crops in raw form, they may also depend on agribusinesses to export their products with some value added. Dhingra and Tenreyro (2017) estimate that when selling to monopsonistic agribusinesses, farmers benefit less from increases in world prices than when they sell to small traders. However, a smaller number of agribusinesses could actually benefit farmers through another channel; in an environment with poor contract

enforcement, competition may increase farmers' willingness to renege on relational contracts to pursue relationships with buyers willing to pay more. Macchiavello and Morjaria (2019) offer support for this conjecture in the Rwanda coffee chain, demonstrating that a higher number of coffee mills downstream makes farmers worse off. In a recent study, Macchiavello and Miquel-Florensa (2019) show that a Sustainable Quality Programme implemented on behalf of a large international company buying 80% of the high-quality coffee in Colombia had a positive impact on farmers.

Beyond agriculture, a series of other papers have documented the benefits of competition on productivity. In a study of footwear manufacturers in China, Qian (2008) shows that when the government reduced its efforts to protect intellectual property rights, implicitly leading to the entry of counterfeiters, incumbent manufacturers upgraded the quality of their products through innovation. The threat of entry into the rail mill industry in India also generated productivity gains in a large state-owned enterprise without any additional investment (Das et al., 2013).

Entry itself can generate important aggregate productivity growth. Growth can happen in the sector in which entry occurs when newcomers are more productive than incumbents. Higher competition can also impact productivity upstream. Javorcik and Li (2013) and Iacovone et al. (2015) show that entry of foreign direct investment in the retail sector pressures suppliers to improve along several dimensions and leads to substantial reallocation across firms. FDI investment in a low- and middle-income country can create wider spillovers for local firms (Crescenzi and Harman, 2022), which we discuss further in **Section 3.2**. Ghani and Reed (2019) show that increased competition in the market for ice spills over to the fish industry downstream, with lower prices being passed on to customers in both industries (see also Holmes and Schmitz, 2010 for a review on the issue of competition and productivity).

Competition, or the lack thereof, also impacts consumers or industries downstream through prices (Lira et al., 2007; Cunha et al., 2018; Busso and Galiani, 2019). The retail sector, in particular, appears to be less competitive in low- and middle-income countries than in high-income countries. Atkin et al. (2018) show that consumer welfare increases twice as much when foreign stores open in Mexico than when Walmart enters a city in the US (Hausman and Leibtag, 2007). This lack of competition among retailers and wholesalers may be the reason that the prices of some commodities are so high in low- and middle-income countries. For example, cement—an essential input for infrastructure and housing—is 183% more expensive in Africa than in the rest of the world (World Bank, 2016). Beirne and Kirchberger (2023) find that these high prices in cement are attributable to lower levels of competition. This lack of competition is thought to be driven by the characteristics of sub-Saharan economies - small market sizes where firms simply cannot enter below a certain threshold (Leone et al., 2024). The World Economic Forum's Global Competitiveness Report (2019) places virtually all sub-Saharan African countries in the bottom third of its competition index ranking. A final explanation for why competition appears to be lower in low-income countries relates to political economy.

Competition within the value chain can also impact innovation. Dugoua and Dumas (2021) find that suppliers along the car manufacturing value chain face weak incentives to innovate on 'greening' inputs, bottlenecking environmental innovation. The introduction of voluntary supply chain requirements has demonstrated a marked shift in demand, with suppliers

innovating to keep up with customers in importing countries. The efficiency of these policies as both innovation-inducing and productivity enhancing (Dragusona et al., 2014) is beginning to be explored.

Similarly, demand from consumers who are exposed to pro-social attitudes is more likely to foster competition in clean innovation (Aghion et al., 2023). In the absence of a strong willingness to pay for environmental goods locally, intermediaries along the supply chain may provide the nudge for improving energy efficiency and even innovating. We will review this more in **Section 2.2**.

Firms connected to power may be able to restrict entry into the sectors they operate in and, as such, have significant market power (Kochanova et al., 2018). In sum, a substantial amount of research suggests that competitive forces may be weaker in low- and middle-income countries. In some limited instances, a smaller number of actors can reduce search frictions, incentives to renege on relational contracts, or the wasteful duplication of entry costs. However, in most cases, it seems likely that a lack of competition is welfare-reducing for consumers on the margin. Yet very few low- and middle-income countries, in particular in sub-Saharan Africa, have a competition law or policy, and only a handful have a competition authority (see **Figure 3**).

Figure 3: Number of years with an operational competition authority

Legend:
- Over 20
- 16-20
- 11-15
- 6-10
- 1-5
- No competition authority but has competition laws
- No competition laws
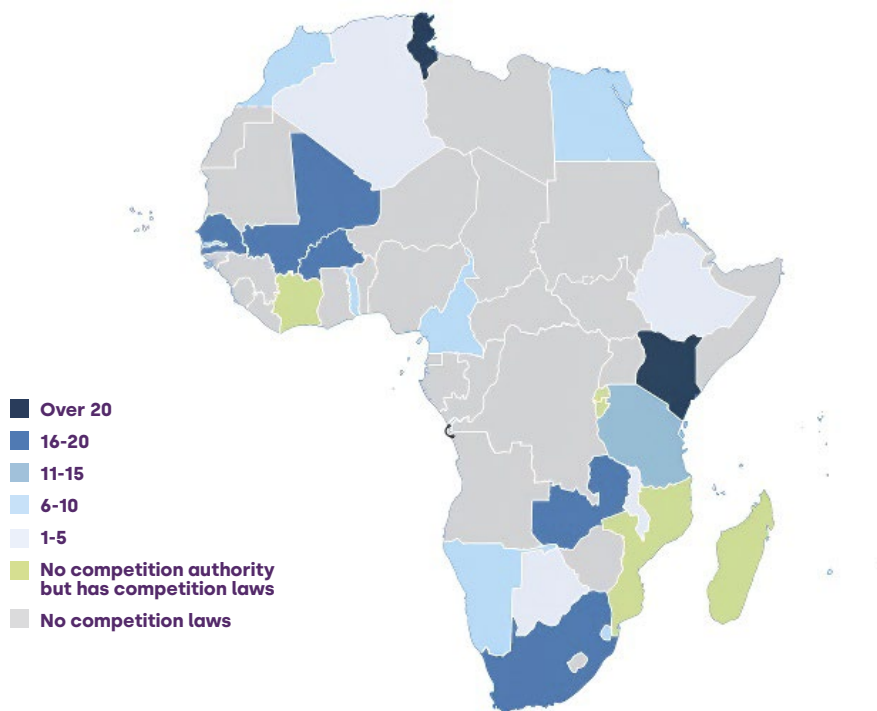
NOTES:
1. In Côte d'Ivoire, the authority is functional but its mandate is limited.
2. The number of years equals the difference between 2015 and the year when the authority started operations.
3. The COMESA competition commission has been operational since January 2014, and the WAEMU commission has been operational since 2003. CEMAC, EAC, and ECOWAS do not have functional competition authorities.
SOURCE: ACF-WBG 2015.

Notes: A substantial amount of research suggests that competitive forces may be weaker in low- and middle-income countries. Source: World Bank, 2016.

We see four avenues for further research that could inform competition policy in low-income countries. The first one involves developing methodological tools to measure mark-ups. This is important because it is difficult to infer much about market power solely from prices or market shares. One potential approach is to develop structural models to estimate mark-ups (as in De Loecker et al., 2016) or use detailed survey data (as in Atkin et al., 2015). Measuring mark-ups precisely typically requires matching specific input use with specific output transactions (see Cajal Grossi et al., 2019)

The second aims to understand the effect of low competition on the structure of value chains and consumer welfare. In which sectors is competition 'good' or 'bad'? In that agenda, perhaps the first item would be to more clearly define what low competition means. Is this the result of high entry costs or contractual frictions that lead to a low number of players in equilibrium? Or is a low level of competition the result of collusion?

The third is to more clearly document how market power at multiple stages of the value chain interact. For example, the evidence from Macchiavello and Miquel-Florensa (2019) in the coffee sector in Colombia indicates that the contract between a large and dominant foreign buyer and the exporter 'alleviates' market failures along the domestic chain. Similarly, Macchiavello and Blouin (2019) suggest that future contracts with foreign buyers relax exporters' credit constraints and allow them to pay higher prices to farmers. Understanding how market power and frictions interact across stages of chains is important. A large literature in industrial organisations on vertical contracting already exists but has not yet been applied to (agricultural) value chains in low- and middle-income countries.

The fourth centres on measuring the impact of various competition-increasing government interventions. The experimental evidence in Bergquist and Dinerstein (2020), while not necessarily representative of feasible policy interventions, suggests that promoting entry may not necessarily increase competition. By contrast, increasing entry in procurement markets where secret bids are submitted and so collusion cannot be sustained, should clearly reduce prices (Banerjee et al., 2019).

Another feasible intervention to increase the share of world prices going to farmers could be programmes like Fair Trade (see Dragunasu et al., 2014 for a review). However, more information needs to be uncovered on how to design such programmes. Dragusanu and Nunn (2017) estimate the impact of Fair Trade on coffee producers in Costa Rica. Despite positive benefits on prices and revenues, these gains are not evenly distributed, with farm owners and skilled workers benefiting the most at the expense of intermediaries and unskilled workers. Finally, trade openness might also be a form of competition policy; we discuss further its impact on distortions in **Section 3.1**.

External economies, spillovers, and industrial policy

We have thus far discussed the market failures working at the level of individual firms, such that one firm ends up using resources more efficiently on the margin than some other firms, leading to a reduction in aggregate output. A wider notion of externalities concerns cross-firm externalities, such as external economies of scale, agglomeration economies and wider technological or human capital spillovers, all of which provide a justification for government interventions.

Many governments in low- and middle-income countries adopt policies that promote specific economic sectors (for example, manufacturing within special economic zones) or particular economic activities (for example, export facilitation services). They do so to encourage structural change, a strategy referred to as industrial policy. More recently, using industrial policy as a second climate policy is well underway in high-income countries – see the US Inflation Reduction Act of 2022. Whether low- and middle-income countries will adopt a similar approach is an area of potentially high value research, as examples from India, China, and Ethiopia demonstrate an interest by governments in industrial policy for the support of clean sectors.

Before moving forward, it is important to note that industrial policy does not have to be focused on 'industrial' sectors. Government interventions in tourism, R&D, or IT services are just as much industrial policy as subsidies to the manufacturing sector (Rodrik, 2023). As such, productive development policies, a term put forward by the Inter-American Development Bank (2014), may be more relevant. Nonetheless, we still use the term industrial policy in this review, as it is more widely used in academia.

The theoretical rationale for industrial policy is clear. In the presence of positive externalities, firms' individually optimal choices will lead them to undertake the activity

The theoretical rationale for industrial policy is clear. In the presence of positive externalities, firms' individually optimal choices will lead them to undertake the activity that generates the externalities at levels below what would be optimal for society as a whole.

that generates the externalities at levels below what would be optimal for society as a whole.

There is a natural role for government intervention in such cases in order to induce firms to undertake more activities that generate positive externalities. These externalities can take various forms. Standard candidates for positive externalities are external economies of scale, a mechanism by which sectoral growth lowers an individual firm's long-run cost curve, or cluster and agglomeration effects (Rosenthal and Strange, 2005), whereby the proximity of firms allows for productivity gains. Labour market frictions that prevent workers from transitioning from low- to high-productivity sectors are also thought to play an important role in slowing down structural transformation in low-income countries. Agglomeration economies which are the most likely driver of urban density (see **IGC Evidence paper on Cities**) are another leading candidate. Industrial policy can also be a vehicle to reduce negative environmental externalities in tandem with growth. Industrial policies which create positive environmental spillovers or 'green' industrial policies, can serve as a second-best climate policy (Harrison, 2017).

Hausmann and Rodrik (2003) describe another market failure that industrial policy can address. Information that a given product can be produced profitably in a given place may spill over quickly to nearby firms, who can then start producing as well. Such competition from imitation makes the private returns from entrepreneurship in new and modern sectors lower than its social value. This may be particularly important in low- and middle-income countries, where the existing number of goods produced is small, and so the number of products to be 'tested' is large.

Despite the numerous theoretical descriptions of market failures in low- and middle-income countries, it is very difficult in practice to measure the size of these externalities. This is probably why, for so long, the consensus in leading policy institutions (the Washington Consensus) was that the best industrial policy was actually no intervention. The idea was that the intention behind industrial policy was to pick winners and that doing so appropriately was too challenging in low- and middle-income country contexts. Easterly et al. (2009) show that a country's distribution of exports follows a power law. Thus, the likelihood of subsidising an export hit is low. Moreover, Freund and Pierola (2012) show that a country's comparative advantage is typically driven by a handful of firms, so identifying high-potential firms in high-potential sectors is likely to be even more difficult. Another concern around the legitimacy of industrial policy came from political economy factors, which are pervasive in many low-income countries. In areas with little enforcement, subsidies can quickly become a means of transferring rents to powerful and well-connected firms. The failure of import substitution policies in Latin America also contributed to industrial policy's bad reputation.

Industrial policy has returned as a focus, in both climate and development economics. In development, the potential for export-driven growth is a main implication of the policy, while in climate economics, its ability to achieve climate targets through strengthening a country's comparative advantage in low-emissions production is of high interest. Hausman et al. (2007)'s finding that countries grow faster when they export products that are also exported by high-income countries has become particularly influential among policymakers. Similarly, the service sector's potential for growth strategies—particularly in Africa—has been the subject of recent studies (see Newfarmer

et al., 2019). Moreover, in spite of the debate on the risks of industrial policy, almost all governments conduct some form of such policies in practice. A calculated 25% of commercial policies from 2009-2020 are classifiable as industry policies (Juhasz et al., 2023). In doing so, policymakers critically need the support of research to provide a framework and guidelines on how to think about these issues. Thus, future research should focus more on how industrial policy should be done, rather than on whether it is well founded (see Rodrik 2023 for a complete review). The paragraphs below review the existing literature on industrial policy.

Country or sectoral case studies can generate important lessons for industrial policy. For low- and middle-income countries related lessons come from: Amsden (1989) and Lane (2022) in South Korea; Wade (1995) in Southeast Asia; Evans (1990) on the computer industry in Brazil, India, and Korea; and Luzio and Greenstein (1995) on microcomputers in Brazil. As the returns to such work are higher if it describes a successful event, these studies are usually supportive of a positive impact of industrial policy. However, this type of analysis can be difficult, as many factors affect growth, and it is difficult to convincingly isolate the effect of a particular industrial policy.

A number of cross-country or cross-sector analyses have found little evidence for the efficiency of industrial policies such as trade protection (Krueger and Tuncer, 1982; Clemens and Williamson, 2001; O'Rourke, 2000) or tax incentives (Lee, 1996). These exercises generally conclude that there is little correlation between industrial policy and growth. Beason and Weinstein (1996) propose a rationale for these mixed results in Japan. They find that targeted sectors are typically low-growth sectors with decreasing returns to scale. It is possible that because of political pressures, many governments around the world support sectors that are struggling economically, rather than designing and implementing a strategy to promote positive externalities (Grossman and Helpman, 1994; Goldberg and Maggi, 1999). Likewise, patterns of trade protection could be driven mostly by government revenue considerations rather than the infant industry hypothesis (Broda et al., 2008). Rodrik (2007) puts forward another explanation: If governments target sectors where market failures are the strongest, but they can only partially address them, it is not surprising that these sectors grow less.

For all these reasons, and because intervention across sectors cannot be randomised, implementing a clear identification strategy to measure the impact of industrial policy on development is challenging. This is perhaps why there were a flurry of studies on the issue in the 1990s or early 2000s, then a pause. A few exceptions stand out (see Lane, 2019a for a thorough review of recent developments in this literature). Juhasz (2018), a paper further discussed in **Section 3.1**, finds evidence for the infant industry hypothesis using a natural experiment, generated by the Napoleonic wars in the early 1800s, that blocked trade from Britain to certain ports in France. Regions in which the cost of importing cotton yarn from Britain rose were more likely to adopt mechanised cotton spinning and significantly increased production capacity. She provides suggestive evidence that this involuntarily acquired comparative advantage lasted for more than 60 years after the blockade ended. A number of other historical case studies exploit natural experiments to show evidence for the infant industry hypothesis (Harris et al., 2015; Hanlon, 2019) or the effectiveness of industrial promotion policies on human capital accumulation (Mitrunen, 2019).

Aghion et al. (2015), Martin et al. (2017), and Rotemberg (2017) measure the impact of recent industrial policies in China and India on firm sales, productivity, and employment by exploiting within-country variation in policy intensity. However, while assessing the effect of specific policies on targeted firms or sectors is interesting, these studies are usually unable to clearly document whether these interventions were targeting a specific well-grounded externality or whether they created significant distortions in other sectors of the economy.

Unlike tariff policy, the magnitude of government subsidies is particularly difficult to measure. Kaloupstidi (2018) develops a methodology to quantify government subsidies in the shipbuilding industry in China. She estimates that the intervention effectively reduced costs by 13-20%. In a follow-up study, Barwick et al. (2019) quantify the positive effects of the policy on investment and entry, which led to China's dominance in the industry. Yet, since the policy was not meant to address a specific market failure but rather to position the country in a strategic industry, the subsidies had a negative impact on welfare due to the sizable distortions they created.

Lane (2019b) quantifies the effect of the 'big push' policy in the 1970s in Korea. He documents important spillovers to non-targeted sectors through the input-output network, suggesting evidence for non-pecuniary externalities that justify the intervention. Liu (2019) argues that governments should prioritise addressing distortions in upstream markets. The intuition follows from the theory of second best: market failures channel through value chains, so upstream sectors are the source of the largest distortions. He finds evidence that China and South Korea indeed targeted upstream sectors in their industrial policies. New efforts have been made to track industrial policy through government accounting (Hanson and Rodrik, 2023). These methodological advances have helped researchers better classify exactly what is industrial policy, in order to measure the effects of the intervention.

Identifying the sectors that are the most likely to be the subject of positive externalities is probably the main challenge of industrial policy. Bartelme et al. (2019) develop a methodology to estimate the magnitude of economies of scale across sectors using easily available trade flow data. They find substantial scale elasticities in every manufacturing sector, and ones that do indeed differ in their extent across such sectors, as is necessary for within-manufacturing industrial policy (i.e., policy that affects some manufacturing sectors over others) to have any impact. However, their results suggest that the gains from optimal interventions targeting these externality sectors would be small; only 1% of GDP on average, even when implemented by a hypothetical government with omniscience, benevolence, a full set of policies to control terms-of-trade and internal distributional effects, and under no threat of foreign retaliation. This result arises because a country that intends to reap substantial gains from industrial policy needs to find not just a sector with large (relative) positive externalities but also one that can be expanded without running into diminishing world demand for its product. On the policy side, decision-makers probably need to take a pragmatic approach when it comes to industrial policy. The IADB (2014) proposes a three-step plan: 1) identify sectors subject to externalities; 2) design a policy that addresses the market failure specifically; and 3) make sure the state has the institutional capacity to implement the policy. The translation of that approach to a research agenda would be to study three questions: why (do industrial policy), what (to do), and how (to do it).

On the first two points, the IADB recommends a public-private collaboration to identify the most important constraints that firms face and the policies that can best address these issues (see Ghezzi, 2017 for an example of how this was implemented in Peru). Harrison and Rodriguez-Clare (2010) make a similar suggestion. They argue that 'soft' policies, involving strong collaboration between the government and private-sector organisations, are preferable to 'hard' interventions, which may end up being a bigger source of distortions than the ones they are trying to address. The optimal design of industrial policy with the constraints imposed by state capabilities is an area where evidence is critically lacking.

We push forward with another question: why has industrial policy for 'green' industries become a common talking point? Firstly, when defining green industrial policies, we identify two types. The first promotes industries which produce low-emissions technologies, and the second type promotes industries to reduce the energy or emissions intensity of production (Harrison, 2017). In Juhasz et al. (2023), evidence on the classification of industrial policies in high-income countries shows that 21% of industrial policies target clean electricity generation (relative to 11% in low- and middle-income countries). While the first best solution is subsidies to R&D to support innovation (Torani et al., 2016), there are substantial barriers in low- and middle-income countries using this approach, including inefficiencies and failures to monitor. Harrison (2017) suggests similarly that first-best climate policies – Pigouvian taxes – are the best approach to avoid unintended consequences resulting from industrial policy's indirect effects. With this recommendation, we would encourage research to better understand what economic conditions and policy design features are necessary to achieve win-wins in green industrial policy in low- and middle-income countries.

With this theory, we now review the empirics. Evidence indicates that public support in clean sectors is not only effective in promoting productivity but also mobilises private investment in the given sector (Deleidi et al., 2020). Green industries suffer from a market failure along with the failure to price the innovation spillover. Green firms have a mitigation externality, where these technologies curb emissions generation, and people worldwide benefit from less pollution (Popp, 2019). An example of effective green industrial policy includes the support of Denmark's nascent wind energy sector, which resulted in a comparative advantage and an indirect environmental benefit that outweighed the cost (Hansen et al., 2003). Emerging evidence on China's solar industry also demonstrates that industrial policies (production and demand subsidies) can induce innovation (Banares-Sanchez et al., 2023). China is now a leader in solar manufacturing, with a significant comparative advantage (Huang et al., 2016). However, industrial policy designs can have adverse effects. In India, local content requirements (LCR) policies were introduced, but learning by doing and reinvestment in R&D did not occur, and the policy actually reduced competition (Munch and Scheifele, 2023).

In summary, we believe that given the importance industrial policy has for policymakers in low- and middle-income countries, it should be the subject of much more research. Juhasz et al. (2023) use a text-based analysis approach to classify historical industrial policies and measure them across countries. They find that industrial policy since 2010 has been growing. Countries that engage in industrial policy practices use subsidies and export promotion measures, and a correlation exists between the industries on the

receiving end of the policy and the sector's comparative advantage. This begs the question, how are industrial policies designed in low- and middle-income countries? Which sectors are being promoted and through what interventions? Which externalities are thought to be more important for policymakers? Do the interventions designed actually match the underlying objectives of the state?

The most promising, and critically concerned, branches of industrial policy research in low- and middle-income countries are measuring the size of externalities, including environmental externalities. The existence and the magnitude of externalities form the basis of government intervention for industrial policy. In which sectors and for which firms are these externalities the largest? What is the exact nature of these externalities?

The interaction between industrial policy, state capacity, climate change, and political economy also deserves more attention. Industrial policy is usually complex and requires the interaction and coordination of various ministries and government agencies. A study that attempts to measure how public sector coordination affects the performance of industrial policy would provide valuable insight into this issue.

RESEARCH PRIORITIES

- Measuring the size of externalities. Where? For which firms and for which sectors are they the strongest?

- What policies are appropriate to address these externalities?

- How can industrial policy be designed to promote the development of infant 'clean' sectors in low- and middle-income countries?

- How should industry policy be designed in an environment with low state capacity and low coordination?

3. International trade

We now turn to the topic of international trade and research that can shed light on how policymakers in low- and middle-income countries can sculpt trade policy to foster growth and reduce poverty. Given the success of the East Asian economies with export-led development strategies and reductions in trade costs, these policies warrant particular attention for application to today's countries in transition. Whether international trade alone can provide the growth needed to 'climb the development ladder' remains an open question, particularly in emerging economies in Africa and South Asia (Stiglitz and Rodrick, 2024; Atkin et al., 2023).

> **Trade is not just a mechanism for growth, but today also serves as a second-best policy to achieve some labour, environment, and climate goals.**

Trade is not just a mechanism for growth, but today also serves as a second-best policy to achieve some labour, environment, and climate goals. New policies, such as the EU's carbon border adjustment mechanism (CBAM), timber sustainability requirements, and export bans on critical minerals are now fundamental policies in encouraging pro-environmental production and securing a role in global green value chains. We will review the evidence on the impact of trade on the environment, as well as the novel use of trade instruments for achieving climate goals.

We split our discussion into four parts. The first resonates with the above discussion of distortions in a closed economy but asks how we might expect those distortions to be affected—either positively or negatively—through the presence of or transition to trade openness. Put simply, exposure to trade may resolve or exacerbate distortions, or change the cost of domestic market failures. The second part discusses general international externalities, in which trade and other forms of openness act as a conduit for spillovers - for knowledge, technology, and positive environmental benefits. Our third topic does not relate to externalities per se but instead to services that states tend to provide (such as transportation infrastructure) that interact with trading. Opening to trade often requires that the state directly addresses distortions that reduce trade potential. Finally, the fourth component of our discussion concerns the way trade can redistribute income within the domestic economy – either mitigating or exacerbating existing inequality – and the political features that come with it. Even in a hypothetical economic environment with no market failures and no publicly provided services, there is still great policy interest in the pros and cons of trade openness due to its distributional consequences and the extent to which other policy instruments exist to facilitate redistribution.

I. Existing distortions affected by trade openness

The previous sections have discussed the existence of market failures and externalities in low- and middle-income countries and why they may be more widespread than in high-income countries. When it comes to openness

to trade, therefore, the question is simply whether trading will magnify or mitigate existing distortions in the economy. Donaldson and Atkin (2022) dive into the potential distortions, both positive and negative, resulting from trade. We review the existing evidence on this question in the next three subsections.

Production externalities

Section 2.3 considered in length the various production externalities that may be present in low- and middle-income countries which legitimise state intervention. Industrial policy can allocate factors of production optimally across sectors and firms, but a wide range of trade-induced reallocations may also affect that process. Some may do so in an indirect way, such as free-trade-induced sectoral specialisation or a series of events affecting a trade partner, while others are up to country leadership, such as trade policy.

The textbook example of externality-focused trade policy is well known (see Harrison and Rodriguez Clare, 2010). In an economy with two sectors, one with constant returns to scale and the other subject to production externalities, there can be multiple equilibria. The economy may end up in the equilibrium with full specialisation in the first sector, which is dominated by the equilibrium that involves specialisation in the externality sector. Protection of the second sector is the appropriate intervention. When the positive externalities are thought to involve dynamic features, this policy is often termed infant industry protection (see **Section 2.3** for a review of the empirical literature on this topic).

Here again, the main issue for policymakers is whether they have the ability to identify externality-generating sectors and the capacity to design the appropriate trade policy in response. While production externalities provide the rationale for state intervention, all actions may not be equally cost-effective or efficient. Harrison and Rodriguez-Clare (2010) discuss the Bastable test—an investigation of whether the discounted gains from the intervention are larger than the consumption loss from temporary protection. On this, Melitz (2005) argues that production subsidies are more efficient than trade protection in addressing Marshallian externalities, as they avoid the consumption cost of higher tariffs. However, implementing fiscal incentives may be more challenging in practice than setting tariff schedules (see **Section 3.3** for a discussion on the infrastructure of customs collection). Bartelme et al. (2019) compare the benefits of trade policy, industrial policy, and the optimal combination of the two in response to external economies of scale. The welfare benefits of one or the other alone are small, but the interaction of the two generates higher gains by allowing for full control of production externalities through industrial policy while simultaneously avoiding deleterious terms-of-trade effects via judicious unilateral trade policy. As discussed previously, these gains remain small relative to the size of the economy. The optimal structure of government intervention between industrial and trade policy to address production externalities, taking into account capacity constraints, is an area of research that deserves further attention.

In addition to the research agenda developed in the industrial policy section above, we see three promising avenues of research for trade-related production externalities. The first relates to the textbook model presented above and the presumption that the economy may end up in the 'wrong'

equilibrium. It may be that in a number of sectors, trade openness actually fosters externalities—by, for example, creating larger production clusters. Trade can support the development of additional firms (horizontal linkages) or more advanced skills (vertical linkages), which we discuss further in **Section 3.2**. Second, quantifying the spillover effect from tradable to non-tradable sectors, such as services, is necessary to put together the full picture of the structural transformation induced by trade policy. Finally, developing structural models in a low- and middle-income country setting— i.e. with limited sectoral data—to predict whether trade openness will lead to specialisation in high- or low-externality sectors would allow policymakers to add to their tools for decision-making.

Firm-level size-dependent distortions

A large literature has documented that in low- and middle-income countries, small firms tend to neither grow nor get driven out of business and that these constitute the bulk of private-sector firms (see Hsieh and Klenow, 2014). This is suggestive of size-dependent distortions that favour small and unproductive firms. For example, large firms may face excessive tax and regulatory burdens that prevent them from expanding and driving out small firms. Alternatively, credit and labour market constraints or corruption might particularly affect small firms; in this case, we have too few small firms. Finally, distortions may affect certain types of firms rather than sizes. For example, state-owned enterprises may have favourable access to capital.

Trade has the potential to alleviate or magnify these distortions, depending on whether more distorted firms benefit or lose out from trade reforms. An obvious starting point is that trade leads to the expansion of larger firms relative to smaller ones in a broad class of trade models (Mrázová and Neary, 2018), as only the most productive firms benefit from access to foreign markets. We first turn to the empirical evidence for which types of firms benefit.

With trade openness, domestic economies become more attractive to foreign direct investment (FDI) and often friendly to the establishment of foreign multinational enterprises (MNEs). Are MNEs good for local growth? Manelici et al. (2024) find that an increase in foreign MNE employment leads to local economic growth in Mexico, increasing aggregate welfare. Large firms, particularly when they have high-value marginal products of inputs, benefit substantially from trade openness, as it combats local distortions, which lead to factor misallocation across firms (Atkin and Donaldson, 2022). Domestically, large firms benefit, both from the presence of MNEs (discussed further in **Section 3.2**) and trade openness.

A large portion of firms in low- and middle-income countries are informal. How are these firms impacted by trade openness? Nataraj (2011) uses firm-level surveys representative of the Indian manufacturing sector. She finds that in response to trade liberalisation, a large number of informal firms exit the market, and the firms that survive increase their productivity. McCaig and Pavcnik (2018) show that the 2011 US-Vietnam Bilateral Trade Agreement led to a reallocation of labour from informal to formal firms. Lower tariffs in the US provided new market opportunities for large firms, which pulled labour from informal firms. This process enhanced efficiency, as large formal firms are substantially more productive (in value terms) in this context.

Informality has several different margins. Firms can remain informal to evade taxes or because they face regulations or entry costs which they are unable to overcome. For example, firms respond to trade policies in the short run by evading taxes on imports, staying informal, as opposed to upgrading (Demir and Javorcik, 2020). The informal sector may also be a pressure valve for unemployment in low- and middle-income countries. To benefit from trade opportunities, firms typically need to be formal, so these factors could have consequences on how trade affects informal firms. If they 'choose' to be informal, trade liberalisation could pressure them to formalise; if the costs of formalisation are too high for them, they will likely not be able to do so.

Family-run firms—which are also prevalent in low-income countries— tend to rely on siblings for senior management. The rationale for doing so may be a lack of trust in delegating management decisions to individuals outside the family circle (Bloom and Van Reenen, 2007). This could have important consequences for capturing the gains from trade liberalisation. If there are only a limited number of siblings available to fill management positions, firm growth could be blocked.

More research is needed to better understand the link between trade liberalisation and its impact on the distortions that affect the left side of the firm distribution. We return to this issue in **Section 3.4**.

Business groups—a set of horizontally or vertically integrated firms—are also ubiquitous in low- and middle-income countries. Khanna and Yafeh (2007) argue that these conglomerates may act as a solution to capital market failures in that they provide opportunities for within-network finance systems. However, evidence on how these groups of firms respond to trade shocks is still an open area for future research.

Many key sectors in low-income countries, particularly energy and minerals, are controlled by state-owned enterprises (SOEs) or politically connected firms. Despite their large size, these firms can be particularly inefficient and potentially only benefit from preferential access to credit or markets to sustain their dominant positions (Mobarak et al., 2006). As such, it is not easy to predict whether trade openness reduces or increases these connection-based misallocations. By providing better access to a wide range of new markets to efficient but constrained firms, trade liberalisation can reduce the market share of politically connected firms. However, access to specific inputs or capital may constrain non-connected firms from expanding; by contrast, connected firms may be the only firms capable of benefiting from trade. Khandelwal et al. (2013) provide evidence for the first mechanism in the Chinese textile industry. A reform in 2005 removed a quota system whereby firms were given a licence to export a specific fabric or garment to a specific destination. Following the liberalisation event, they document a significant market share reallocation from unproductive SOEs to more productive private firms.

Two studies provide evidence for the second view. Brandt et al. (2017) document that the pro-competitive effects following China's entry into the WTO did not significantly affect SOEs. Similarly, Baccini et al. (2019) find that though there were significant reallocation effects from Vietnam's entry into the WTO, they were fairly small for SOEs. Both studies argue that preferential access to capital may be the main reason that SOEs tend not to be highly impacted by trade liberalisation.

More research is needed on this topic—particularly on the mechanisms through which connected firms obtain dominant positions in specific markets and how these can be removed smoothly to increase efficiency. If these mechanisms are not removed properly, it can result in even greater problems: Naidu et al. (2017) show that private-sector elites supported a military coup in Haiti to put an end to the previous government, which was considering removing the licensing scheme for imports that provided them rents.

Trade can produce efficiency gains by causing inefficient firms to exit the market and allowing productive firms to grow. However, there is limited evidence on the effect of trade on market power, mark-ups, and consumer prices. Edmond et al. (2015) show evidence that trade lowers mark-ups and mark-up dispersion in Taiwan. By contrast, De Loecker et al. (2016) document higher mark-ups in response to India's trade liberalisation. Tariff duty drops led to cheaper inputs, but these did not entirely pass through to consumers. In other words, the price reductions were small relative to the decrease in marginal costs.

Trade may also reinforce or worsen market power. An absence of a competitive domestic environment may cause trade liberalisation to reinforce the accumulation of rents and provide little or no productivity gains. In recent work, Edmonds, Midrigan, and Xu (2023) find that trade openness does reduce misallocation, but there is also a significant reduction in the entry of firms into the market, relative to autarky where more firms enter because expected profits are higher. Chatterjee (2023) shows farmers, when restricted to trading with intermediaries within their state in India, receive much lower prices than if they were able to engage in intra-state trade, thus trade reduces local market power Trade in some cases can worsen market power given the benefits to larger and more productive firms that trade openness can cause. Contrarily, opening up to trade can also reduce market power, as more buyers exert pressure on sellers to improve their products or offer lower prices.

What is the result of this market power? De Roux et al. (2022) find that exporting coffee producers get a significant premium in Colombia, but the gains from this export premium are not passed onto domestic producers. Therefore, distortions in the export market may allow larger firms to benefit due to certain factor advantages (see Boudreau et al., 2023 for a more complete discussion on the relationship between trade and market power in developing firm supply chains). Overall, larger firms can mitigate domestic distortions through trade channels and increase their control as free entry into the market becomes more difficult.

In summary, some progress has been made in understanding which types of firms are most affected by trade liberalisation. However, there is still much to learn about which types of firms face the largest distortions and hence, whether trade reforms raise or reduce efficiency.

Distortions in factor markets

Distortions in factor markets and the potential for misallocation were introduced and discussed in **Sections 2.2** and **2.3**. Of course, these factor-market distortions are partially responsible for the firm-specific frictions presented above that may lead trade to raise or lower efficiency. This section focuses on how trade may magnify or shrink these factor-market frictions.

Firstly, we discuss the newly understood drivers of distortions of trade, both political capture and climate change. Next, we review how distortions in essential markets - capital and labour - occur.

Distortionary wedges can derive from various sources, making it important to understand how trade will then mitigate or augment existing distortions. Javervall and Khoban (2023) find that existing political distortions in factor markets can be mitigated by trade liberalisation, as demonstrated in the case of India. Certain firms in India had an explicit connection to political parties or actors, seen through an increase in their capital, labour, and other input use. However, when Indian policy reduced trade tariffs, the price of inputs decreased and the value of political connections decreased. Boehm and Oberfield (2021) then find that there is a hold-up issue, particularly acute between buyers and sellers of specific inputs for production. This issue can be mitigated through improved contract enforcement, which only came to surface as trade liberalisation made many sellers eager to match with Indian producers. Distortions in factor markets due to political capture can be mitigated through trade openness, as seen in this example.

Growing evidence has also shown that climate policy and climate events are now shocks to trade which can often be anticipated. Domestic trade policy on import requirements for input use, carbon intensity or environmental safeguards are likely to grow, causing new market frictions as countries open. As seen in Hsiao (2022), the palm oil market has been severely disrupted as suppliers seek to change their internal practices to align with EU regulations on forest use practices. Other trade policies are likely to interrupt and cause additional frictions.

1. Capital

International trade typically involves long distances and slow passage at borders and ports, increasing the need for trade credit and working capital. Moreover, a number of studies have estimated high fixed costs for firms entering foreign markets (Das et al., 2007; Lincoln and Maccallum, 2018; Piveteau, 2019), which requires further capital. Learning about market conditions elsewhere, finding buyers abroad, building distribution channels in foreign countries, and buying equipment for the shipment of goods are normally essential investments for firms considering export.

Thus, credit constraints can prevent firms from reaching their export potential. Paravisini et al. (2015) study how the 2008 financial crisis, which differentially impacted banks in Peru, impacted trade. With data on firm-bank matches, they document that exporters who were clients of local banks that were more exposed to the US financial crisis reduced their export volumes. This reduced both the volume of exports but also the selection of firms that ended up trading (see Foley and Manova, 2015 for a review). Bau and Matray (2023) find that foreign capital liberalisation can both reduce capital misallocation and have a significant positive impact on aggregate productivity in Indian firms. Particularly, they find that areas with less access to local banking services benefit more, increasing revenues on average by 23%.

Despite this evidence on the importance of access to finance in international markets, there is little empirical evidence on how facilitating trade credit or state-subsidised trade-specific loans can ameliorate these constraints. As most export and import transactions in low- and middle-income countries

are typically invoiced in US dollars, the role of access to foreign currencies for trade credit should also be studied. Stiglitz and Rodrick (2024) suggest maintaining a balance between aggregate demand and supply to keep exchange rates competitive and avoid overreliance on foreign capital.

Finally, an emerging area of interest in capital markets is the relationship between a firm's environmental performance and credit access. Andersen (2017) finds a macro-level relationship between declining ambient air pollution and the creation of credit bureaus across countries. This is due to the need for firms to hold tangible assets as demonstrable collateral, leading to an overinvestment in pollution-generating assets. This mechanism indicates it is possible that stricter requirements for credit access will lead to firms holding onto or investing in potentially emissions-intensive capital. Alternatively, we can imagine with access to capital markets, the decision to invest in more or less emissions technologies will then be parameterised differently. We think this area deserves further attention.

2. Labour

Trade may also affect labour market distortions. Export opportunities may increase requirements for high-skilled workers or workers with particular skills. For example, Mion and Opromolla (2014) document Portugal's need for experienced marketing employees in order to make inroads into foreign markets. In India, Amirapu and Gechter (2020) find that labour regulations applying to firms with more than 10 employees create a marginal distortion of 35% for manufacturing firms. If there are distortions that limit the supply of such workers, trade may exacerbate the impact of these distortions.

Labour mobility distortions can also limit the optimal reallocation of labour across sectors that follow trade liberalisation and hence reduce the gains from trade openness relative to a frictionless benchmark (Dix-Carneiro, 2014). We return to these issues in **Section 3.4** where we discuss adjustment mechanisms to trade shocks, including skill intensity increases (Feiler et al., 2018). However, beyond simple adjustment costs, the process of adjustment may generate or exacerbate market failures.

Technology upgrading can reduce the demand for labour in manufacturing, which in turn limits the comparative advantage low- and middle-income countries have in labour to create export-driven growth pathways. This dynamic has driven labour into less productive sectors, most notably the informal sector, in a direction oppositional to positive structural change (McMillan, Rodrik, and Verduzco-Gallo, 2014). The flow of labour to less productive positions, alongside shifting agriculture productivity away from low- and middle-income countries, can cause the gap between high and low productivity firms and sectors to widen. With this trend, rethinking the pathway to step up into more productive work in these economies will be needed.

One example could involve the size of the informal sector to the extent that the presence of such a sector is the source of distortions (for example, through tax and regulation evasion). As discussed above, there is some evidence that import competition shocks can potentially exacerbate informality. For example, Dix-Carneiro and Kovak (2019) study the labour market response to trade liberalisation in Brazil. They document a strong shift toward informal employment or employment in low-paying service

industries in the regions facing the largest tariff declines. Most workers do not respond to these negative shocks by migrating to regions offering better employment opportunities; they simply shift to the informal sector. These results suggest that the informal sector absorbs a large share of trade-displaced workers who are unable to move to benefit from employment opportunities that arise from trade liberalisation elsewhere. Adao et al. (2022) finds that increased trade liberalisation in Ecuador disproportionately benefits those in the middle of the income distribution whose production is most likely to be exported, and the highest income groups, primarily through the fact that their high skill levels are complementary to imported intermediate inputs.

To take another example, if labour market search is inefficient due to congestion externalities, then the labour market adjustments required by any change in the demand or production structure of an economy—such as a change in outside trade conditions—will necessitate more search, and hence a broader incidence of congestion externalities. There is also the possibility that firm-specific training will be especially underprovided (even relative to a benchmark in which it is underprovided due to the hold-up problem) in an environment with a higher risk of external shocks.

More research is needed to understand the complementarities between labour market policies and trade reforms. Just as for capital, specific policies can worsen barriers to labour mobility. Conversely, labour market reforms may be needed in parallel to trade liberalisation, particularly in newer, green sectors, which may require a select and advanced set of skills. Increasing spatial and sectoral mobility may require more complex policies than simply subsidising worker movement.

RESEARCH PRIORITIES

- Does the reallocation that results from opening to trade promote positive production externalities?

- What is the overall environmental externality from trade liberalisation? What policies reduce or augment emissions through trade?

- What is the optimal structure of government intervention between industrial policy and trade policy to address production externalities?

- Does opening to trade reduce distortions in domestic markets?

- What are the impacts of trade policy on informality?

- How can a trade policy impact innovation by domestic firms?

- How are embedded firms affected by changes in trade policy?

II. International connections as a vector for spillovers

Many low- and middle-income countries create strategies to promote exports and attract foreign direct investment (FDI), in hopes that these policies will have a significant impact on their economic development. The potential long-run benefits of these policies are that they generate externalities for exporting firms, or for domestic firms in proximity with foreign firms. This is particularly important for the transfer of green technologies and practices that will help firms improve their energy or input efficiency of production. Recent cross-country analysis by Shapiro (2023) shows that countries with above-median institutional strength and existing environmental regulation specialise in clean production. If developing firms want to leverage opportunities for entering supply chains via cleaner production, there is potential for exporting to buyers with increased supply chain scrutiny to build out these capabilities in low- and middle-income countries. We discuss below some existing evidence on spillovers from exporting and FDI and consider potential policies that can promote them.

Spillovers from exporting

Does exporting increase productivity at the firm-level? Clerides et al. (1998), using firm-level data from Mexico, Colombia, and Morocco, do not find evidence that serving foreign markets reduces costs. Similarly, Luong (2013) finds that productivity estimates for automobile manufacturers in China do not increase when businesses start exporting.

By contrast, a number of other studies have found positive effects of exporting on productivity in low- and middle-income countries, including Blalock and Gertler (2004), Van Biesebroeck (2005), and Park, Yang, Shi, and Jiang (2010). The main challenge in identifying the impact of exporting on efficiency is how to adequately estimate productivity. This variable is unobserved, and researchers typically resort to structural estimation techniques to measure productivity at the firm level, each method being subject to different potential biases. De Loecker (2007; 2013) develops a methodology that addresses the fact that standard structural approaches assume that productivity evolves exogenously. By contrast, De Loecker's proposed methodology allows the productivity process to be endogenous to exporting. Using data from Slovenia, he finds evidence of learning by exporting, primarily when firms export to wealthier countries. This result suggests that many of the previous null results may have occurred because learning by exporting is only present when poorer, less capable countries export to richer, more capable ones.

Another constraint faced by researchers when estimating productivity at the firm level is that it may not be possible to observe the output quantity of each of the goods produced. Thus, productivity measures are generally revenue-based, and since more efficient firms tend to charge lower prices, this leads to a bias in productivity measures. Garcia-Marin and Voigtlander (2019) developed a method to separate technical efficiency from markups and found that marginal costs decline by about 20% for new exporters in Chile, Colombia, and Mexico. Atkin et al. (2019) argue that traditional revenue-based measures may perform better in environments where more productive firms manufacture more complex products.

Atkin et al. (2017) provide the most direct evidence on learning by exporting. They randomly provide opportunities to export to Egyptian rug manufacturers. By focusing on a narrow industry, they are able to measure productivity more convincingly. Several years after the initial opportunity, treated firms have higher quality-adjusted productivity. Making rugs with identical specifications and materials on the exact same equipment, treated firms produce higher quality rugs but do not take any longer to manufacture them. The authors document productivity improvements that come, at least in part, from knowledge flows between foreign buyers, local intermediaries, and producers. While there is growing evidence that there is learning from exporting, there is currently limited evidence on whether this learning is external to the firm—that is, not the result of a firm's investment in its own productive capacity or of payments or price reductions made in exchange for the training offered by a buyer. This is in line with earlier work which finds that self-selection of efficient firms into the export market primarily drives the difference in exporting firms' productivity (Clerides et al., 1998).

A final consideration is the spillovers from exporting on innovation decisions related to improved energy and emissions efficiency. Innovation across firms will be necessary to increase productivity while minimising environmental degradation. Buyer pressure and demand shocks may determine firms' innovation behaviour, as recorded by Aghion et al. (2022) in French firms. Similarly, in a high-income country setting, Dugoua and Dumas (2021) find that innovation bottlenecks occur in firms that are key suppliers, and this case study could be applicable for low- and middle-income countries that provide primary inputs to global supply chains. Firms which are nested within the global value chain are likely to need to reduce the emissions intensity of production, but innovation in process improvements will likely not occur without enforceable buyer standards or subsidies to exposed industries (Grubb et al., 2022). Firms which are within global value chains are more likely to be covered under product standards or supply chain standards, which may encourage the adoption of low-emissions practices and technologies. The relative strength of supply-side pushes on innovation in green technology is currently under-researched, as these studies have focused primarily on high-income country setting.

Export promotion policies predicated on spillovers require that these be external. If they are, we need to know what the magnitude of this externality is across sectors or destinations to appropriately target export promotion programmes given limited government capacity. Thus, policymakers need to better understand where to spend the marginal dollar for export support, whether it be with the aim of correcting externalities related to emissions or energy use, labour standards, or factor productivity. As randomly dropping foreign demand across a wide range of sectors cannot be easily replicated, progress in this literature will likely have to come from the development of more theory-driven empirical approaches to improve upon the measurement of productivity spillovers from exporting.

Moreover, the mechanisms through which those productivity benefits appear when exporting are only explored in Atkin et al. (2017). Research is lacking on the quantitative importance of productivity improvements from increased production volume versus learning from foreign buyers' feedback. If the first one is more important, this suggests that sector targeting—where the potential for learning by doing is larger—may be more efficient. If, on the other hand, the effect takes the form of quality upgrading to meet the

standards imposed by foreign markets, it may be more efficient to promote exports to specific destinations.

Another interesting avenue for future research could be to follow the efficiency benefits of exporting along value chains. Low-emissions technology and products will also be taken up through the global value chain. There is an opportunity for exporters to adopt new processes. For example, Macchiavello and Miquel-Floresna (2019) find that sustainability certification in coffee production in Colombia leads to significant quality upgrading along the value chain, increasing surplus by 30% with farmers receiving gains from this surplus. Beyond this example, more research is needed on the impact of value chain transparency and openness and not only production efficiency, but emissions efficiency. Because exporters often source inputs from other firms in the local economy, these firms could also exert a positive externality for their suppliers. This research agenda will make progress with the collection of administrative data on value chains, particularly VAT data, and input and emissions data at the firm level. Potential interventions are becoming increasingly common, from multi-buyer initiatives, labour unions, or other non-profits setting particular standards along the supply chain that are then adopted by domestic firms or applied to local labourers (Boudreau et al., 2023). This combination of new data and buyer-driven interventions can be assessed to better understand what spillovers may occur from trade with these buyers.

Spillovers from FDI

Many low- and middle-income countries dedicate substantial resources to attracting FDI. These resources can take the form of newly built infrastructure, investment facilitation services, and tax incentives, all considered important for increasing FDI flows. To justify these expenses, the economic benefits from FDI attraction have to outweigh the costs. The focus of policymakers is often on job creation and export growth; with multinational enterprises (MNEs) being good candidates for reaching these objectives by size and nature, spillovers from high-productivity foreign firms are also often cited as an argument for capturing higher FDI flows.

A number of early studies have looked at whether sectors that attract more FDI are more productive or become more efficient over time (Blomström and Persson, 1983; Haddad and Harrison, 1993; Aitken and Harrison, 1999) and found mixed results (see Demena and Van Bergeijk, 2017 for a meta-analysis). The exact location of establishments has also been used to show that firms located closer to FDI firms are more productive (see, Khalifah and Adam, 2009). However, the identification strategy in most studies leaves open the possibility that a surge in FDI flows could be the result of changing (local) comparative advantage or competitive pressures that push domestic firms to become more productive. Compelling new evidence from Abebe et al. (2022) builds on earlier work (cited above) and shows that technology upgrading occurs as a result of both knowledge spillovers and competition, with FDI increasing local plant productivity in Ethiopia by 11%.

The mechanism responsible for these spillovers from FDI is increasingly of interest to researchers with the availability of new firm-level, transaction-level and VAT data. Javorcik (2004), uses an input-output matrix for Lithuania to document productivity gains in sectors that supply FDI firms, which she calls 'backward spillovers.' She finds no evidence for spillovers in sectors

downstream to foreign firms or in the same sectors in which FDI companies operate. In contrast, Kee (2015) finds evidence for backward linkages from FDI in the garment sector in Bangladesh. Foreign firms exert a potential externality on domestic firms when they share an intermediate input supplier. Most recent evidence by Alfaro-Urena et al. (2022) finds FDI flows in the form of MNE buyers lead to a positive increase in hiring more workers, increasing total factor productivity, and in the long run, growing sales to other buyers. By using actual linkages between firms who are sellers and their buyers, this work overcomes the noise present in previous studies which rely on sector-level proxies for exposure to FDI. This work demonstrates that positive spillovers are of a significant magnitude and are realised over time through the ability of MNEs to transfer knowledge to domestic firms, ensure reliable payments, and scale their relationship.

As FDI firms typically require higher quality inputs from their suppliers, other downstream domestic firms indirectly benefit from quality upgrading and productivity gains from common suppliers. Evidence in Ethiopia from Crescenzi and Limodio (2021) finds that Chinese FDI reduces sales of competing domestic firms but expands both upstream and downstream factors, with gains only noticeable after a number of years. Atkin et al. (2017), discussed above, also provide a rationale for why productivity spillovers may come from backward linkages. By selling inputs to foreign MNEs, domestic firms can potentially learn and implement more efficient production processes from the feedback they receive in this supplier-buyer relationship.

Yet, there is limited evidence on the other channels through which productivity spillovers from MNEs may arise. These include horizontal spillovers, where ideas spillover to local competitors, or vertical upgrading, where firms enhance processes, products or technologies to transition to higher value add production or other externalities that arise from technology or ideas radiating from foreign firms to domestic companies. Another overlooked mechanism could be worker training inside FDI firms. Many foreign companies employ domestic labour, as they are more productive, better equipped in terms of technology or management practices, and the workforce may learn more on the job than in local firms. Javorcik et al. (2018) find that firms produce more complex products, indicating FDI can drive local innovation. The mechanism for this is likely knowledge or idea transmissions, as well as potential technological spillovers. Surveys in the study by Alfaro-Urena et al. (2022) reveal that improvements in productivity are a result of communication - knowledge spillovers - with MNEs on performance expectations and advice for how to improve delivery.

If the magnitude of the externality from FDI could be important, spillovers may not materialise in a vacuum. Productivity gains from backward linkages will not emerge if foreign firms face significant barriers to sourcing their inputs locally. Similarly, if MNEs have no incentive to hire and train local labour, they may resort to asking senior expats to run operations, which will limit the potential for knowledge transfers. This is particularly poignant in the mining sector, where local content requirements have been introduced as a potential requirement to reduce the outsourcing of labour. Many low- and middle-income countries are attempting to leverage their mineral assets as demand for electrification technology grows, making the structure of these supply chains important for long-term, sustainable growth. A number of interesting policies have been proposed, including Zimbabwe and Indonesia effectively banning the export of raw minerals while the Democratic

Republic of Congo and Zambia have created a special economic zone (SEZ) for the production of EV batteries along the border where both lithium and copper are mined. Quantifying the channels through which externalities may arise is a necessary first step in guiding policy and implementing efficient mechanisms to promote spillovers.

Steenbergen and Sutton (2017) argue that soft policies to promote linkages are more appropriate than rules imposing that some share of inputs be sourced locally. The latter option tends to increase the cost of an investment if local firms are not able to supply the right inputs and so may deter FDI flows. Instead, they recommend that a small team of capable bureaucrats and experienced managers from the private sector work together to form a local content unit. This agency would aim to reduce matching frictions between local and foreign firms and support domestic firms in upgrading their product standards to meet the requirements that MNEs impose.

As discussed above in Alfaro-Urena et al. (2022), the effect of a government programme linking domestic firms to MNEs in Costa Rica relied on VAT data providing supplier-buyer matches. Using an event study design, they find domestic firms that win contracts with foreign MNEs experience a 4% increase in productivity four years after matching with a foreign company, as well as higher sales from a larger number of buyers than just the newly acquired foreign buyer. These results suggest significant potential for policies to link firms to global value chains, depending on the sector. For example, only manufacturing and services experienced an increase in productivity, and not the agriculture sector.

More research is needed on the impact of such programmes. Even if they lead to significant productivity improvements, these economic benefits from backward linkages may not justify the cost of the policies. The above research findings pertain exclusively to MNEs and a sample of large firms. Whether developing firms can learn from buyers and suppliers who are not MNEs remains understudied (Verhoogen, 2023) due to the fact that most large firms in low- and middle-income countries are MNEs (Van Reenen et al., 2023). Looking at the case of Belgium, Van Reenen et al. (2023) find that superstar firms—defined as large firms or heavy exporting firms—have a similar positive spillover to MNEs. The takeaway is that more productive firms are likely able to transfer the knowledge benefits for productivity improvements unconditional on their status as a foreign player. Moreover, there is no evidence as to whether and how governments should facilitate the transfer of knowledge to domestic firms and wider participants. While we know the government could support or facilitate domestic firms building a relationship with large exporting firms, both the costs and mechanisms of these programmes would need further investigation.

Finally, many low- and middle-income countries make use of special economic zones to attract foreign investment. Such an institutional setting allows governments to more closely monitor the activities of FDI firms, and as such, management committees of zones may be well placed to facilitate linkages between MNEs and the domestic economy.

A final consideration needs to be made on the potential environmental spillovers of FDI. To begin on the downside, there is a long literature focusing on the pollution haven hypothesis (PHH), or the idea that firms reallocate their investments out of an area when strict environmental policies are introduced. Hanna (2010) finds that the US increased outbound FDI in

response to increasing stringency of air pollution regulations. Similarly, Levinson and Taylor (2008) find evidence of the PHH in the waste recycling industry in Mexico, exported from the US, under shifting regulations. Tanaka et al. (2022) build off of this case and find that the introduction of domestic air quality policy in the US did lead to an increase in one particularly polluting industry - battery recycling - in Mexico, negatively impacting childhood health outcomes. Azhur and Elliot (2007) suggest that pollution havens are, by consequence, transient as the policy environment evolves. Therefore, evidence of the PHH may hold in certain industries for certain periods of time and should be further investigated to understand the magnitude of the impact on low- and middle-income countries in the future. One reason for varying degrees of evidence of PHH is that studies must deploy different proxies for environmental regulation stringency. Cole et al. (2017) review the studies and find measurements are taken from either the domestic cost of pollution abatement, the number of environmental regulations within a country, or pollution-intensity metrics such as emissions per unit of output or energy per unit of output.

In terms of positive environmental spillover effects from FDI, new evidence has shown MNEs can be drivers or improved local environmental performance or labour conditions by firms in low- and middle-income countries, as demonstrated by Alfaro-Urena et al. (2023) and Robertson et al. (2020), respectively. The active investment of FDI at the firm level seems to demonstrate an ability for firms that hold internal environmental, social, and governance (ESG) requirements to then implement them locally through FDI. At the aggregate level, trade liberalisation still seems to result in increasing emissions, and particularly environmental degradation, when not coupled with climate policy. Driven by leakage, MNEs in host countries are, on average, dirtier in terms of production. A 20% increase in trade liberalisation leads to about a 3.8% increase in global emissions (Garcia-Lembergman et al., 2024), given new results from a quantitative model of trade which looks at the emissions generated by the use of fossil fuels in the production of final goods. With this limited evidence, there is an opportunity to further examine the channels through which positive environmental spillovers may occur through FDI. For example, in the review by Cole et al. (2017), they conjecture that FDI firms are typically larger and subsequently have a greater need to maintain a good reputation, have more resources to train staff and adopt new technologies, and may create supply chain linkages which encourage positive environmental spillovers to local firms. We identify this as a promising area of research which can inform our understanding of the role of value chains in improving firm productivity and environmental standards.

When we zoom out to consider the implications of trade policy at both the local and global levels, we consider how emissions-intensive firms locate themselves across countries. We already reviewed the pollution haven hypothesis in earlier sections, and we now turn to efforts to estimate the global distribution of environmental externalities as a result of trade. Shapiro (2021) investigates global trade policies, finding that current trade policies exhibit a pattern of higher tariffs on clean goods, seen globally. There is evidence reviewed above that global emissions are driven by open trade policies which foster the movement of polluting industries to countries with less strict regulations. However, a number of models now consider how trade policy could be used to shift the tide in the other direction. Hemous (2016) estimates a two-country model and finds that unilateral environmental policies are not sufficient to reduce increased emissions from trade and

can only be done when combined with a trade tax on high-emissions goods. Additionally, Farrokhi and Lashkaripour (2021) find that trade policy, even with the involvement of EU and US, will likely only account for about 1% of potential emissions reductions under global cooperation. Hsiao (2023) estimates that trade bans on highly polluting products alongside a domestic carbon tax can lead to significant reductions in carbon emissions. These models are examples of an emerging literature using structural models to evaluate optimal trade policies in the context of climate objectives. This type of modelling has the potential to help policymakers understand the interaction of trade and climate policies, as well as potential environmental externalities under different trade regimes.

RESEARCH PRIORITIES

- Does exporting promote external learning or quality upgrading? In which sectors are these effects the strongest?

- What are the channels through which spillovers from FDI arise?

- How can we understand the reallocation of FDI under different climate policy regimes?

- What is the impact of FDI on local firms in terms of productivity, wages, and competition?

- What is the impact of policies linking domestic firms to foreign firms, and what policies are effective and cost-efficient in promoting spillovers (productivity, positive environmental)?

III. State-provided services that aim to promote trade

Trading infrastructure

Our discussion of international trade has thus far focused on settings in which exporting and importing can potentially impact, either positively or negatively, domestic and international externalities. Such phenomena would provide a natural motive for intervention in traditional trade (or even domestic) policies such as taxes and subsidies. However, there are many other government policies and public goods that impact trade flows, which one could broadly term a country's 'trading infrastructure.' A natural example would be the deep-sea ports used by large container ships to offload goods. Another equally important example is the communication infrastructure, such as the internet, that allows firms to market their products and wholesalers to find new suppliers. When this sort of 'infrastructure' is provided by a state, the natural question is whether the state is providing the right amount of it, which requires an estimate of its marginal returns. That brings in the need for rigorous evaluations; we discuss some of these next, but a great deal more remains to be learned about the returns to state-provided trading infrastructure. This is also a setting in which modern tools from the study of public finance, such as

the 'marginal value of public funds' calculations from Hendren (2016), would be powerful for comparing and ranking various policies.

Numerous public services are involved in getting goods physically to and from international markets. Roads, railways, and ports are all used to transport goods within countries to or from the border. Virtually all are settings in which the user is not covering the marginal cost of building the infrastructure. Evaluating these physical infrastructure investments—considering how large a share of the public purse they can comprise—lags way behind the need for such inputs into the policy process. As discussed above, some evidence (Atkin and Donaldson, 2016) suggests that the cost of transporting the same goods over similar distances is many times more expensive in areas of sub-Saharan Africa than in high-income countries like the US. Therefore, it seems plausible that internal transport costs can be lowered in many low-income countries; but the question of whether they should be—and whether this is possible in a cost-efficient way—remains largely unsettled.

Figure 4: Percentage of firms identifying transportation as a major constraint

Percent of firms identifying transportations as a major constraint

- 0-10%
- 10-15%
- 15-30%
- 30-40%
- 40%+
- Countries without data
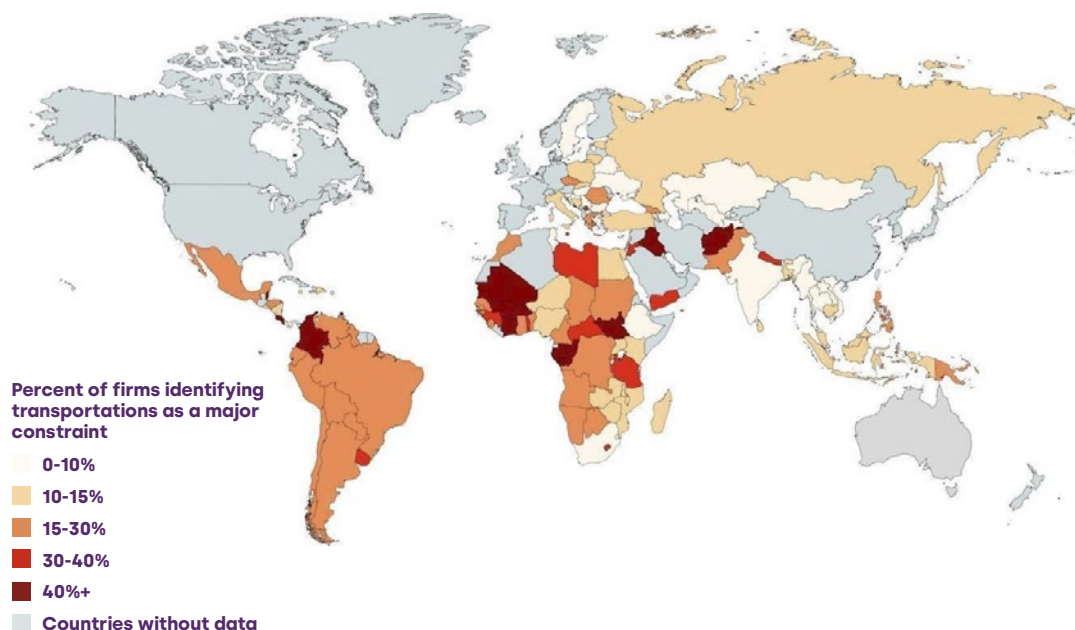
Notes: The cost of transporting the same goods over similar distances is many times more expensive in areas of sub-Saharan Africa than in high-income countries like the US. Source: World Bank Enterprise Survey.

A good example of existing evidence on measuring the impact of physical infrastructure, including a cost-benefit assessment, can be found in Cosar and Demir (2016). They study the impact of an upgrade of single-lane intra-national roads to high-capacity expressways on facilitating foreign trade to and from Turkey. Over a 10-year period, the estimated present value of the additional trade flows generated by a US$ 1 investment in infrastructure are between US$ 0.7 and US$ 2. These effects are likely to be heterogeneous across countries or even regions. In 2002, when the infrastructure projects were initiated, Turkey was already trading considerably—particularly with the European Union—and was classified as an upper-middle-income country. In sub-Saharan Africa or South Asia, the trade elasticity of intra-national infrastructure may be considerably different, and it may be harder to estimate given the lack

of data. Donaldson (2018) finds historic railroad projects in India decreased trade costs and increased domestic trade, confirming the benefits physical infrastructure may support the expansion of trade both locally and globally.

Infrastructure also shapes the patterns of specialisation within countries. Cosar and Fagjelbaum (2016) hypothesise that intra-national trade costs imply that regions near international gateways have a natural comparative advantage in export-oriented sectors and find compelling evidence of this in China. Consistent with this theory, Storeygard (2016) finds that following oil price increases, cities near large ports in sub-Saharan Africa grow faster than cities further away. Roads can also impact structural transformation by bringing people to cities with higher productivity activities. Using panel data on roads in 39 African countries over 50 years, Jedwab and Storeygard (2019) show that increased market access accelerates cities' population growth. They find a stronger effect for small and remote locations, again supporting the evidence that the economic returns to infrastructure are higher where it is most lacking. Similarly, Fajgelbaum and Redding (2018) argue that the construction of the railway network in Argentina in the late 19th century was instrumental to its process of structural transformation, economic development, and international trade openness.

Of course, many road and railway projects cannot be neatly divided into those segments that promote intra-national trade and those that promote international trade. So much of the demand for evaluation here resonates with the wider need to understand the economic impact of publicly provided transportation infrastructure services. New data sources such as VAT and customs records, as well as tracking technologies from smartphones and other devices, offer hope for an improved understanding of who is travelling from where to where and for what purposes. In turn, this may facilitate a greater understanding of who benefits from infrastructure projects, as well as the extent to which those benefits are linked (or not) to trading with the outside world.

About 90% of the world's trade transits by sea, so containerisation is at the centre of these global trade patterns (Bernhofen et al., 2016; Rua, 2014; Cosar and Demir, 2018). Recent work has also attempted to understand—though so far more in a cross-country context—the effects of improvements in a nation's port facilities. For example, Nordas and Piermartini (2004) argue that among all indicators of infrastructure, the quality of port installations has the largest impact on relative bilateral trade flows. Stressing further the importance of port infrastructure, Brooks et al. (2019) show that US cities neighbouring ports that were exogenously deeper prior to the advent of large container ships grew about twice as fast as other coastal cities. However, Ducruet et al. (2019) show that much of this growth was 'zero-sum' at a relatively local scale, since new port technologies displaced economic activity from large to small cities.

Air travel also plays an important role in carrying out global trade. Campante and Yanagizawa-Drott (2017) show that an increase in an airport's connectivity has a positive effect on local economic activity. This effect is likely due to air travel facilitating the movement of people rather than the movement of goods. In particular, they document that foreign ownership of companies is stronger between two cities just below 6,000 miles in distance than just above, a regulatory threshold that makes it more expensive to connect two cities by air on one flight. Startz (2016) also shows the importance of face-to-face relationships for retailers based in Nigeria. To

remove contractual and informational frictions with manufacturers in China, these retailers constantly need to travel to China to source goods for their stores, making air connectivity extremely important.

Studies which determine the relationship between traditional infrastructure (roads, ports, containers) for the movement of goods have not captured energy trading, or the export of energy services. While an emerging sector, the potential growth of energy as an exported service from low- and middle-income countries is large. For example, the energy firm XLinks is currently developing a transmission line between Morocco, potentially the UK, and the EU to facilitate the trade of renewable energy between the countries' grids (Bloomberg, 2024). Energy trading can improve competition within the domestic market, and expanding the necessary infrastructure allows for countries with high endowments of renewable energy (solar, hydro) to export energy. Gonzales et al. (2023) find market integration (increased transmission investment by the government) encourages renewable energy investment and improves the efficiency of the energy market. These lessons can be extended in support of regional energy trade, where market integration may improve the overall efficiency of the sector and subsequent domestic outcomes. Ryan (2021) found that a market for electricity, when expanded to function between regions in India, was successful in increasing market surplus and encouraging further investment in the sector.

To expand the sector, the government can provide critical energy infrastructure to crowd in private investment. In order to generate improvements within the energy sector and facilitate the trade of energy services, the government may need to mitigate existing barriers in the sector. Ryan (2021) also finds that when the central government in India intermediates contracting between new solar generators, the risk premium on the project is eliminated, and renewable energy projects become viable. This research shows there is a hold-up issue in creating energy assets and infrastructure, which can be reduced through government support for energy infrastructure.

Information frictions are arguably another important barrier to trade. However, evidence on the impact of communication infrastructure on trade flows is thin. Using historical examples, Steinwender (2018) and Juhasz and Steinwender (2019) show that transatlantic telegraph lines impact trade flows along two dimensions. They allowed exporters to learn about foreign market conditions and allowed buyers to acquire information on the characteristics of codifiable products. The expansion of internet access and its market platforms could significantly boost the export potential of low- and middle-income countries (see Hjort and Poulsen, 2019 for suggestive evidence on the effect of the internet on exporting status).

Overall, while the literature points to a positive and significant impact of physical infrastructure on trade and economic development, more evidence is needed on the cost efficiency of infrastructure projects and where their returns are the highest on the margin.

Customs collection and trade facilitation

To be exported or imported, goods typically need to be inspected by customs agents, and they are often subject to tariff duty collection. Firm perception studies such as the World Bank Enterprise Survey typically point to delays in clearing customs as a significant trade barrier. Djankov

et al. (2010) find support for this view in the data. The distance equivalent of customs compliance time is quite high: each day of delay corresponds to an increase in distance of about 70 km. Given that the average time to clear exports through customs is on average 11 days in sub-Saharan Africa (compared to 3 days in the European Union), low- and middle-income countries are de facto further away from trade partners. Policies to improve customs efficiency relate more to state efficiency than trade policy, but we stress this as an important and relevant area for further research, particularly with the ongoing interest in carbon budget adjustment policies, which will require significant increases in data collection at the industry and product level.

Tariff collection is the customs agents' other main responsibility. This is particularly critical for low- and middle-income countries, as a large share of their fiscal capacity consists of import duties (Cagé and Gadenne, 2018). Due to low tax enforcement capacity, this may be where firms circumvent duties the most. Reflecting this, a number of papers have used mirrored international trade data to show the prevalence of tariff evasion in low- and middle-income countries (Fisman and Wei, 2004; Mishra et al., 2008; Rijkers et al., 2015).

Sequeira and Djankov (2014) provide direct evidence of the importance of tariff evasion and the role customs agents play in facilitating that process. It is typically done through bribe payments in exchange for tariff payments that are lower than the official rate, which reduces trade costs for importing firms. This may be why a *de jure* tariff reduction might not translate into a significant increase in trade flows in some settings, as *de facto* tariff duties are already meagre. Additionally, coercive corruption, whereby bureaucrats ask for additional fees to remove the threat of having goods locked at the border, also takes place. This process may also explain why the customs clearing process takes substantially more time in low- and middle-income countries. At the border, gender or ethnic attributes might affect the bargaining relationship between customs agents and traders and so these distortions might disproportionately affect certain groups.

Reducing corruption and tariff evasion at the border is a challenging task. The process of assessing the value of a good crossing the border leaves room for bargaining; as such, strict rules on methods for evaluating product prices, such as the WTO Customs Valuation Agreement, could be a reasonable solution (Javorcik and Narciso, 2017). Hiring private firms to conduct shipment inspections has also shown promising results for tariff collection (Yang, 2008). Financial incentives for customs agents could also be an alternative (Chalendard et al., 2019), as it has yielded promising results for administrative workers in other fields (Khan et al., 2016, who offered performance-based incentives to tax collectors in Pakistan). Finally, recent developments in technology or advanced statistical techniques could support the efforts of states to detect tariff evasion (Demir and Javorcik, 2019; Mittal et al., 2018). More research is needed at the intersection of state capacity and trade policy to reduce the costs associated with the burden of red tape and corruption at the border.

On top of customs, exporters and importers typically need to interact with several cross-border agencies that develop trade regulations and enforce them. The digitisation of some of these procedures could have a significant impact on trade flows. Similarly, a change in international regulations or

harmonisation of norms between countries trading with one another could have an effect on exports. Yet, evidence on the effectiveness and the economic returns of such policies is lacking.

<div style="background-color:#efe3f7; padding: 1em;">

RESEARCH PRIORITIES

- Develop methodologies to perform cost-benefit analysis of physical trading infrastructure

- Where-in terms of location and sectors-are the marginal returns of infrastructure the highest?

- What policies can improve the processes of customs collection? How can corruption at the border be reduced?

- What trade facilitation services can significantly increase trade flows?

- How can intra-national trade infrastructure be expanded to increase the equal distribution of gains from trade?

</div>

Export promotion

While export growth and promotion are at the centre of most low- and middle-income countries' growth strategies, this objective often remains difficult to implement in practice. World export markets are competitive, and a sector must have the right comparative advantage in order to succeed. Theoretically, the dynamic gains from trade should accrue to countries which open up to trade and specialise in more complex sectors—those with more scope for learning. However, when empirically assessed by Atkin et al. (2023), those complex sectors which generate strong spillovers domestically face greater competition globally, pushing countries away from specialising in these sectors. States can play an important role to promote export markets and capture positive spillovers while remaining competitive, although long-run export-growth trajectories in today's world may be more difficult to access. This question requires further investigation.

Section 3.1 reviewed a number of potential market failures on the demand side. In export markets specifically, search frictions may be even more important. Finding buyers in remote countries seems likely to be harder than it is in one's home country. One rationale for policy intervention is that knowledge about available exporters and importers can be considered a public good. As such, governments should focus on collecting and providing information that is useful for entire sectors, as opposed to facilitating only firm-specific relationships. In the latter case, the state may just be subsidising the cost of finding new buyers that firms may have found anyway on their own. To be efficient, government intervention should be focused on solving coordination failures (such as marketing an entire industry's products abroad) or building tools with large economies of scale (such as listing all available exporters on a web platform). While there is a large body of evidence on the existence of search frictions (Allen ,2014; Startz, 2017; Jensen and Miller, 2018), research on how these frictions can be addressed in practice is scarce.

A second important market failure could be collective reputation. Foreign buyers, unable to assess the quality of potential exporters' products, are likely to rely on signals from the rest of the industry or country to decide whether they want to import goods from a particular firm. In turn, high-quality exporters may have difficulty reaching export markets (Macchiavello, 2010; Bai et al., 2017). In low- and middle-income countries, where weak institutions and low contract enforcement exist, trust becomes increasingly important for promoting exports (Bourdreau and Macchiavello, 2023). New evidence from Barteska and Lee (2024) shows that South Korea's growth story can be understood as a feat of its most successful bureaucrats. The study shows that the state bureaucrat overseeing export promotion policy in foreign country offices had a significant effect on the ability to grow exports in that country. The researchers find the mechanism of transmitting information about the market conditions to the host country is essential for decreasing any information asymmetries and supporting buyers to match with sellers. To increase trust, governments can promote reputation mechanisms that reliably rate sellers and buyers, such as international certifications. On this issue, too, evidence is lacking.

Credit constraints could also play a prominent role in preventing firms from exporting. As discussed in **Section 3.1**, estimates of the fixed cost of entering foreign markets are quite high, and firms may not have the resources necessary to pay that cost. Improving access to trade credit or directly subsidising the costs of export business plans are potential solutions. Cadot et al. (2015) estimate the effect of FAMEX, an export-matching grant programme in Tunisia. While the impact on exports is strong in the short run, it fades out after three years. Yet, the additional corporate tax revenue generated from the programme covers its cost, suggesting that such interventions could be cost-efficient.

Perhaps because so many low- and middle-income countries already conduct export-promotion activities in some form, a promising research strategy could be to initiate collaborations with these export agencies and randomise export promotion interventions. This would potentially allow researchers to quantify the size of different externalities while measuring the cost efficiency of various policies at the same time. Interactions between researchers and tax administrations in low- and middle-income countries over the past decade have led to significant progress in this literature, and we believe there is a similar potential for export promotion.

RESEARCH PRIORITIES

- What externalities or market failures legitimate export promotion programmes? How large are these externalities?

- How effective are programmes to support local firms' reputations at increasing the probability of matching between exporters and buyers?

- What types of interventions are effective and cost-efficient in addressing these market failures?

IV. Trade and inequality

Over the past few years, trade has been at the centre of the inequality debate. While globalisation was followed by significant growth for many countries around the world, it has left a number of people behind. Lakner and Milanovic (2015)'s 'elephant curve' showed that the middle class in low- and middle-income countries and the poorest populations in high-income countries experienced less growth than the average. The recent rise in protectionist views generated by shrinking industries in high-income countries raises the threat that if the trade gains are not sufficiently shared across the population, they may slow to a halt in the future.
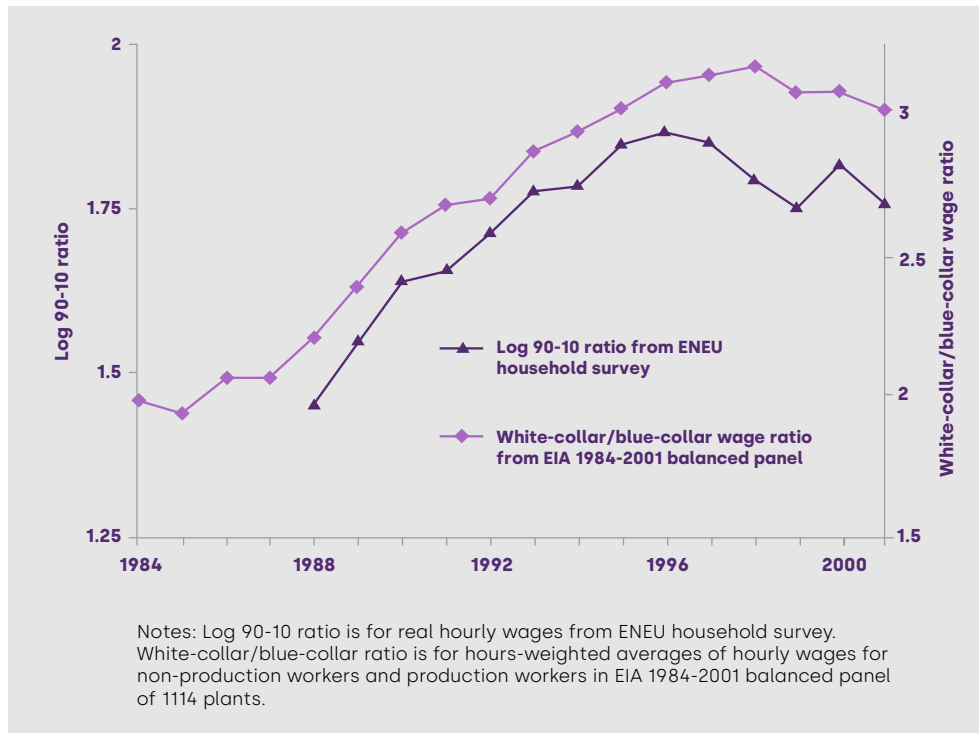
We first discuss the issue of inclusive export-led growth. How can the gains from trade be more widely shared? We then turn to mitigating adjustments from trade shocks. In the short run, certain groups of firms or individuals may be particularly affected by liberalisation reforms, variations in world prices, or trade policies implemented by other countries. In general, the agenda for this section aims at better understanding who benefits and who loses from trade. If we can learn more about this, it may be possible to determine which policies should be enacted to make growth more inclusive.

Inclusive and sustainable export-led growth

Export-led growth is thought to have lifted hundreds of millions of people out of poverty, with the experiences of East Asian countries particularly suggestive in this regard. Many policymakers nowadays believe that trade openness is a reliable poverty-reduction strategy. In the case of China, the country is also heavily engaged in the global value chain for green products, most notably solar panels. The intuition for the presumption that opening up to trade can generate economic returns is simple. Standard trade models predict that when opening to trade, low- and middle-income countries—who tend to have a relatively more abundant unskilled labour supply— should see higher employment opportunities and an increase in earnings for the poorest.

However, several studies have documented that the trade liberalisation episodes that took place in the 1990s in many low- and middle-income countries were typically followed by a relative increase in the wages of the most educated (see Goldberg and Pavnik, 2007 and Pavnik, 2012 and **Figure 5** below showing the increase in inequality in Mexico at a time where exports boomed). These patterns were rationalised by the subsequent observation that reaching export markets typically requires technological upgrading (Bustos, 2011) or quality upgrading (Verhoogen, 2008), all of which require that firms use skilled workers more intensively (Brambilla, Lederman, and Porto, 2012). The effect of trade on wages also varies across firms. More recently, evidence by Alfaro-Urena et al. (2023) found that low-wage workers saw pay increases as a result of foreign firm entry into the domestic market in Costa Rica, although the total share of low-wage labour at the firm did drop. While the results indicate a mix of winners and losers, overall low-wage workers lose out.

Figure 5: Increase in inequality over time in Mexico

Notes: Log 90-10 ratio is for real hourly wages from ENEU household survey. White-collar/blue-collar ratio is for hours-weighted averages of hourly wages for non-production workers and production workers in EIA 1984-2001 balanced panel of 1114 plants.

Notes: Trade liberalisation episodes that took place in the 1990s in many low- and middle-income countries (including Mexico) were typically followed by a relative increase in the wages of the most educated. Source: Verhoogen, 2008.

What policies can be introduced to encourage both growth in wages and improvements in working conditions? Beyond wages, Alfaro-Urena et al. (2023) also find that the same MNE opening in Costa Rica with a policy of responsible sourcing show labour costs for the exposed firms increased, indicating improved benefits and wages for the low-wage workers remaining at the firms. Im and McLaren (2023) find that labour standards - under two theories - are stricter than optimal at equilibrium, due to the fact that countries can demand stricter labour standards and pass on the costs to buyer countries quite easily. Oddly enough, child labour bans in regional trade agreements were found to increase child employment ages 14 to 17 and decrease schooling (McLaren et al., 2023). Child labour bans, when implemented, can increase income inequality and exacerbate credit constraint issues, keeping countries locked into relying on child employment. The evidence indicates that trade openness and the availability of low-skilled manufacturing jobs, particularly in the case of Southeast Asia's development story, lead to an increase in educational outcomes as adults took up jobs that were born from trade agreements. Designing policies to support inclusive growth must consider the adverse effects of policies and support structural transformation.

Trade openness increases competition and makes the least productive firms die or shrink (Melitz, 2003). Supporting this hypothesis, Menezes-Filho and Muendler (2011) document large employment declines in the least productive firms in response to trade liberalisation in Brazil in the 1990s. Amiti and Davis (2012) show that Indonesia's tariff cuts in the 1990s reduced wages in firms competing with imports while increasing wages among exporters. In Adao et al. (2022), novel data linking firms and employees with trade data reveal that an increase in trade results in an overall incidence that is pro-rich, increasing

inequality between high- and middle-income workers and low-income workers. A large literature has shown that firm fixed effects account for a large part of the variation in wages observed within industries (Card et al., 2013; Song et al., 2016; Barth et al., 2018; Alvarez et al., 2018). Depending on the firm they join, workers can earn significantly different wages. Helpman et al. (2016) find that most of the wage inequality generated by trade shocks in Brazil comes from changes in the wage gap between workers with similar characteristics, in the same industry, but employed in different firms. If trade is not driving inclusive growth, policymakers can think about supporting firms with certain characteristics or making complementary investments in workers across skill levels to facilitate a more even distribution of the gains from trade.

Trade impacts welfare through more than just employment and wages. By increasing competition and allowing consumers to buy goods from cheaper countries, trade also reduces prices and increases product variety. While these effects are clear, evidence of the distributional impact of trade openness on consumer welfare is rare. Fagjelbaum and Khandelwal (2016) argue that the poor in the US benefit more from trade, as they spend more on imported goods relative to their income. By contrast, using consumer expenditure survey data from the US, Borusyak and Jaravel (2018) find that the expenditure distributional effect of the gains from trade is neutral. These effects may be slightly different in low and middle-income countries, where the poor rely heavily on crops that may not be traded on international markets.

There is contrasting empirical analysis on who benefits from trade openness on net—i.e. combining both the income and consumption sides—with evidence of differential impacts being felt across individuals dependent on geography, employment status, and consumption bundles. Artuc et al. (2019) measure the overall effect—from employment to consumption— of trade policy in low- and middle-income countries. They investigate both the welfare gains and distributional impact of trade across 54 low- and middle-income countries. While trade openness creates an income-inequality trade-off, imposing structure on the social welfare function associated with inequality, they conclude that the majority of low- and middle-income countries would still be better off by reducing protectionism. Atkin and Donaldson (2015) find that even with lower international trade barriers, intranational trade costs may bottleneck the gains from trade, leaving many of the most rural consumers without welfare gains.

A growing point of interest is the uneven dispersion of environmental damages as a result of trade. In the same way, labour outcomes may be adversely affected, and unfair burdens placed on the natural endowments or environment in low- and middle-income countries (relative to their developed trade partners) deserve attention. First, we consider the distribution of local environmental damages due to trade. Given low and middle-income countries often serve as exporters of primary products, the sustainable use of these resources could be particularly important for their long-term growth (Ross and Werker, 2024), although a successful example of poverty reduction driven by export-driven growth in natural resources has yet to materialise in sub-Saharan Africa.

Next, the impact of trade, which has traditionally concentrated in manufacturing and focused on the transportation of goods across the world, has had a significant impact on global emissions. Because of this

unpriced negative externality, there are a number of trade policies which do not account for emissions and are systematically lower for high-emitting industries (Shapiro, 2021). This significant difference between tariffs in clean and dirty sectors could be attributable to the high organisation of trade groups in exporting sectors, the level of 'upstreaminess' of a firm, and the level of local pollution which could lead to lower tariffs to avoid leakage (Shapiro, 2021). Trade policies, including tariffs and country-sector-specific taxation, can create global incentives for dirtier production without accounting for carbon costs.

Beyond tariffs, firms may choose to locate themselves where production costs are lowest. Evidence aggregated by Cole et al. (2017) demonstrates foreign firms are less likely to completely relocate to less environmentally stringent countries but may outsource or relocate the components of their supply chain that are 'dirtiest' to other countries with less environmental policy. While low- and middle-income countries could harness the potential gains from growth, policy interventions in Europe to limit the consumption of 'dirtier' goods are being introduced, including carbon border adjustment mechanisms (CBAM). CBAM is likely to impact low- and middle-income countries in a number of ways: firstly, reshuffling, or sorting, of goods may occur. What matters to low- and middle-income countries is whether these policies will lead to increased investment in cleaner production activities from foreign firms or a move away from foreign investment as demand for these goods decreases. At this point in time, the relative demand for dirty versus clean goods under these trade policies is unknown but will remain important as governments seek to attract investment from foreign firms with varying emissions intensities.

Finally, Shapiro (2016) estimates the welfare effects of global trade openness against the emissions produced from shipping internationally and finds that overall, the welfare gains are much larger than the cost of the produced emissions. With these results, more evidence should be built to assess the distribution of welfare gains and losses, potentially at a sub-aggregate level, in order to understand how trade may reinforce unequal distributions of local pollutants. A final area of research on trade and environment is how trade openness, without complementary climate policies, may stifle progress on gains in emissions reductions globally (Clausing and Wolfram, 2023).

Trade has had both positive impacts on individuals in low- and middle-income countries and has also enabled emissions growth across the globe. The distribution of these benefits and costs generated from trade are stratified across income groups and geographies.

Trade has had both positive impacts on individuals in low- and middle-income countries and has also enabled emissions growth across the globe. The distribution of these benefits and costs generated from trade are stratified across income groups and geographies.

Trade liberalisation can also impact the structure of the economy in the long term. Evidence thus far points to trade openness having some adverse effects on education. Edmonds et al. (2010) show that in districts in India that were the most exposed to increased competition from trade liberalisation, parents took their children out of school to cope with the increase in poverty. When trade positively affects the local economy, it also increases the opportunity cost of schooling as new employment

opportunities arise. Atkin (2016) finds that although the returns to education are high, when export-oriented factories open in Mexico, local high-school dropouts increase.

In sum, the literature on the inclusivity of trade liberalisation strategies is already substantial. However, we see four new important avenues for research on this issue. First, as trade does not start at the border, trade policy does not only impact firms that directly engage in exporting and importing activities; rather, the entire upstream and downstream value chains are likely to be involved. However, there is limited evidence on how trade policy impacts value chains and the mechanism through which trade can generate spillover effects in the wider economy.

Second, the issue of compensation for individuals who are negatively affected by trade deserves more attention. If governments or firms wish to compensate for the losses associated with shifts in trade openness or requirements, it is typically done through social protection programmes and tax policy, which create distortions. Striking the right balance between sharing the gains from trade more equally and the loss in efficiency from higher taxes is challenging. Antras et al. (2017) explore this issue theoretically in the US, but to our knowledge, no study dealing with this issue exists for low-income countries.

Third, unionisation and other labour market policies, such as the minimum wage, are becoming more common in low- and middle-income countries as well. Yet, little is known about how they alter the distributional impact of trade openness. More evidence on the consequences this has for the distributional impact of trade policy is needed. Unionisation per se is typically not a government policy, but the state can create an enabling environment that favours trade union membership.

Fourth, the global push to increase transparency in supply chains and reduce the impact of climate change in low- and middle-income countries has generated interest in the impacts of trade on the environment (and inversely, the environment or environmental policy on trade). There are a number of new policies – including subsidies, taxes, certifications, and CBAMs – which deserve further investigation in the literature to understand how they will alter or interact with existing trade regimes. Modelling efforts will be instrumental in evaluating the impacts on environmental, trade, and growth outcomes.

As a final point, the spatial distributional impact of trade integration is also a first-order issue for many low- and middle-income countries. Regional economic integration has increased substantially in sub-Saharan Africa and Asia over the past decade. Yet, when multiple countries sign a trade deal, little is known about which of them benefit from it. How do common market agreements impact the reallocation of factors of production across countries? As transfers across countries are rare, the winners of trade deals do not necessarily compensate the losers.

Mitigating adjustment effects of trade shocks

While ensuring that export-led growth is inclusive in the long run is a first order priority, low- and middle-income countries are also exposed to various trade-related shocks that they have to bear in the short run. These can take the form of prices of internationally traded commodities being subject to high volatility or a change in the policy of an important trade partner. The dynamic transition from a relatively closed to a more open economy is also of importance as a number of frictions can make trade shocks more costly or delay the time until the gains from trade openness are fully grasped.

The evidence that firms are risk-averse to climate change is growing (see **Section 2.2** and **2.4**). In a new working paper Castro Vicienzi et al. (2024), the researchers find that firms who are exposed to climate risks lower their prices, and buyers, in response, diversify their suppliers away from climate-exposed firms. This early evidence indicates that firms can and do actively mitigate the negative effects of climate shocks. Regions with high climate risks will experience declining demand a fall in real wages - leading to unequal distributional effects of climate risk (Castro Vicienzi et al., 2024). This is emerging evidence on how climate hazards may require firms to shift their behaviour in identifying and working with trade partners. More work is needed on what adaptive measures are most effective in reducing the impacts of these shocks and whether there is a limit to the efficacy of climate information in providing insights into potential shocks.

Evidence for the slow adjustment of low- and middle-income countries' economies in response to trade shocks is growing. This can be explained in part by their lack of labour mobility (see Pavnik, 2017 for a recent review). Artuc et al. (2010) document significant switching costs for workers in the US. Similarly, in Brazil, as discussed above, Dix-Caneiro (2014) estimates meaningful costs of mobility between 1.4 and 2.7 times average annual wages. Worker mobility can take the form of changes in sectoral occupation as well as spatial movement. A number of papers have also shown that workers do not necessarily move to regions where employment opportunities emerge following trade shocks (Chiquiar, 2008; Topalova, 2010; Kovak, 2013; Dix-Carneiro and Kovak, 2017). This particularly

applies to low-skilled workers, who face relatively higher migration costs relative to earnings (Notowidigdo, 2019). Finally, Artuc and McLaren (2015) have shown that in the US, a worker's occupation is as important as their industry of employment. In low-income countries, understanding which type of mobility—sectoral, spatial, or occupational—is responsible for the slow adjustment to trade shocks remains a relevant area of research. Do these barriers disproportionately affect low-skilled workers? Equally important is the need to design policies that can smooth the response to trade adjustments so labour markets can rapidly grasp the benefits from positive shocks and be more resilient to negative ones. It seems likely that high transport costs (Morten and Oliveira, 2019), scarce opportunities for later-life job training, or the reliance on informal safety nets (Munshi and Rosenzweig, 2016) all contribute to making labour mobility more costly in low-income countries (Artuc et al., 2015). And we have much to learn about the details.

Another channel through which trade shocks propagate is through production networks. As discussed in the previous section, a small fraction of a country's firms export, but the number of companies involved in business relationships with exporters is very large. The recent opening of VAT data to researchers allowed them to document the structure of production networks and how shocks spread through these networks. Yet, most of the research on this issue focuses on high-income countries (see Bernard and Moxnes, 2018 for a review). Huneeus (2019) shows that firm-to-firm relationships do not react strongly to firm-specific international trade shocks but are far more responsive to aggregate shocks.

Environmental trade regulations are likely to have a medium-term impact on economies which export primary goods. Unilateral or regional trade policies are likely to shift the industries which could drive export-led growth.

Finally, the political economy of trade policy is likely to be important for both the impact of international trade on inequality and how an economy responds to trade shocks (Rodrik, 1995; Gawande and Krishna, 2003). Interest groups may lobby the government to influence trade policy toward an allocation that benefits them rather than most people in the economy. Data on lobbying efforts, the composition of company boards, and measures of connections to politicians in power are all the more difficult to get in a low- and middle-income country context, but the increased focus on transparency imposed by donors may allow this literature to make significant progress in the years to come. In fragile states, lobbying can take a more radical form. For example, Naidu et al. (2017) show private-sector elites supported a military coup in Haiti to put an end to the previous government, which was considering removing the licensing scheme for imports that provided them rents.

Research on how the gains from trade are distributed across firms and subgroups in the population would also shed light on why policymakers make specific trade policy choices that may not be favourable from an efficiency standpoint but are the result of an equity constraint.

RESEARCH PRIORITIES

- What factors are responsible for the slow adjustment to trade shocks?

- For whom are these barriers the strongest?

- What policies can speed up the adjustment to trade shocks?

- Are there measures to mitigate adjustments to climate shocks? How will they differ from traditional trade shocks?

- Investigate the importance of lobbying and the political economy in shaping trade policy in low- and middle-income countries.

4. Conclusion

There is a pressing need for productivity growth in low-income countries as it provides the only sustainable pathway out of poverty. While a number of countries have experienced high growth rates over the past few decades, allowing them to catch up, productivity remains low for most low- and middle-income countries, particularly in sub-Saharan Africa and South Asia. Understanding what holds firms back is a necessary step to making progress and guiding effective policies to support productivity growth. In this review, we have discussed the existing evidence on the distortions that curb productivity growth at different levels, from individual firms to an economy's integration in global markets.

We end this paper by highlighting broad areas for future research that run through the sections presented above. The first is the need to deepen our understanding of how markets function and the consequences for firms. The focus on markets must be broader than firm-to-consumer relationships; firm-to-firm relationships and value chains are also central. Well-functioning markets provide high-powered incentives for both existing firms and potential entrants, facilitating a robust Schumpeterian selection process that allows dynamic entrants to induce innovation and slower-moving incumbents to exit. While inefficient firms in low- and middle-income countries survive for longer, the difference between the stringency of the selection channel in low- and high-income countries may only contribute to differences in aggregate productivity but not differences in long-run development (Majerovitz, 2023). Therefore, research should cover the selection into entrepreneurship and the dynamics of firm growth, as they remain important aspects of how markets function.

The second general theme that emerges is the need to measure the size of externalities and market failures and identify where—in which sectors and for which firms—they are most important. Externalities and market failures come in various forms, from standard production externalities, environmental externalities, and agglomeration effects to contractual frictions and external learning through business relationships. We believe this is a first-order issue for policy design, as any government intervention whose intent goes beyond redistribution must draw its legitimacy principally from the existence of market failures and externalities.

The third cross-cutting issue is the need to evaluate the effectiveness and cost efficiency of various policies that aim to increase productivity, particularly those that counteract negative productivity impacts from climate change or speed up the green transformation A given distortion can, in general, be addressed through a variety of potential interventions, yet little is known about which will have a significant impact and which are cost-efficient.

The final emerging issue is the way firms will be affected and respond to climate change. Climate shocks are likely to disrupt the productivity of workers, augment trade dynamics and generate negative externalities. However, firms will also need to drive innovation to adapt to physical climate impacts, as well as create and implement the solutions required to reduce emissions growth. Learning to adapt to climate shocks and the subsequent disruptions to productivity will require understanding market distortions caused by these externalities, encouraging the adoption of energy-saving technologies, and encouraging the use of productive inputs in highly exposed sectors such as agriculture. Markets will continue to transform as trade policy becomes a more robust tool for diffusing technology and improving the environmental standards of firms in low- and middle-income countries.

5. References

Abebe, G., Caria, S. A., Dupes, P., Fafchamps, M., and Getahun, T. (2023). Competition and management upgrading. Working paper.

Abebe, G., Caria, S. A., Fafchamps, M., and Falco, P. (2024a). Matching frictions and distorted beliefs: Evidence from a job fair experiment. *Economic Journal*. (forthcoming).

Abebe, G., Caria, S. A., Fafchamps, M., Falco, P., Franklin, S., and Quinn, S. (2020). Anonymity or distance? Job search and labour market exclusion in a growing African city. *The Review of Economic Studies*, 88(3), 1279–1310.

Abebe, G., Caria, S., and Ortiz-Ospina, E. (2019). The selection of talent: Experimental and Structural Evidence from Ethiopia. *American Economic Review*, 111 (6): 1757-1806.

Abebe, G., Caria, S., Dupas, P., and Fafchamps, M. (2024). Why Do African Firms Underinvest in Management Training? Experimental Evidence from Middle and Large Ethiopian Firms. Working paper.

Abebe, G., McMillan, M., and Serafinelli, M. (2022). Foreign direct investment and knowledge diffusion in poor locations. *Journal of Development Economics*, 158, Article S0304387822000827.

Abeberese, A. B. (2017). Electricity cost and firm performance: Evidence from India. *Review of Economics and Statistics*, 99(5), 839-852.

Abeberese, A., Ackah, C., and Asuming, P. (2021). Productivity losses and firm responses to electricity shortages: Evidence from Ghana. *World Bank Economic Review*, 35(1), 1-18.

Abel, M., Burger, R., and Piraino, P. (2020). The Value of Reference Letters: Experimental Evidence from South Africa. *American Economic Journal: Applied Economics*, 12(3), 40–71.

Acemoglu, D. (2023). Distorted innovation: Does the market get the direction of technology right? *AEA Papers and Proceedings*, 113, 1-28.

Acemoglu, D., Aghion, P., Bursztyn, L., and Hémous, D. (2012). The environment and directed technical change. *The American Economic Review*, 102(1), 131–166.

Acemoglu, D., Akcigit, U., Hanley, D., and Kerr, W. (2016). Transition to clean technology. *Journal of Political Economy*, 124(1), 52-104.

Adamopoulos, T., and Restuccia, D. (2020). Land reform and productivity: A quantitative analysis with micro data. *American Economic Journal: Macroeconomics, 12(3), 1-39.*

Adão, R., Carrillo, P., Costinot, A., Donaldson, D., and Pomeranz, D. (2022). Imports, exports, and earnings inequality: Measures of exposure and estimates of incidence. *The Quarterly Journal of Economics*, 137(3), 1553–1614.

Adhvaryu, A., Kala, N., and Nyshadham, A. (2020). The Light and the heat: Productivity Co-Benefits of Energy-Saving technology. ***The Review of Economics and Statistics***, 102(4), 779–792.

Adhvaryu, A., Kala, N., and Nyshadham, A. (2022). Management and shocks to worker productivity. ***Journal of Political Economy***, 130(1).

Adhvaryu, A., Kala, N., and Nyshadham, A. (2018). The skills to pay the bills: Returns to on-the-job soft skills training ***National Bureau of Economic Research*** Working Paper 24313.

Aghion, P., Bénabou, R., Martin, R., and Roulet, A. (2023). Environmental preferences and technological choices: Is market competition clean or dirty? ***American Economic Review: Insights***, 5(1), 1-20.

Aghion, P., Bergeaud, A., Lequien, M., and Melitz, M. J. (2022). The heterogeneous impact of market size on innovation: Evidence from French firm-level exports. ***Review of Economics and Statistics***.

Aghion, P., Cai, J., Deration, M., Du, L., Harrison, A., and Legros, P. (2015). Industrial policy and competition. ***American Economic Journal: Macroeconomics***, 7(4), 1-32.

Aghion, P., Dechezleprêtre, A., Hémous, D., Martin, R., and Van Reenen, J. (2016). Carbon taxes, path dependency, and directed technical change: Evidence from the auto industry. ***Journal of Political Economy***, 124(1).

Ahn, J., Khandelwal, A. K., and Wei, S. J. (2011). The role of intermediaries in facilitating trade. ***Journal of International Economics***, 84(1), 73-85.

Aitken, B. J., and Harrison, A. E. (1999). Do domestic firms benefit from direct foreign investment? Evidence from Venezuela. ***American Economic Review***, 89(3), 605-618.

Aker, J. C., and Jack, B. K. (2023). Harvesting the rain: The adoption of environmental technologies in the Sahel. ***The Review of Economics and Statistics.***

Albert, C., Bustos, P., and Ponticelli, J. (2021). The effects of climate change on labor and capital reallocation. ***National Bureau of Economic Research*** Working Paper 28995.

Alfaro-Ureña, A., Manelici, I., and Vasquez, J. P. (2022). The Effects of Joining Multinational Supply Chains: New Evidence from Firm-to-Firm Linkages. ***The Quarterly Journal of Economics***, 137(3), 1495–1552.

Alfaro-Urena, A., Faber, B., Gaubert, C., Manelici, I., and Vasquez, J. P. (2023). Responsible Sourcing? Theory and Evidence from Costa Rica. ***National Bureau of Economic Research*** Working Paper 30683.

Alfonsi, L., Bandiera, O., Bassi, V., Burgess, R., Rasul, I., Sulaiman, M., and Vitali, A. (2020). Tackling youth unemployment: Evidence from a labour market experiment in Uganda. ***Econometrica***, 88(6), 2369-2414

Ali, A., and Rahut, D. B. (2013). Impact of agricultural extension services on technology adoption and crops yield: Empirical evidence from Pakistan. ***Asian Journal of Agriculture and Rural Development***, 3(393-2016-23855), 801-812.

Allcott, H., and Greenstone, M. (2012). Is there an energy efficiency gap? *The Journal of Economic Perspectives*, 26(1), 3-28.

Allcott, H., Collard-Wexler, A., and O'Connell, S. D. (2016). How Do Electricity Shortages Affect Industry? Evidence from India. *The American Economic Review*, 106(3), 587–624.

Allen, T. (2014). Information frictions in trade. *Econometrica*, 82(6), 2041-2083.

Allen, T., and Atkin, D. (2016). Volatility and the Gains from Trade (No. w22276). *NBER*

Alvarez, J., Benguria, F., Engbom, N., and Moser, C. (2018). Firms and the decline in earnings inequality in Brazil. *American Economic Journal: Macroeconomics*, 10(1), 149-89

Amirapu, A., and Gechter, M. (2020). Labor regulations and the cost of corruption: Evidence from the Indian firm size distribution. *Review of Economics and Statistics*, 102, 34–48.

Amiti, M., and Davis, D. R. (2011). Trade, firms, and wages: Theory and evidence. *The Review of Economic Studies*, 79(1), 1-36.

Amiti, M., and Konings, J. (2007). Trade liberalization, intermediate inputs, and productivity: Evidence from Indonesia. *American Economic Review*, 97(5), 1611-1638.

Amsden, A. H. (1989). South Korea and late industrialization. New York.

Andersen, D. (2016). Credit constraints, technology upgrading, and the environment. *Journal of the Association of Environmental and Resource Economists*, 3(2), 283-319.

Andersen, D. C. (2017). Credit constraints, technology upgrading, and the environment. *Journal of the Association of Environmental and Resource Economists*, 3(2).

Anderson, S. J., and McKenzie, D. (2022). Improving business practices and the boundary of the entrepreneur: A randomized experiment comparing training, consulting, insourcing, and outsourcing. *Journal of Political Economy*, 130(1), 157-209.

Anderson, S. J., Chandy, R., and Zia, B. (2018). Pathways to profits: The impact of marketing vs. Finance Skills on Business Performance. *Management Science*, 64(12), 5559-5583.

Anderson-Macdonald, S., Chandy, R., and Zia, B. (2014). The impact of marketing (versus finance) skills on firm performance: Evidence from a randomized controlled trial in South Africa. Working Paper

Angelucci, M., Karlan, D., and Zinman, J. (2015). Microcredit impacts: Evidence from a randomized microcredit program placement experiment by Compartamos Banco. *American Economic Journal: Applied Economics*, 7(1), 151-82.

Antle, J. M., and Capalbo, S. M. (2010). Adaptation of agricultural and food systems to climate change: An economic and policy perspective. *Applied Economic Perspectives and Policy*, 32(3), 386-416.

Antras, P., Fort, T. C., and Tintelnot, F. (2017). The margins of global sourcing: Theory and evidence from us firms. *American Economic Review*, 107(9), 2514-64.

Arndt, C., Jensen, H. T., Robinson, S., and Tarp, F. (2000). Marketing margins and agricultural technology in Mozambique. *The Journal of Development Studies*, 37(1), 121-137.

Arráiz, I., Henríquez, F., and Stucchi, R. (2013). Supplier development programmes and firm performance: evidence from Chile. *Small Business Economics*, 41(1), 277-293.

Arráiz, I., Meléndez, M., and Stucchi, R. (2014). Partial credit guarantees and firm performance: evidence from Colombia. *Small Business Economics*, 43(3), 711-724.

Artuç, E., and McLaren, J. (2015). Trade policy and wage inequality: A structural analysis with occupational and sectoral mobility. *Journal of International Economics*, 97(2), 278-294..

Artuç, E., Chaudhuri, S., and McLaren, J. (2010). Trade shocks and labour adjustment: A structural empirical approach. *American Economic Review*, 100(3), 1008-45

Artuc, E., Porto, G., and Rijkers, B. (2019). Trading off the income gains and the inequality costs of trade policy. *Journal of International Economics*, 120, 1-45.

Asher, S., and Novosad, P. (2020). Rural roads and local economic development. *American Economic Review*, 110(3), 797–823.

Atkin, D. (2016). Endogenous skill acquisition and export manufacturing in Mexico. *American Economic Review*, 106(8), 2046-85.

Atkin, D., and Donaldson, D. (2022). Chapter 1 - The role of trade in economic development. In *Handbook of International Economics* (Vol. 5, pp. 1-59). Elsevier.

Atkin, D., Chaudhry, A., Chaudhry, S., Khandelwal, A. K., and Verhoogen, E. (2015). Markup and cost dispersion across firms: Direct evidence from producer surveys in Pakistan. *American Economic Association: Papers and Proceedings*, 105(5), 537-44.

Atkin, D., Chaudhry, A., Chaudry, S., Khandelwal, A. K., and Verhoogen, E. (2017). Organizational barriers to technology adoption: Evidence from soccer-ball producers in Pakistan. *The Quarterly Journal of Economics*, 132(3), 1101-1164.

Atkin, D., Costinot, A., and Fukui, M. (2023). Globalization and the Ladder of Development: Pushed to the Top or Held at the Bottom? Revise and resubmit, *Review of Economic Studies.*

Atkin, D., Khandelwal, A. K., and Osman, A. (2017). Exporting and firm performance: Evidence from a randomized experiment. *The Quarterly Journal of Economics*, 132(2), 551-615A

Atkin, D., Khandelwal, A. K., and Osman, A. (2019). Measuring Productivity: Lessons from Tailored Surveys and Productivity Benchmarking. In *American Economic Association: Papers and Proceedings* (Vol. 109, pp. 444-49).

Attanasio, O., Kugler, A., and Meghir, C. (2011). Subsidizing vocational training for disadvantaged youth in Colombia: evidence from a randomized trial. *American Economic Journal: Applied Economics*, 3(3), 188-220.

Auffhammer, M., and Carleton, T. A. (2018). Regional crop diversity and weather shocks in India. *Asian Development Review*, 35(2), 113-130. MIT Press.

Avenyo, E. K., and Tregenna, F. (2022). Greening manufacturing: Technology intensity and carbon dioxide emissions in developing countries. *Applied Energy*, 324, Article 117983.

Avenyo, E. K., and Tregenna, F. (2022). Greening manufacturing: Technology intensity and carbon dioxide emissions in developing countries. *Applied Energy*, 324(C). Elsevier.

Ayyagari, M., Demirguc-Kunt, A., and Maksimovic, V. (2021). Are large firms born or made? Evidence from developing countries. *Small Business Economics*, 57(1), 191-219.

Ayyagari, M., Juarros, P., Martinez Peria, M. S., and Singh, S. (2021). Access to finance and job growth: Firm-level evidence across developing countries. *Review of Finance*, 25, 1473-1497.

Azhar, A. K. M., and Elliott, R. J. R. (2007). Trade and Specialisation in Pollution Intensive Industries: North-South Evidence. *International Economic Journal*, 21(3), 361-380.

Baccini, L., Impullitti, G., and Malesky, E. J. (2019). Globalization and state capitalism: Assessing Vietnam's accession to the WTO. *Journal of International Economics*, 119, 75-92.

Bai, J. (2016). Melons as Lemons: Asymmetric Information, Consumer Learning and Seller Reputation (No. 00540). *The Field Experiments Website*.

Bai, J., Gazze, L., and Wang, Y. (2022). Collective reputation in trade: Evidence from the Chinese dairy industry. *The Review of Economics and Statistics*, 104(6), 1121-1137.

Bai, X., Krishna, K., and Ma, H. (2017). How you export matters: Export mode, learning and productivity in China. *Journal of International Economics*, 104, 122-137.

Balboni, C., Boehm, J., and Waseem, M. (2023). Firm Adaptation in Production Networks: Evidence from Extreme Weather Events in Pakistan. Working Paper.

Banares-Sanchez, I., Burgess, R., László, D., Simpson, P., Van Reenen, J., and Wang, Y. (2023). Ray of Hope? China and the Rise of Solar Energy. Working Paper.

Bandiera, O., Barankay, I., and Rasul, I. (2008). Social capital in the workplace: Evidence on its formation and consequences. *Labour Economics*, 15(4), 724-748.

Bandiera, O., Bassi, V., Burgess, R., Rasul, I., Sulaiman, M., and Vitali, A. (2024). The search for good jobs: Evidence from a six-year field experiment in Uganda. *Journal of Labor Economics* (forthcoming).

Bandiera, O., Callen, M., Casey, K., La Ferrara, E., Landais, C., and Teachout, M. (2021). IGC evidence paper: State effectiveness. *IGC Evidence Paper.*

Bandiera, O., Elsayed, A., Heil, A., and Smurra, A. (2022). Presidential Address 2022: Economic Development and the Organisation Of Labour: Evidence from the Jobs of the World Project. *Journal of the European Economic Association*, 20(6), 2226–2270.

Banerjee, A. V., and Duflo E. (2005). Growth theory through the lens of development economics.*Handbook of economic growth*, 1, 473-552.

Banerjee, A. V., and Duflo E. (2014). Do firms want to borrow more? Testing credit constraints using a directed lending program. *Review of Economic Studies*, 81(2), 572-607.

Banerjee, A., and Sequeira, S. (2023). Learning by Searching: Spatial Mismatches and Imperfect Information in Southern Labor Markets. *Journal of Development Economics*, 164, Article S0304387823000664.

Banerjee, A., and Munshi, K. (2004). How efficiently is capital allocated? Evidence from the knitted garment industry in Tirupur. *The Review of Economic Studies*, 71(1), 19-42.

Banerjee, A., Duflo, E., Glennerster, R., and Kinnan, C. (2015). The miracle of microfinance? Evidence from a randomized evaluation. *American Economic Journal: Applied Economics*, 7(1), 22-53.

Banerjee, A., Hanna, R., Kyle, J., Olken, B. A., and Sumarto, S. (2019). Private *Outsourcing and Competition: Subsidised Food Distribution in Indonesia. Journal of Political Economy*, 127(1), 101-137.

Barbier, E. B. (2010). Poverty, development, and environment. *Environment and Development Economics*, 15(6), 635-660.

Bardhan, P., Mookherjee, D., and Tsumagari, M. (2013). Middlemen margins and globalization. *American Economic Journal: Microeconomics*, 5(4), 81-119.

Barrage, L., and Nordhaus, W. (2024). Policies, projections, and the social cost of carbon: Results from the DICE-2023 model. *Proceedings of the National Academy of Sciences*, 121(13).

Barrett, C. B., Ortiz-Bobea, A., and Pham, T. (2023). Structural transformation, agriculture, climate, and the environment. Review of Environmental Economics and Policy, 17(2), 195-216. *University of Chicago Press.*

Bartelme, D., Costinot, A., and Rodriguez-Clare, A. (2019). The textbook case for industrial policy: Theory meets data. *Journal of Political Economy* (revise and resubmit).

Bartelsman, E., Haltiwanger, J., and Scarpetta, S. (2013). Cross-country differences in productivity: The role of allocation and selection. *American Economic Review*, 103(1), 305-34.

Barteska, P., and Lee, J. E. (2024). Bureaucrats and the Korean export miracle. *London School of Economics*, Job Market Paper.

Barth, M. E., Gomez-Biscarri, J., Kasznik, R., and López-Espinosa, G. (2017). Bank earnings and regulatory capital management using available for sale securities. *Review of Accounting Studies*, 22(4), 1761-1792

Barwick, P. J., Kalouptsidi, M., and Zahur, N. B. (2019). China's Industrial Policy: an Empirical Evaluation. *National Bureau of Economic Research* Working Paper 26075.

Bas, M., and Paunov, C. (2019). What gains and distributional implications result from trade liberalization? *MERIT Working Papers 2019-003*.

Bassi, V., and Nansamba, A. (2022). Screening and signalling non-cognitive skills: Experimental evidence from Uganda. *The Economic Journal*, 132(642), 471-511.

Bassi, V., Kahn, M., Gracia, N. L., Porzio, T., and Sorin, J. (2023). Exposure to air pollution for small firms in African cities. *IGC Policy Brief*.

Bassi, V., Muoio, R., Porzio, T., Sen, R., and Tugume, E. (2022). Achieving scale collectively. *Econometrica*, 90(6), 2937–2978.

Bau, N., and Matray, A. (2023). Misallocation and Capital Market Integration: Evidence From India. *Econometrica*, 91(1), 67-106.

Beam, E. A. (2016). Do job fairs matter? Experimental evidence on the impact of job-fair attendance. *Journal of Development Economics*, 120, 32-40.

Beaman, L., BenYishay, A., Magruder, J., and Mobarak, A. M. (2021). Can network theory-based targeting increase technology adoption? *American Economic Review*, 111(6), 1918-1943.

Beaman, L., Karlan, D., Thuysbaert, B., and Udry, C. (2013). Profitability of fertilizer: Experimental evidence from female rice farmers in Mali. *American Economic Review*, 103(3), 381-386.

Beaman, L., Karlan, D., Thuysbaert, B., and Udry, C. (2023). Selection into credit markets: Evidence from agriculture in Mali. *Econometrica*. ISSN: 0012-9682.

Beason, R., and Weinstein, D. E. (1996). Growth, economies of scale, and targeting in Japan (1955-1990). *Review of Economics and Statistics*, 78(2), 286-295.

Beck, T., Pamuk, H., Ramrattan, R., and Uras, B. R. (2018). Payment instruments, finance and development. *Journal of Development Economics*, 133, 162-186.

Benhima, K., Chafik, O., Fang, M., and Tang, W. (2022). Short-term finance, long-term effects: Theory and evidence from Morocco. Working Paper 002003.

Berge, L. I. O., Bjorvatn, K., and Tungodden, B. (2014). Human and financial capital for microenterprise development: Evidence from a field and lab experiment. *Management Science*, 61(4), 707-722.

Berge, L. I. O., Bjorvatn, K., Pires, A. J. G., and Tungodden, B. (2015). Competitive in the lab, successful in the field?. *Journal of Economic Behavior and Organization*, 118, 303-317.

Bergquist, L. F. (2017). Efficiency, Competition, and Welfare in African Agricultural Markets. Job Market Paper, UC Berkeley.

Bergquist, L. F., and Dinerstein, M. (2020). Competition and entry in agricultural markets: Experimental evidence from Kenya. *American Economic Review*, 110(12), 3705-3747.

Bernard, A. B., and Moxnes, A. (2018). Networks and trade. *Annual Review of Economics*, 10, 65-85.

Bernhofen, D. M., El-Sahli, Z., and Kneller, R. (2016). Estimating the effects of the container revolution on world trade. *Journal of International Economics, 98, 36-50.*

Bernstein, S., Colonnelli, E., Malacrino, D., and McQuade, T. (2018). Who creates new firms when local opportunities arise? *National Bureau of Economic Research* Working Paper 25112*.*

Betcherman, G., Dar, A., and Olivas, K. (2004). Impacts of active labour market programmes: New evidence from evaluations with particular attention to developing and transition countries.

Bilal, A., and Känzig, D. R. (2024). The Macroeconomic Impact of Climate Change: Global vs. Local Temperature. *National Bureau of Economic Research* Working Paper 32450.

Blakeslee, D., Fishman, R., and Srinivasan, V. (2020). Way down in the hole: Adaptation to long-term water loss in rural India. *American Economic Review*, 110(1), 200-224.

Blalock, G., and Gertler, P. J. (2004). Learning from exporting revisited in a less developed setting. *Journal of Development Economics,* 75(2), 397-416.

Blattman, C., and Dercon, S. (2018). The impacts of industrial and entrepreneurial work on income and health: Experimental evidence from Ethiopia. *American Economic Journal: Applied Economics*, 10(3), 1-38.

Blattman, C., Fiala, N., and Martinez S. (2020). The long-term impacts of grants on poverty: Nine-year evidence from Uganda's Youth Opportunities Program. *American Economic Review: Insights*, 2(3), 287-304.

Blomström, M., and Persson, H. (1983). Foreign investment and spillover efficiency in an underdeveloped economy: evidence from the Mexican manufacturing industry. *World Development*, 11(6), 493-501.

Blomström, M., and Persson, H. (1983). Foreign investment and spillover efficiency in an underdeveloped economy: evidence from the Mexican manufacturing industry. *World Development*, 11(6), 493-501.

Bloom, N., and Van Reenen, J. (2007). Measuring and explaining management practices across firms and countries. *The Quarterly Journal of Economics*, 122(4), 1351-1408.

Bloom, N., and Van Reenen, J. (2010). Why do management practices differ across firms and countries?. *Journal of Economic Perspectives*, 24(1), 203-24.

Bloom, N., Eifert, B., Mahajan, A., McKenzie, D., and Roberts, J. (2013). Does management matter? Evidence from India. *The Quarterly Journal of Economics*, 128(1), 1-51.

Bloom, N., Genakos, C., Sadun, R., and Van Reenen, J. (2012). Management practices across firms and countries. *Academy of Management Perspectives*, 26(1), 12-33.

Bloom, N., Lemos, R., Sadun, R., Scur, D., and Van Reenen, J. (2014). JEEA-FBBVA Lecture 2013: The new empirical economics of management. *Journal of the European Economic Association*, 12(4), 835-876.

Bloom, N., Mahajan, A., McKenzie, D., and Roberts, J. (2020). Do management interventions last? Evidence from India. *American Economic Journal: Applied Economics*, 12(2), 198-219.

Bloom, N., Mahajan, A., McKenzie, D., and Roberts, J. (2020). Do management interventions last? Evidence from India. *American Economic Journal: Applied Economics*, 12(2), 198-219.

Bloom, N., Sadun, R., and Van Reenen, J. (2016). Management as a Technology? *National Bureau of Economic Research* Working Paper 22327.

Bloomberg - Are you a robot? (2024, March 11).

Blouin, A., and Macchiavello, R. (2019). Strategic default in the international coffee market. *The Quarterly Journal of Economics*, 134(2), 895-951.

Blum, B.S., Claro, S., and Horstmann, I.J. (2010). Intermediation and the Nature of Trade Costs: Theory and Evidence.

Boehm, J., and Oberfield, E. (2020). Misallocation in the market for inputs: Enforcement and the organization of production. *Sciences Po Economics Discussion Papers*.

Bonilla Cedrez, C., Chamberlin, J., Guo, Z., and Hijmans, R. J. (2020). Spatial variation in fertilizer prices in Sub-Saharan Africa. *PLOS ONE*, 15(1), e0227764.

Borusyak, K., and Jaravel, X. (2018). The Distributional Effects of Trade: Theory and Evidence from the United States. Working Paper

Boudreau, L. (2022). Multinational enforcement of labor law: Experimental evidence on strengthening occupational safety and health (OSH) committees. *CEPR Discussion Paper* 17579.

Boudreau, L., Cajal-Grossi, J., and Macchiavello, R. (2023). Global Value Chains in Developing Countries: A Relational Perspective from Coffee and Garments. *The Journal of Economic Perspectives*, 37(3), 59–86.

Brambilla, I., Lederman, D., and Porto, G. (2012). Exports, export destinations, and skills. *American Economic Review*, 102(7), 3406-38.

Brandt, L., Van Biesebroeck, J., Wang, L., and Zhang, Y. (2017). WTO accession and performance of Chinese manufacturing firms. , 107(9), 2784-2820.

Broda, C., Limao, N., and Weinstein, D. E. (2008). Optimal tariffs and market power: the evidence. *American Economic Review*, 98(5), 2032-65.

Broda, C., Limao, N., and Weinstein, D. E. (2008). Optimal tariffs and market power: the evidence. *American Economic Review*, 98(5), 2032-65.

Brooks, L., Gendron-Carrier, N., and Rua, G. (2021). The local impact of containerization. *Journal of Urban Economics*, 126, Article C.

Brooks, W., and Donovan, K. (2017). Eliminating Uncertainty in Market Access: The Impact of New Bridges in Rural Nicaragua. In Understanding Productivity Growth in Agriculture. *University of Chicago Press*.

Brooks, W., Donovan, K., and Johnson, T. R. (2018). Mentors or teachers? Microenterprise training in Kenya. *American Economic Journal: Applied Economics*, 10(4), 196-221

Brucal, A., Javorcik, B., and Love, I. (2019). Good for the environment, good for business: Foreign acquisitions and energy intensity. *Journal of International Economics*, 121, 103247.

Bruhn, M., Karlan, D., and Schoar, A. (2018). The impact of consulting services on small and medium enterprises: Evidence from a randomized trial in mexico. *Journal of Political Economy*, 126(2), 635-687.

Bryan, G., and Morten, M. (2019). The aggregate productivity effects of internal migration: Evidence from Indonesia. *Journal of Political Economy*, 127(5), 000-000.

Bryan, G., Karlan, D., and Osman, A. (2023). Big Loans to Small Businesses: Predicting Winners and Losers in an Entrepreneurial Lending Experiment. *SSRN.*

Buera, F. J., Kaboski, J. P., and Shin, Y. (2011). Finance and development: A tale of two sectors. *American Economic Review*, 101(5), 1964-2002.

Burke, M., Hsiang, S. M., and Miguel, E. (2015). Global non-linear effect of temperature on economic production. *Nature*, 527(7577), 235-239.

Burlig, F., and Preonas, L. (2024). Out of the darkness and into the light? Development effects of rural electrification. *Journal of Political Economy*.

Busso, M., and Galiani, S. (2019). The causal effect of competition on prices and quality: Evidence from a field experiment. *American Economic Journal: Applied Economics*, 11(1), 33-56.

Busso, M., Madrigal, L., and Pagés, C. (2013). Productivity and resource misallocation in Latin America1. *The BE Journal of Macroeconomics*, 13(1), 903-932.

Bustos, P. (2011). Trade liberalization, exports, and technology upgrading: Evidence on the impact of MERCOSUR on Argentinian firms. *American Economic Review*, 101(1), 304-40.

Bustos, P., Caprettini, B., and Ponticelli, J. (2016). Agricultural productivity and structural transformation: Evidence from Brazil. *American Economic Review*, 106(6), 1320-65.

Bustos, P., Vincenzi, J. M. C., Monras, J., and Ponticelli, J. (2019). Structural Transformation, Industrial Specialization, and Endogenous Growth. *National Bureau of Economic Research* Working Paper 25871.

Cadot, O., Fernandes, A. M., Gourdon, J., and Mattoo, A. (2015). Are the benefits of export support durable? Evidence from Tunisia. *Journal of International Economics*, 97(2), 210-224.

Cagé, J., and Gadenne, L. (2018). Tax revenues and the fiscal cost of trade liberalization, 1792– 2006. *Explorations in Economic History*, 70, 1-24.

Cai, J., and Szeidl, A. (2017). Interfirm relationships and business performance. *The Quarterly Journal of Economics*, 133(3), 1229-1282.

Caicedo, S., Espinosa, M., and Seibold, A. (2022). Unwilling to train?—Firm responses to the Colombian apprenticeship regulation. *Econometrica*, 90(2), 507–550.

Cajal-Grossi, J., Macchiavello, R., and Noguera, G. (2023). Buyers' sourcing strategies and suppliers' markups in Bangladeshi garments. *The Quarterly Journal of Economics*, 138(4), 2391–2450.

Campante, F., and Yanagizawa-Drott, D. (2017). Long-range growth: economic development in the global network of air links. *The Quarterly Journal of Economics*, 133(3), 1395-1458.

Campos, F., Frese, M., Goldstein, M., Iacovone, L., Johnson, H. C., McKenzie, D., and Mensmann, M. (2018). Is Personal Initiative Training a Substitute or Complement to the Existing Human Capital of Women? Results from a Randomized Trial in Togo. *American Economics Association: Papers and Proceedings,* 108, 256–261.

Card, D., Devicienti, F., and Maida, A. (2013). Rent-sharing, holdup, and wages: Evidence from matched panel data. *Review of Economic Studies*, 81(1), 84-111.

Card, D., Ibarrarán, P., Regalia, F., Rosas-Shady, D., and Soares, Y. (2011). The labour market impacts of youth training in the Dominican Republic. *Journal of Labour Economics*, 29(2), 267-300.

Carranza, E., Garlick, R., Orkin, K., and Rankin, N. (2022). Job search and hiring with limited information about workseekers' skills. *American Economic Review*, 112(11), 3547–3583.

Carter, M. R., Laajaj, R., and Yang, D. (2013). The Impact of Voucher Coupons on the Uptake of Fertilizer and Improved Seeds: Evidence from a Randomized Trial in Mozambique. *American Journal of Agricultural Economics*, 95(5), 1345–1351.

Casaburi, L., and Reed, T. (2014). Interlinked transactions and pass-through: Experimental evidence from Sierra Leone. *Stanford Institute for Economic Policy Research.*

Casaburi, L., Glennerster, R., and Suri, T. (2013). Rural roads and intermediated trade: Regression discontinuity evidence from Sierra Leone. *SSRN.*

Caselli, F. (2005). Accounting for cross-country income differences. *Handbook of economic growth*, 1, 679-741.

Castro-Vincenzi, J., Khanna, G., Morales, N., and Pandalai-Nayar, N. (2024). Weathering the Storm: Supply Chains and Climate Risk. *National Bureau of Economic Research* Working Paper 32218.

Caunedo, J., and Kala, N. (2022). Mechanizing agriculture. *National Bureau of Economic Research* Working Paper 29061.

Caunedo, J., and Keller, E. (2021). Capital obsolescence and agricultural productivity. *The Quarterly Journal of Economics*, 136(1), 505–561.

Chalendard, C., Raballand, G., and Rakotoarisoa, A. (2019). The use of detailed statistical data in customs reforms: The case of Madagascar. *Development Policy Review*, 37(4), 546-563.

Chang, T. Y., Graff Zivin, J., Gross, T., and Neidell, M. (2019). The effect of pollution on worker productivity: Evidence from call center workers in China. *American Economic Journal: Applied Economics*, 11(1), 151-172.

Chatterjee, S. (2023). Market power and spatial competition in rural India. ***The Quarterly Journal of Economics***, 138(3), 1649–1711.

Chen, C., Restuccia, D., and Santaeulalia-Llopis, R. (2022). The effects of land markets on resource allocation and agricultural productivity. ***Review of Economic Dynamics***, 45, 41-54.

Chiquiar, D. (2008). Globalization, regional wage differentials and the Stolper–Samuelson Theorem: Evidence from Mexico. ***Journal of International Economics***, 74(1), 70-93.

Clausing, K. A., and Wolfram, C. (2023). Carbon Border Adjustments, Climate Clubs, and Subsidy Races When Climate Policies Vary. ***Journal of Economic Perspectives***, 37(3), 137–162.

Clemens, M. A., and Williamson, J. G. (2001). A tariff-growth paradox? Protection's impact the world around 1875-1997. ***National Bureau of Economic Research*** Working Paper 8459***.***

Clerides, S. K., Lach, S., and Tybout, J. R. (1998). Is learning by exporting important? Micro- dynamic evidence from Colombia, Mexico, and Morocco. ***The Quarterly Journal of Economics***, 113(3), 903-947.

Cole, M. A., Elliott, R. J. R., and Zhang, L. (2017). Foreign Direct Investment and the Environment. ***Annual Review of Environment and Resources***, 42(1), 465-487.

Colmer, J. (2021). Temperature, labor reallocation, and industrial production: Evidence from India. ***American Economic Journal: Applied Economics***, 13(4), 101-124.

Comin, D., and Hobijn, B. (2010). An exploration of technology diffusion. ***American Economic Review,*** 100(5), 2031-59.

Conley, T. G., and Udry, C. R. (2010). Learning about a new technology: Pineapple in Ghana. ***American Economic Review,*** 100(1), 35-69.

Conte, B., Desmet, K., Nagy, D. K., and Rossi-Hansberg, E. (2020). Local sectoral specialization in a warming world. Working Papers 1221. Barcelona School of Economics.

Cordaro, F., Fafchamps, M., Mayer, C., Meki, M., Quinn, S., and Roll, K. (2022). Microequity and mutuality: Experimental evidence on credit with performance-contingent repayment. ***National Bureau of Economic Research*** Working Paper 30411***.***

Coşar, A. K., and Fajgelbaum, P. D. (2016). Internal Geography, international trade, and regional specialization. ***American Economic Journal. Microeconomics***, 8(1), 24–56.

Coşar, A. K., and Demir, B. (2016). Domestic road infrastructure and international trade: Evidence from Turkey. ***Journal of Development Economics,*** 118, 232-244.

Coşar, A. K., and Demir, B. (2018). Shipping inside the box: Containerization and trade. ***Journal of International Economics***, 114, 331-345.

Costa, F., Forge, F., Garred, J., and Pessoa, J. P. (2023). The impact of climate change on risk and return in Indian agriculture. ***Environmental and Resource Economics***, 85(1), 1-27. Springer.

Costinot, A., Donaldson, D., and Smith, C. M. (2016). Evolving comparative advantage and the impact of climate change in agricultural markets: Evidence from 1.7 million fields around the world. ***Journal of Political Economy***, 124(1), 205–248.

Couture, V., Faber, B., Gu, Y., and Liu, L. (2018). E-commerce integration and economic development: evidence from China. ***National Bureau of Economic Research*** Working Paper 24384***.***

Crépon, B., Devoto, F., Duflo, E., and Parienté, W. (2015). Estimating the impact of microcredit on those who take it up: Evidence from a randomized experiment in Morocco. ***American Economic Journal: Applied Economics***, 7(1), 123-150.

Crescenzi, R., and Harman, O. (2022). Harnessing Global Value Chains for Regional Development: How to Upgrade through Regional Policy, FDI and Trade. 4(1).

Crescenzi, R., and Limodio, N. (2021). The impact of Chinese FDI in Africa: Evidence from Ethiopia. ***Geography and Environment Discussion Paper Series (22)***. Department of Geography and Environment, London School of Economics.

Crouzet, N., Gupta, A., and Mezzanotti, F. (2023). Shocks and technology adoption: Evidence from electronic payment systems. Working Paper.

Cunguara, B., and Moder, K. (2011). Is agricultural extension helping the poor? Evidence from rural Mozambique. ***Journal of African Economies***, 20(4), 562-595.

Cunha, M., Osório, C., António, M., and Ribeiro, R. (2018). Endogenous product design and quality with rationally inattentive consumers. Working Paper.

Dalton, P., Pamuk, H., Ramrattan, R., van Soest, D., and Uras, B. (2019). Transparency and financial inclusion: Experimental evidence from mobile money (revision of CentER DP 2018-042), No 2019-032, Discussion Paper, Tilburg University, Center for Economic Research.

Dar, M. H., Zaidi, N. W., Waza, S. A., et al. (2018). No yield penalty under favorable conditions paving the way for successful adoption of flood tolerant rice. ***Scientific Reports***, 8, 9245.

Das, S., Krishna, K., Lychagin, S., and Somanathan, R. (2013). Back on the rails: competition and productivity in state-owned industry. ***American Economic Journal: Applied Economics***, 5(1), 136-62.

Das, S., Roberts, M. J., and Tybout, J. R. (2007). Market entry costs, producer heterogeneity, and export dynamics. ***Econometrica***, 75(3), 837-873.

Dasgupta, S., van Maanen, N., Gosling, S. N., Piontek, F., Otto, C., and Schleussner, C.-F. (2021). Effects of climate change on combined labour productivity and supply: An empirical, multi-model study. ***The Lancet Planetary Health***.

De Loecker, J. (2007). Do exports generate higher productivity? Evidence from Slovenia. ***Journal of International Economics***, 73(1), 69-98.

De Loecker, J. (2013). Detecting learning by exporting. ***American Economic Journal: Microeconomics***, 5(3), 1-21.

De Loecker, J., Goldberg, P. K., Khandelwal, A. K., and Pavcnik, N. (2016). Prices, markups, and trade reform. *Econometrica*, 84(2), 445-510.

De Mel, S., Callen, M., McIntosh, C., and Woodruff, C. (2019). What are the headwaters of formal savings? Experimental evidence from Sri Lanka. *Review of Economic Studies*.

De Mel, S., McKenzie, D., and Woodruff, C. (2008). Returns to capital in microenterprises: evidence from a field experiment. *The Quarterly Journal of Economics*, 123(4), 1329-1372.

De Mel, S., McKenzie, D., and Woodruff, C. (2009). Are women more credit constrained? Experimental evidence on gender and microenterprise returns. *American Economic Journal: Applied Economics*, 1(3), 1-32.

De Mel, S., McKenzie, D., and Woodruff, C. (2012). One-time transfers of cash or capital have long-lasting effects on microenterprises in Sri Lanka. *Science*, 335(6071), 962-966.

De Mel, S., McKenzie, D., and Woodruff, C. (2016). Labour drops: Experimental evidence on the return to additional labour in microenterprises. *The World Bank*.

De Rochambeau, G. (2017). Monitoring and intrinsic motivation: Evidence from Liberia's trucking firms. Working Paper.

Deleidi, M., Mazzucato, M., and Semieniuk, G. (2020). Neither crowding in nor out: Public direct investment mobilising private investment into renewable electricity projects. *Energy Policy*, 140, 111195.

Demena, B. A., and van Bergeijk, P. A. (2017). A meta-analysis of FDI and productivity spillovers in developing countries. *Journal of Economic Surveys*, 31(2), 546-571.

Demir, B., and Javorcik, B. (2020). Trade policy changes, tax evasion and Benford's law. *Journal of Development Economics*, 144, Article C.

Demir, B., Fieler, C., Xu, D. Y., and Yang, K. K. (2023). O-Ring production networks. *Journal of Political Economy*.

Dercon, S., and Christiaensen, L. (2011). Consumption risk, technology adoption and poverty traps: Evidence from Ethiopia. *Journal of Development Economics*, 96(2), 159-173.

Deschenes, O. (2023). Temperature, productivity, and income. *IZA World of Labor*, 505.

Dhingra, S., and Tenreyro, S. (2017). Piggy-back exporting, intermediation, and the distributional gains from trade in agricultural markets. Working Paper.

Diffenbaugh, N. S., and Burke, M. (2019). Global warming has increased global economic inequality. *Proceedings of the National Academy of Sciences*, 116(20), 9808–9813.

Dinkelman, T. (2011). The effects of rural electrification on employment: New evidence from South Africa. *American Economic Review*, 101(7), 3078-3108.

Dix-Carneiro, R. (2014). Trade liberalization and labour market dynamics. *Econometrica*, 82(3), 825-885.

Dix-Carneiro, R., and Kovak, B. K. (2019). Margins of labour market adjustment to trade. *Journal of International Economics*, 117, 125-142.

Djankov, S., Freund, C., and Pham, C. S. (2010). Trading on time. *The Review of Economics and Statistics*, 92(1), 166-173.

Dlugosch, T. J., Klinger, B., Frese, M., and Klehe, U. C. (2018). Personalityşbased selection of entrepreneurial borrowers to reduce credit risk: Two studies on prediction models in lowşand highşstakes settings in developing countries. *Journal of Organizational Behavior*, 39(5), 612- 628.

Donaldson, D. (2018). Railroads of the Raj: Estimating the impact of transportation infrastructure. *American Economic Review*, 108(4-5), 899-934.

Donovan, K., Lu, W. J., and Schoellman, T. (2020). Labour market dynamics and development. Discussion Paper, 1071, *Yale University, Economic Growth Centre (EGC)*.

Dragusanu, R., Giovannucci, D., and Nunn, N. (2014). The Economics of Fair Trade. *Journal of Economic Perspectives*, 28(3), 217–236.

Dragusanu, R., Montero, E., and Nunn, N. (2022). The effects of Fair Trade certification: Evidence from coffee producers in Costa Rica. *Journal of the European Economic Association*, 20(4), 1743-1790.

Drexler, A., Fischer, G., and Schoar, A. (2014). Keeping it simple: Financial literacy and rules of thumb. *American Economic Journal: Applied Economics*, 6(2), 1-31.

Ducruet, C., Juhász, R., Nagy, D. K., and Steinwender, C. (2019). All aboard: The aggregate effects of port development. *Economics Working Papers 1708*. Department of Economics and Business, Universitat Pompeu Fabra. Revised January 2022.

Duflo, E., and Suri, T. (2010). Diffusion of technologies within social networks, evidence from a coffee training program in Rwanda. *International Growth Centre* Ref No. F-4001- RWA-1.

Duflo, E., Greenstone, M., Pande, R., and Ryan, N. (2018). The value of regulatory discretion: Estimates from environmental inspections in India. *Econometrica*.

Duflo, E., Greenstone, M., Pande, R., and Ryan, N. (2018). The value of regulatory discretion: Estimates from environmental inspections in India. *Econometrica*.

Dugoua, E., and Dumas, M. (2021). Green product innovation in industrial networks: A theoretical model. *Journal of Environmental Economics and Management*, 107(C). Elsevier.

Easterly, W., Reshef, A., and Schwenkenberg, J. (2009). The power of exports. *The World Bank.*

Edmond, C., Midrigan, V., and Xu, D. Y. (2015). Competition, markups, and the gains from international trade. *American Economic Review*, 105(10), 3183–3221.

Egger, H., Kreickemeier, U., and Richter, P. M. (2021). Environmental Policy and Firm Selection in the Open Economy. *Journal of the Association of Environmental and Resource Economists*, 8(4), 655-690.

Emerick, K., de Janvry, A., Sadoulet, E., and Dar, M. H. (2016). Technological innovations, downside risk, and the modernization of agriculture. *The American Economic Review*, 106(6), 1537-1561.

Eslava, M., Haltiwanger, J. C., and Pinzón, A. (2019). Job creation in Colombia vs the US:"up or out dynamics" meets "the life cycle of plants" *National Bureau of Economic Research* Working Paper 25550.

Evans, P. B. (1999). Embedded autonomy: States and industrial transformation. *Princeton University Press.*

Evans, P. B., and Tigre, P. B. (1989). Going beyond clones in Brazil and Korea: a comparative analysis of NIC strategies in the computer industry. *World Development*, 17(11), 1751-1768.

Fafchamps, M., and Hill, R. V. (2008). Price transmission and trader entry in domestic commodity markets. *Economic Development and Cultural Change*, 56(4), 729-766.

Fafchamps, M., and Quinn, S. (2017). Aspire. *The Journal of Development Studies*, 53(10), 1615-1633.

Fafchamps, M., and Quinn, S. (2018). Networks and manufacturing firms in africa: Results from a randomized field experiment. *The World Bank Economic Review*, 32(3), 656-675.

Fafchamps, M., and Woodruff, C. (2017). Identifying gazelles: Expert panels vs. surveys as a means to identify firms with rapid growth potential. *The World Bank Economic Review*, (31)3, 670-686*.*

Fafchamps, M., McKenzie, D., Quinn, S., and Woodruff, C. (2014). Microenterprise growth and the flypaper effect: Evidence from a randomized experiment in Ghana. *Journal of Development Economics*, 106, 211-226.

Fajgelbaum, P. D., and Khandelwal, A. K. (2016). Measuring the unequal gains from trade. *The Quarterly Journal of Economics*, 131(3), 1113- 1180.

Fajgelbaum, P., and Redding, S. (2018). Trade, Structural Transformation and Development: Evidence from Argentina 1869-1914. *National Bureau of Economic Research* Working Paper 20217.

Farrokhi, F., and Lashkaripour, A. (2022). Can Trade Policy Mitigate Climate Change? *STEG Working Paper Series*.

Fernando, A., Nilesh, N., Singh, N., and Tourek, G. (2023). Hiring frictions and the promise of online job portals: Evidence from India. *American Economic Review: Insights*, 5(4), 546-562.

Ferraz, C., Finan, F., and Szerman, D. (2015). Procuring firm growth: the effects of government purchases on firm dynamics. *National Bureau of Economic Research* Working Paper 21219*.*

Fiala, N. (2014). Skills Training for Entrepreneurs in developing countries (No. 37). *DIW Roundup: Politik im Fokus*.

Field, E., Pande, R., Papp, J., and Rigol, N. (2013). Does the classic microfinance model discourage entrepreneurship among the poor? Experimental evidence from India. *American Economic Review*, 103(6), 2196-2226.

Fieler, A. C., Eslava, M., and Xu, D. Y. (2018). Trade, quality upgrading, and input linkages: Theory and evidence from Colombia. *American Economic Review*, 108(1), 109-46

Fieler, A. C., Eslava, M., and Xu, D. Y. (2018). Trade, quality upgrading, and input linkages: Theory and evidence from Colombia. *American Economic Review*, 108(1), 109-46.

Fischer, G. (2013). Contract Structure, Risķ Sharing, and Investment Choice. *Econometrica*, 81(3), 883-939.

Fisher-Vanden, K., Mansur, E. T., and Wang, Q. J. (2015). Electricity shortages and firm productivity: evidence from China's industrial firms. *Journal of Development Economics*, 114, 172-188.

Fisman, R., and Wei, S. J. (2004). Tax rates and tax evasion: evidence from "missing imports" in China. *Journal of Political Economy*, 112(2), 471-496.

Foster, A. D., and Rosenzweig, M. R. (1995). Learning by doing and learning from others: Human capital and technical change in agriculture. *Journal of Political Economy*, 103(6), 1176-1209.

Foster, A. D., and Rosenzweig, M. R. (2010). Microeconomics of technology adoption. *Annual Review of Economics*, 2(1), 395-424.

Fowlie, M., Greenstone, M., and Wolfram, C. (2015). Are the non-monetary costs of energy efficiency investments large? Understanding low take-up of a free energy efficiency program. *American Economic Review*, 105(5), 201-204.

Fowlie, M., Greenstone, M., and Wolfram, C. (2018). Do energy efficiency investments deliver? Evidence from the Weatherization Assistance Program. *The Quarterly Journal of Economics*, 133(3), 1597-1644.

Fowlie, M., Petersen, C., and Reguant, M. (2021). Border Carbon Adjustments When Carbon Intensity Varies across Producers: Evidence from California. *American Economics Association: Papers and Proceedings*, 111, 401-405.

Franklin, S. (2018). Location, search costs and youth unemployment: A randomized trial of transport subsidies. *The Economic Journal*, 128(614), 2353-2379

Freund, C., and Pierola, M. D. (2012). Export superstars. *World Bank.*

Fried, S. (2018). Stuck in a corner? Climate policy in developing countries. *Macroeconomic Dynamics*.

Fried, S., and Lagakos, D. (2023). Electricity and firm productivity: A general-equilibrium approach. *American Economic Journal: Macroeconomics* (Forthcoming).

Fritz Foley, C., and Manova, K. (2015). International trade, multinational activity, and corporate finance. *Annual Reviews of Economics*, 7(1), 119- 146.

Garcia-Marin, A., and Voigtländer, N. (2019). Exporting and plant-level efficiency gains: It's in the measure. *Journal of Political Economy*, 127(4), 000-000.

Garcia-Santana, M., and Pijoan-Mas, J. (2014). The reservation laws in India and the misallocation of production factors. *Journal of Monetary Economics*, 66, 193-209.

Gawande, K., and Krishna, P. (2003). The political economy of trade policy: Empirical approaches. *Handbook of International Trade*, 213-250.

Gebresilasse, M. (2023). Rural roads, agricultural extension, and productivity. *Journal of Development Economics*, 162, 103048.

Gerschenkron, A. (1962). Economic backwardness in historical perspective: a book of essays (No. 330.947 G381). *Cambridge, MA: Belknap Press of Harvard University Press*.

Ghani, E., Kerr, W. R., and O'connell, S. (2014). Spatial determinants of entrepreneurship in India. *Regional Studies*, 48(6), 1071-1089.

Ghani, T., and Reed, T. (2022). Relationships on the rocks: Contract evolution in a market for ice. *American Economic Journal: Microeconomics*, 14(1), 330-365.

Ghezzi, P. (2017). Mesas Ejecutivas in Peru: Lessons for Productive Development Policies. *Global Policy*, 8(3), 369-380.

Giné, X., and Klonner, S. (2008). Credit constraints as a barrier to technology adoption by the poor: Lessons from south indian small-scale fisheries. In Globalization and the Poor in Asia (pp. 221- 249). Palgrave Macmillan, London.

Giné, X., and Yang, D. (2009). Insurance, credit, and technology adoption: Field experimental evidence from Malawi. *Journal of Development Economics*, 89(1), 1-11.

Giorcelli, M. (2019). The long-term effects of management and technology transfers. *American Economic Review*, 109(1), 121-52.

Global Carbon Budget. (2023). Annual CO_2 emissions – GCB [dataset]. Global Carbon Project. Major processing by Our World in Data.

Goldberg, P. K., and Reed, T. (2023). Presidential Address: Demand-Side Constraints in Development. The Role of Market Size, Trade, and (In)Equality. *Econometrica*, 91(6), 1915-1950.

Goldberg, P. K., and Reed, T. (2023). Presidential address: Demand-side constraints in development. The role of market size, trade, and (in)equality. *Econometrica*, 91(6), 1915-1950.

Goldberg, P. K., and Maggi, G. (1999). Protection for sale: An empirical investigation. *American Economic Review*, 89(5), 1135-1155.

Goldberg, P. K., and Pavcnik, N. (2007). Distributional effects of globalization in developing countries. *Journal of Economic Literature*, 45(1), 39-82.

Goldberg, P. K., and Pavcnik, N. (2016). The effects of trade policy. Handbook of Commercial Policy (Vol. 1, pp. 161-206). North-Holland.

Goldberg, P. K., Khandelwal, A. K., Pavcnik, N., and Topalova, P. (2010). Imported intermediate inputs and domestic product growth: Evidence from India. *The Quarterly Journal of Economics*, 125(4), 1727-1767.

Gollin, D., Asher, S., Campion, A., and Novosad, P. (2022). The long-run development impacts of agricultural productivity gains: Evidence from irrigation canals in India. *CEPR Discussion Papers* 17414.

Gollin, D., Lagakos, D., and Waugh, M. E. (2013). The agricultural productivity gap. *The Quarterly Journal of Economics*, 129(2), 939-993.

Gollin, D., Parente, S., and Rogerson, R. (2002). The role of agriculture in development. *American Economic Review*, 92(2), 160-164.

Gonzales, L. E., Ito, K., and Reguant, M. (2023). The dynamic impact of market integration: Evidence from renewable energy expansion in Chile. *Econometrica*.

Gonzalez-Uribe, J., and Leatherbee, M. (2017). The effects of business accelerators on venture performance: Evidence from start-up chile. *The Review of Financial Studies*, 31(4), 1566-1603.

Gopinath, G., and Neiman, B. (2014). Trade adjustment and productivity in large crises. *American Economic Review*, 104(3), 793-831.

Graff Zivin, J., and Neidell, M. (2012). The impact of pollution on worker productivity. *American Economic Review*, 102(7), 3652-3673.

Graff Zivin, J., and Neidell, M. (2014). Temperature and the allocation of time: Implications for climate change. *Journal of Labor Economics*, 32(1), 1-26.

Greenstone, M., and Hanna, R. (2014). Environmental regulations, air and water pollution, and infant mortality in India. *American Economic Review*, 104(10), 3038-3072.

Greenstone, M., Pande, R., Sudarshan, A., and Ryan, N. (2023). Can pollution markets work in developing countries? Experimental evidence from India. *Warwick Economics Working Paper* No. 1453.

Grimm, M., and Paffhausen, A. L. (2015). Do interventions targeted at micro-entrepreneurs and small and medium-sized firms create jobs? A systematic review of the evidence for developing countries. *Labour Economics*, 32, 67-85.

Grossman, G. M., and Helpman, E. (1994). Protection for sale, *American Economic Review*, 84(4), 793-831.

Grubb, M., Jordan, N. D., Hertwich, E., Neuhoff, K., Das, K. R., Bandyopadhyay, K. R., van Asselt, H., Sato, M., Wang, R., Pizer, W. A., and Oh, H. (2022). Carbon Leakage, Consumption, and Trade. *Annual Review of Environment and Resources*, 47(1), 753-795.

Guner, N., Ventura, G., and Xu, Y. (2008). Macroeconomic implications of size-dependent policies. *Review of Economic Dynamics*, 11(4), 721-744.

Gupta, D., Gupta, R., Jain, K., and Momaya, K. S. (2019). International Perspectives: Case of India. Managing Mobile Technologies: An Analysis From Multiple Perspectives, 4, 87.

Haddad, M., and Harrison, A. (1993). Are there positive spillovers from direct foreign investment?: Evidence from panel data for Morocco. *Journal of Development Economics*, 42(1), 51-74.

Hall, R. E., and Jones, C. I. (1999). Why do some countries produce so much more output per worker than others?. *The Quarterly Journal of Economics*, 114(1), 83-116.

Hallward-Driemeier, M., Kochanova, A., and Rijkers, B. (2021). Does democratisation promote competition? Evidence from Indonesia [Democracy and firm productivity: Evidence from Indonesia]. *The Economic Journal*, 131(640), 3296-3321.

Halpern, L., Koren, M., and Szeidl, A. (2015). Imported inputs and productivity. *American Economic Review*, 105(12), 3660-3703.

Haltiwanger, J. C., Hyatt, H. R., Kahn, L. B., and McEntarfer, E. (2018). Cyclical job ladders by firm size and firm wage. *American Economic Journal: Macroeconomics*, 10(2), 52-85.

Hanlon, W. W. (2019). The Persistent Effect of Temporary Input Cost Advantages in Shipbuilding, 1850-1911. *NYU Stern School of Business working paper*.

Hanna, R. (2010). US Environmental Regulation and FDI: Evidence from a Panel of US-Based Multinational Firms. *American Economic Journal: Applied Economics*, 2(3), 158-189.

Hanna, R., Mullainathan, S., and Schwartzstein, J. (2014). Learning through noticing: Theory and evidence from a field experiment. *The Quarterly Journal of Economics*, 129(3), 1311-1353.

Hansen, J. D., Jensen, C., and Madsen, E. S. (2003). The establishment of the Danish windmill industry—was it worthwhile? *Review of World Economics*, 139, 324-347.

Hansman, C., Hjort, J., León, G., and Teachout, M. (2019). Vertical integration, supplier behavior, and quality upgrading among exporters. *National Bureau of Economic Research* Working Paper 23949.

Hanson, G., and Rodrik, D. (2023). How does place based policy work? Reimagining the economy program. *Harvard Kennedy School*.

Hardy, M. and Kagy, G. (2020). It's getting crowded here: Experimental evidence of demand constraints in the gender profit gap. *The Economic Journal*, 130(631), 2272-2290

Hardy, M., and McCasland, J. (2023). Are small firms labor constrained? Experimental evidence from Ghana. *American Economic Journal: Applied Economics*, 15(2), 253-284.

Hardy, M., and Mccasland, J. L. (2019). Lights off, lights on: The effects of electricity shortages on small firms. Working Paper.

Harris, R., Keay, I., and Lewis, F. (2015). Protecting infant industries: Canadian manufacturing and the national policy, 1870–1913. *Explorations in Economic History*, 56, 15-31.

Harrison, A., and Rodríguez-Clare, A. (2010). Trade, foreign investment, and industrial policy for developing countries. In *Handbook of Development Economics* (Vol. 5, 4039-4214). Elsevier.

Harrison, A., Martin, L. A., and Nataraj, S. (2017). Green industrial policy in emerging markets. *Annual Review of Resource Economics*, 9(1), 253-274.

Hausman, J., and Leibtag, E. (2007). Consumer benefits from increased competition in shopping outlets: Measuring the effect of Wal-Mart. *Journal of Applied Econometrics,* 22(7), 1157- 1177.

Hausmann, R., and Rodrik, D. (2003). Economic development as self-discovery. *Journal of Development Economics*, 72(2), 603-633.

He, J., Liu, H., and Salvo, A. (2019). Severe air pollution and labor productivity: Evidence from industrial towns in China. *American Economic Journal: Applied Economics*, 11(1), 173-201.

Helpman, E., Itskhoki, O., Muendler, M. A., and Redding, S. J. (2017). Trade and inequality: From theory to estimation. *The Review of Economic Studies*, 84(1), 357-405.

Hémous, D. (2016). The dynamic impact of unilateral environmental policies. *Journal of International Economics*, 103(C), 80-95.

Hendren, N. (2016). The policy elasticity. Tax Policy and the Economy, 30(1), 51-89.

Hensel, L., Tekleselassie, T., and Witte, M. (2022). Formalized employee search and labor demand. *SSRN*.

Hicks, J. H., Kleemans, M., Li, N. Y., and Miguel, E. (2017). Reevaluating agricultural productivity gaps with longitudinal microdata. *National Bureau of Economic Research* Working Paper 23253.

Higgins, S. (2023). Financial technology adoption: Network externalities of cashless payments in Mexico. Conditionally accepted, *American Economic Review*.

Higuchi, Y., Mhede, E. P., and Sonobe, T. (2019). Short-and medium-run impacts of management training: An experiment in Tanzania. *World Development*, 114, 220-236.

Higuchi, Y., Namb, V. H., and Sonobec, T. (2017). Management skill, entrepreneurial mindset, and enterprise survival: Evidence from randomized experiments and repeated surveys in Vietnam.

Hjort, J., and Poulsen, J. (2019). The arrival of fast internet and employment in Africa. *American Economic Review*, 109(3), 1032-79.

Hjort, J., de Rochambeau, G., Iyer, V., and Ao, F. (2024). Informational barriers to market access: Experimental evidence from Liberian firms. *National Bureau of Economic Research* Working Paper 27662.

Hnatkovska, V., Lahiri, A., and Paul, S. (2012). Castes and labour mobility. *American Economic Journal: Applied Economics*, 4(2), 274-307.

Holmes, T. J., and Schmitz Jr, J. A. (2010). Competition and productivity: a review of evidence. *Annual Review of Economics*, 2(1), 619-642.

Hopenhayn, H. A. (2014). Firms, misallocation, and aggregate productivity: A review. *Annual Review of Economics*, 6(1), 735-770.

Hopenhayn, H., and Rogerson, R. (1993). Job turnover and policy evaluation: A general equilibrium analysis. *Journal of Political Economy*, 101(5), 915-938.

Hsiao, A. (2023). Coordination and Commitment in International Climate Action: Evidence from Palm Oil. Revise and resubmit, *Econometrica*.

Hsieh, C. T., and Klenow, P. J. (2009). Misallocation and manufacturing TFP in China and India. *The Quarterly Journal of Economics*, 124(4), 1403-1448.

Hsieh, C. T., and Klenow, P. J. (2010). Development accounting. *American Economic Journal: Macroeconomics*, 2(1), 207-23.

Hsieh, C. T., and Klenow, P. J. (2014). The life cycle of plants in India and Mexico. *The Quarterly Journal of Economics*, 129(3), 1035-1084.

Hsieh, C. T., and Olken, B. A. (2014). The missing" missing middle". *Journal of Economic Perspectives*, 28(3), 89-108.

Huang, P., Negro, S., Hekkert, M., and Bi, K. (2016). How China became a leader in solar PV: An innovation system analysis. *Renewable and Sustainable Energy Reviews*, 64, 777–789.

Hultgren, A., Carleton, T., Delgado, M., Gergel, D. R., Greenstone, M., Houser, T., et al. (2022). Estimating global impacts to agriculture from climate change accounting for adaptation.

Huneeus, F. (2019). Production Network Dynamics and the Propagation of Shocks. Working Paper.

Hussam, R., Rigol, N., and Roth, B. N. (2022). Targeting High Ability Entrepreneurs Using Community Information: Mechanism Design in the Field. *American Economic Review*, 112(3), 861-898.

Iacovone, L., Javorcik, B., and Fitrani, F. (2015). Trade Integration, FDI, and Productivity.

Iacovone, L., Maloney, W., and McKenzie, D. (2022). Improving management with individual and group-based consulting: Results from a randomized experiment in Colombia [From Proof of Concept to Scaleable Policies: Challenges and Solutions, with an App]. *Review of Economic Studies*, 89(1), 346-371.

Im, H., and McLaren, J. (2023). Global value chains and labor standards: The race-to-the-bottom problem. *National Bureau of Economic Research*. Working Paper 31362.

Imbert, C., and Papp, J. (2019). Short-term Migration, Rural Public Works, and Urban Labor Markets: Evidence from India. *Journal of the European Economic Association*, 18(2), 927–963

Inter-American Development Bank. (2014). Rethinking productive development. Palgrave Macmillan, New York.

Islam, M., Ahamed, T., and Noguchi, R. (2018). Land suitability and insurance premiums: A GIS-based multicriteria analysis approach for sustainable rice production. *Sustainability*, 10(6), 1759.

Jaffe, A. B., and Stavins, R. N. (1994). The energy-efficiency gap What does it mean? *Energy Policy*, 22(10), 804-810.

Javervall, S., and Khoban, R. (2023). The impact of trade liberalization in the presence of political distortions. Job Market Paper.

Javorcik, B. J. (2004). Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages. *American Economic Review*, 94(3), 605-627.

Javorcik, B. S., and Li, Y. (2013). Do the biggest aisles serve a brighter future? Global retail chains and their implications for Romania. *Journal of International Economics*, 90(2), 348-363.

Javorcik, B. S., and Narciso, G. (2017). WTO accession and tariff evasion. *Journal of Development Economics*, 125, 59-71.

Javorcik, B., Lo Turco, A., and Maggioni, D. (2018). New and improved: Does FDI boost production complexity in host countries? *Economic Journal*, 128(614), 2507-2537.

Jayachandran, S. (2022). How economic development influences the environment. *Annual Review of Economics*, 14, 229-252.

Jedwab, R., and Storeygard, A. (2022). The average and heterogeneous effects of transportation investments: Evidence from Sub-Saharan Africa 1960–2010 [Review of the Implementation Status of the Trans African Highways and the Missing Li]. *Journal of the European Economic Association*, 20(1), 1-38.

Jensen, R. (2007). The digital provide: Information (technology), market performance, and welfare in the South Indian fisheries sector. *The Quarterly Journal of Economics*, 122(3), 879- 924.

Jensen, R. (2010). The (perceived) returns to education and the demand for schooling. *The Quarterly Journal of Economics*, 125(2), 515-548.

Jensen, R., and Miller, N. H. (2018). Market Integration, Demand, and the Growth of Firms: Evidence from a Natural Experiment in India. *American Economic Review*, 108(12), 3583-3625.

Jia, R., Ma, X., and Xie, V. W. (2022). Expecting floods: firm entry, employment, and aggregate implications. *National Bureau of Economics* Working Paper **30250.**

Jones, M., Kondylis, F., Loeser, J., and Magruder, J. (2022). Factor market failures and the adoption of irrigation in Rwanda. *American Economic ReviewNational Bureal of Economcis* 112(7), 2316-2352.

Juhász, R. (2018). Temporary protection and technology adoption: Evidence from the napoleonic blockade. *American Economic Review*, 108(11), 3339-76.

Juhász, R., and Steinwender, C. (2018). Spinning the web: The impact of ICT on trade in intermediates and technology diffusion. *National Bureau of Economic Research* Working Paper 24590.

Juhász, R., Lane, N., Oehlsen, E., and Perez, V. (2023). The who, what, when, and how of industrial policy: A text-based approach. *Center for Open Science*, Working Paper.

Kahn, M. E., and Li, P. (2019). The effect of pollution and heat on high skill public sector worker productivity in China. *National Bureau of Economic Research* Working Paper 25594.

Kahn, M. E., Mohaddes, K., Ng, R. N. C., Pesaran, M. H., Raissi, M., and Yang, J-C. (2019). Long-Term Macroeconomic Effects of Climate Change: A Cross-Country Analysis. Cambridge Working Papers in Economics 1965, *Faculty of Economics, University of Cambridge*.

Kahneman, D., and Klein, G. (2009). Conditions for intuitive expertise: a failure to disagree. *American Psychologist*, 64(6), 515.

Kala, N. (2017). Learning, adaptation, and climate uncertainty: Evidence from Indian agriculture. *MIT Center for Energy and Environmental Policy Research* Working Paper, 23.

Kalemli-Ozcan, S., and Sørensen, B. E. (2014). Misallocation, property rights, and access to finance: Evidence from within and across Africa. In African Successes, Volume III: Modernization and Development (183-211). *University of Chicago Press*.

Kalouptsidi, M. (2017). Detection and impact of industrial subsidies: The case of Chinese shipbuilding. *The Review of Economic Studies*, 85(2), 1111-1158.

Karlan, D., and Valdivia, M. (2011). Teaching entrepreneurship: Impact of business training on microfinance clients and institutions. *Review of Economics and Statistics*, 93(2), 510-527.

Karlan, D., Knight, R., and Udry, C. (2015). Consulting and capital experiments with microenterprise tailors in Ghana. *Journal of Economic Behavior and Organization*, 118, 281-302.

Kassem, D. (2021). Does electrification cause industrial development? grid expansion and firm turnover in Indonesia. ideas.repec.org.

Kee, H. L. (2015). Local intermediate inputs and the shared supplier spillovers of foreign direct investment. *Journal of Development Economics*, 112, 56-71.

Keller, W. (2004). International technology diffusion. Journal of Economic Literature, 42(3), 752-782.

Kelley, E. M., Lane, G. and Schönholzer, D. (2018). The Impact of Monitoring Technologies on Contracts and Employee Behavior: Experimental Evidence from Kenya's Transit Industry. Working Paper

Khalifah, N. A., and Adam, R. (2009). Productivity spillovers from FDI in Malaysian manufacturing: evidence from microşpanel data. *Asian Economic Journal*, 23(2), 143-167.

Khan, Adnan Q., Asim I. Khwaja, and Benjamin A. Olken. (2016). "Tax farming redux: Experimental evidence on performance pay for tax collectors". *The Quarterly Journal of Economics* 131.1 (2015): 219-271.

Khandelwal, A. K., Schott, P. K., and Wei, S. J. (2013). Trade liberalization and embedded institutional reform: Evidence from Chinese exporters. *American Economic Review*, 103(6), 2169-95.

Khanna, T., and Yafeh, Y. (2007). Business groups in emerging markets: paragons or parasites? *Journal of Economic Literature*, 45(2), 331-372.

Kirchberger, M., and Beirne, K. (2021). Concrete thinking about development. Trinity Economics Papers tep0621, *Trinity College Dublin, Department of Economics*.

Kochanova, A., Rijkers, B., and Hallward-Driemeier, M. (2018). Does Cronyism Curtail Competition? Evidence from Indonesia.

Kochhar, R., and Song, R. (2023). Does market power in local agricultural markets hinder farmer climate change adaptation? Working Paper.

Kondylis, F., Mueller, V., and Zhu, S. (2017). Seeing is believing? Evidence from an extension network experiment. *Journal of Development Economics*, 125, 1-20.

Koren, M., and Csillag, M. (2017). Machines and machinists: Importing skill-biased technology. CEU Working Papers 2017_1. ***Department of Economics, Central European University***.

Kovak, B. K. (2013). Regional effects of trade reform: What is the correct measure of liberalization? ***American Economic Review***, 103(5), 1960-1976.

Kreft, B (2023), "Information, skills and job search: A Bayesian hierarchical analysis of the impacts of reducing information frictions for unskilled jobseekers in developing countries," ***Manuscript, University of Oxford***.

Krueger, A. O., and Tuncer, B. (1982). An empirical test of the infant industry argument. The ***American Economic Review***, 72(5), 1142-1152.

Kugler, M., and Verhoogen, E. (2012). Prices, plant size, and product quality. ***The Review of Economic Studies***, 79(1), 307-339.

Lagakos, D., Mobarak, M., and Waugh, M. E. (2022). The welfare effects of encouraging rural-urban migration. Staff Report 635. ***Federal Reserve Bank of Minneapolis***.

Lagakos, D., Moll, B., Porzio, T., Qian, N., and Schoellman, T. (2018). Life cycle wage growth across countries. ***Journal of Political Economy***, 126(2), 797-849.

Lakner, C., and Milanovic, B. (2016). Global income distribution: From the fall of the Berlin Wall to the Great Recession. ***The World Bank Economic Review***, 30(2), 203–232.

Lane, N. (2020). The New Empirics of Industrial Policy. ***Journal of Industry, Competition and Trade***, 20, 209-234.

Lane, N. (2022). Manufacturing revolutions: Industrial policy and industrialization in South Korea. EconStor Preprints 235845. ZBW - ***Leibniz Information Centre for Economics***.

Lee, J. W. (1996). Government interventions and productivity growth. ***Journal of Economic Growth***, 1(3), 391-414.

Lee, K., Miguel, E., and Wolfram, C. (2020). Experimental evidence on the economics of rural electrification. ***Journal of Political Economy***, 128(4), 1523–1565.

Leone, F., Reed, T., and Macchiavello, R. (2023). The high and falling price of cement in Africa. ***American Economic Journal: Applied Economics*** (Forthcoming)***.***

Levinson, A., and Taylor, M. S. (2008). Unmasking the Pollution Haven Effect. ***International Economic Review***, 49(1), 223–254.

Lin, C., Schmid, T., and Weisbach, M. S. (2019). Climate change, operating flexibility and corporate investment decisions. ***National Bureau of Economic Research*** Working Paper 26441***.***

Lincoln, W. F., and McCallum, A. H. (2018). The rise of exporting by US firms. ***European Economic Review***, 102, 280-297.

Loreto, L., Rivero. R., and Vergara. R. (2007). Entry and prices: Evidence from the supermarket sector. **Review of Industrial Organization** 31, 237-260.

Liu, E. (2019). Industrial policies in production networks. *The Quarterly Journal of Economics*, 134(4), 1883-1948.

Liu, M., Shamdasani, Y., and Taraz, V. (2023). Climate change and labor reallocation: Evidence from six decades of the Indian census. *American Economic Journal: Economic Policy*, 15(2), 395-423.

Loiseau, J., and Walsh, C. (2015). Where credit is due. J-PAL and IPA Policy Bulletin, 1-16.

Luong, T. A. (2013). Does Learning by Exporting Happen? Evidence from the Automobile Industry in China. *Review of Development Economics*, 17(3), 461–473.

Luzio, E., and Greenstein, S. (1995). Measuring the performance of a protected infant industry: the case of Brazilian microcomputers. *The Review of Economics and Statistics*, 622-633.

Lyubich, E., Shapiro, J., and Walker, R. (2018). Regulating mismeasured pollution: Implications of firm heterogeneity for environmental policy. *American Economics Association: Papers and Proceedings*, 108, 136-142.

McKenzie. D., Campos, F., Frese, M., Goldstein, M., Iacovone, L., Johnson, H., and Mensmann, M. (2017). Teaching personal initiative beats traditional training in boosting small business in West Africa. *Science*, 357(6357), 1287-1290.

Macchiavello, L. B. and. J. C. and. R. (2023). Global Value Chains in Developing Countries: A Relational Perspective from Coffee and Garments. ideas. repec.org.

Macchiavello, R. (2008). Public sector motivation and development failures. *Journal of Development Economics*, 86(1), 201-213.

Macchiavello, R. (2010). Development uncorked: Reputation acquisition in the new market for Chilean wines in the UK. *CEPR Discussion Papers* 7698.

Macchiavello, R., and Miquel-Florensa, J. (2019). Buyer-Driven Upgrading in GVCs: The Sustainable Quality Program in Colombia. *SSRN*.

Macchiavello, R., and Morjaria, A. (2015). The value of relationships: evidence from a supply shock to Kenyan rose exports. *American Economic Review*, 105(9), 2911-45.

Macchiavello, R., Menzel, A., Rabbani, A., and Woodruff, C. (2015). Challenges of change: An experiment training women to manage in the Bangladeshi garment sector. Economic Research Papers 269725, *University of Warwick - Department of Economics*.

Macchiavello, R., Nasir, R., and Teschemecher, C. (2023). Evidence review for agricultural SME finance. *IGC Synthesis paper*.

Macchiavello, R., Rabbani, A., and Woodruff, C. (2015). The market for training services: a demand experiment with Bangladeshi garment factories. *American Economic Review: Papers and Proceedings*, 105(5), 300-304.

Maffioli, A., McKenzie, D., and Ubfal, D. (2020). Estimating the demand for business training: Evidence from Jamaica. *World Bank Policy Research* Working Paper 9415.

Magruder, J. R. (2018). An assessment of experimental evidence on agricultural technology adoption in developing countries. ***Annual Review of Resource Economics***, 10, 299-316.

Majerovitz, J. (2023). Misallocation and the Selection Channel. Working paper.

Manelici, I., Vasquez, J. P., and Zárate, R. D. (2024). The gains from foreign multinationals in an economy with distortions. Working Paper.

Martin, L. A., Nataraj, S., and Harrison, A. E. (2017). In with the big, out with the small: Removing small-scale reservations in India. ***American Economic Review***, 107(2), 354-86.

Martínez, A., Puentes, E., and Ruiz-Tagle, J. (2018). The effects of micro-entrepreneurship programmes on labour market performance: experimental evidence from Chile. ***American Economic Journal: Applied Economics***, 10(2), 101-24.

Masuda, Y. J., Garg, T., Anggraeni, I., et al. (2021). Warming from tropical deforestation reduces worker productivity in rural communities. ***Nature Communications***, 12, 1601

McCaig, B., and Pavcnik, N. (2018). Export markets and labour allocation in a low-income country. ***American Economic Review***, 108(7), 1899-1941.

McKenzie, D (2017). Identifying and Spurring High-Growth Entrepreneurship: Experimental Evidence from a Business Plan Competition, ***American Economic Review***, 107 (8), 2278-2307.

McKenzie, D. (2021). Small business training to improve management practices in developing countries: Re-assessing the evidence for 'training doesn't work.' ***Oxford Review of Economic Policy***, 37(2), 276–301.

McKenzie, D., and Puerto, S. (2021). Growing markets through business training for female entrepreneurs: A market-level randomized experiment in Kenya. ***American Economic Journal: Applied Economics***, 13(2), 297-332.

McKenzie, D., and Woodruff, C. (2021, August 1). Training entrepreneurs. ***VoxDevLit***, 1(2).

McKenzie, D., and Sansone, D. (2017). Man vs. machine in predicting successful entrepreneurs: Evidence from a business plan competition in Nigeria. ***The World Bank***,.

McKenzie, D., and Woodruff, C. (2008). Experimental evidence on returns to capital and access to finance in Mexico. ***The World Bank Economic Review***, 22(3), 457-482.

McKenzie, D., and Woodruff, C. (2014). What are we learning from business training and entrepreneurship evaluations around the developing world? ***The World Bank Research Observer***, 29(1), 48-82.

McKenzie, D., and Woodruff, C. (2017). Business practices in small firms in developing countries, ***Management Science***, 63 (9), 2967-2981

McKenzie, D, Woodruff, C., Bjorvatn, K., Bruhn, M., Cai, J., Gonzalez-Uribe, J., Quinn, S., Sonobe, T., and Valdivia, M. (2023). Training Entrepreneurs. ***VoxDevLit***, 1(3).

McLaren, J., Abman, R., Lundberg, C., and Ruta, M. (2023). Child labour standards in regional trade agreements: Theory and evidence. *National Bureau of Economic Research*. Working Paper 30908.

McMillan, J., and Woodruff, C. (1999). Interfirm relationships and informal credit in Vietnam. *The Quarterly Journal of Economics*, 114(4), 1285- 1320.

McMillan, M., Rodrik, D., and Verduzco-Gallo, Í. (2014). Globalization, structural change, and productivity growth, with an update on Africa. *World Development*, 63(C), 11-32.

McMillan, M., Rodrik, D., and Welch, K. (2003). When economic reform goes wrong: Cashew in Mozambique. *Brookings Trade Forum*, 2003.

Meager, R. (2019). Understanding the average impact of microcredit expansions: A Bayesian hierarchical analysis of seven randomized experiments. *American Economic Journal: Applied Economics*, 11(1), 57-91.

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, 71(6), 1695- 1725.

Melitz, M. J. (2005). When and how should infant industries be protected?. *Journal of International Economics*, 66(1), 177-196.

Menezes-Filho, N. A., and Muendler, M. A. (2011). Labour reallocation in response to trade reform. *National Bureau of Economic Research* Working Paper 17372*.*

Menzel, A., and Woodruff, C. (2021). Gender wage gaps and worker mobility: Evidence from the garment sector in Bangladesh. *Labour Economics*, 71, Article 102000.

Mion, G., and Opromolla, L. D. (2014). Managers' mobility, trade performance, and wages. *Journal of International Economics*, 94(1), 85-101.

Mishra, P., Subramanian, A., and Topalova, P. (2008). Tariffs, enforcement, and customs evasion: Evidence from India. *Journal of Public Economics*, 92(10-11), 1907-1925.

Mitrunen, M. (2019). Essays on the Political Economy of Development. Job Market Paper, Stockholm University.

Mittal, S., Reich, O., and Mahajan, A. (2018, June). Who is Bogus?: Using One-Sided Labels to Identify Fraudulent Firms from Tax Returns. In Proceedings of the 1st ACM SIGCAS Conference on Computing and Sustainable Societies (p. 24). *ACM*

Miyata, S., and Sawada, Y. (2006). Credit accessibility, risk attitude, and social learning: Investment decisions of aquaculture in rural Indonesia. 2006 Annual Meeting, August 12-18, 2006, Queensland, Australia 25669. *International Association of Agricultural Economists*.

Mobarak, A. M., and Purbasari, D. P. (2006). Corrupt protection for sale to firms: Evidence from Indonesia. Working Paper.

Mobarak, A. M., and Rosenzweig, M. (2012). Selling formal insurance to the informally insured. Working Papers 1007, *Economic Growth Center, Yale University.*

Morten, M., and Oliveira, J. (2019). The effects of roads on trade and migration: Evidence from a planned capital city. *National Bureau of Economic Research* Working Paper 22158.

Moser, C. M., and Barrett, C. B. (2006). The complex dynamics of smallholder technology adoption: the case of SRI in Madagascar. *Agricultural Economics*, 35(3), 373-388.

Mrázová, M., and Neary, J. P. (2020). IO for exports(s). *International Journal of Industrial Organization*, 70, 102561.

Münch, F. A., and Scheifele, F. (2023). Nurturing national champions? Local content in solar auctions and firm innovation. *Energy Policy*, 179, 113574.

Munshi, K. (2004). Social learning in a heterogeneous population: technology diffusion in the Indian Green Revolution. *Journal of Development Economics*, 73(1), 185-213.

Munshi, K., and Rosenzweig, M. (2016). Networks and misallocation: Insurance, migration, and the rural-urban wage gap. *American Economic Review*, 106(1), 46-98.

Naidu, S., Robinson, J. A., and Young, L. E. (2021). Social origins of dictatorships: Elite networks and political transitions in Haiti. *American Political Science Review*.

Nataraj, S. (2011). The impact of trade liberalization on productivity: Evidence from India's formal and informal manufacturing sectors. *Journal of International Economics*, 85(2), 292-301.

Nath, I. (2022). Climate change, the food problem, and the challenge of adaptation through sectoral reallocation. Conference papers 333404. Purdue University, *Center for Global Trade Analysis, Global Trade Analysis Project*.

Newfarmer, R., Page, J., and Tarp, F. (Eds.). (2019). Industries without Smokestacks: Industrialization in Africa Reconsidered. *Oxford University Press*,

Nishida, M., Petrin, A., Rotemberg, M., and White, T. (2017). Are We Undercounting Reallocation's Contribution to Growth?. *US Census Bureau Center for Economic Studies Paper* No. CES- WP-13-55R.

Nordås, H. K., and Piermartini, R. (2004). Infrastructure and trade.

Notowidigdo, M. J. (2020). The incidence of local labour demand shocks. *Journal of Labour Economics*, 38(3).

O'Rourke, K. H. (2000). Tariffs and growth in the late 19th century. *The Economic Journal*, 110(463), 456-483.

Oxfam (2012). Cereal secrets: the world's largest grain traders and global agriculture.

Pallais, A. (2014). Inefficient hiring in entry-level labour markets. *American Economic Review*, 104(11), 3565-99.

Paravisini, D., Rappoport, V., Schnabl, P., and Wolfenzon, D. (2014). Dissecting the effect of credit supply on trade: Evidence from matched credit-export data. *The Review of Economic Studies*, 82(1), 333-359.

Park, A., Yang, D., Shi, X., and Jiang, Y. (2010). Exporting and firm performance: Chinese exporters and the Asian financial crisis. *The Review of Economics and Statistics,* 92(4), 822- 842.

Patel, D. (2024). Floods. Working Paper.

Pavcnik, N. (2017). The impact of trade on inequality in developing countries. *National Bureau of Economic Research* Working Paper 23878*.*

Piveteau, P. (2019). An empirical dynamic model of trade with consumer accumulation. *American Economic Journal: Microeconomics* (Forthcoming)*.*

Ponticelli, J., Bustos, P., and Albert, C. (2021). The effects of climate change on labor and capital reallocation. *CEPR Discussion Papers* 16312.

Popp, D. (2019). International Review of Environmental and Resource Economics. *International Review of Environmental and Resource Economics*, 13(3–4), 265–337.

Qian, Y. (2008). Impacts of entry by counterfeiters. *The Quarterly Journal of Economics*, 123(4), 1577–1609.

Ramondo, N., Garcia-Lembergman, E., Rodriguez-Clare, A., and Shapiro, J. (2024). The carbon footprint of multinational production. Work in Progress. Slides.

Rao, X., Hurley, T. M., and Pardey, P. G. (2019). Are agricultural RandD returns declining and development dependent? *World Development,* 122, 27-37.

Restuccia, D., and Rogerson, R. (2008). Policy distortions and aggregate productivity with heterogeneous establishments. *Review of Economic Dynamics*, 11(4), 707-720.

Restuccia, D., and Rogerson, R. (2017). The causes and costs of misallocation. *Journal of Economic Perspectives*, 31(3), 151-74.

Rijkers, B., Baghdadi, L., and Raballand, G. (2015). Political connections and tariff evasion evidence from Tunisia. *The World Bank Economic Review*, 31(2), 459-482.

Roberts, M. J., Yi Xu, D., Fan, X., and Zhang, S. (2017). The role of firm factors in demand, cost, and export market selection for chinese footwear producers. *The Review of Economic Studies*, 85(4), 2429-2461.

Robertson, R., Brown, D., and Dehejia, R. (2020). Working conditions and factory survival: Evidence from better factories Cambodia. *Review of Development Economics*, 25(1), 228-254.

Rodrik, D. (1995). Political economy of trade policy. *Handbook of International Economics*, 3, 1457-1494.

Rodrik, D. (2004). Industrial policy for the Twenty-First Century. *Social Science Research Network*.

Rodrik, D. (2007). Industrial development: Stylized facts and policies, in United Nations, Industrial Development for the 21st Century. New York: U.N.

Rodrik, D., and Stiglitz, J. E. (2024). A new growth strategy for developing **nations.**

Rosenthal, S. S., and Strange, W. C. (2006). The micro-empirics of agglomeration economies. *A Companion to Urban Economics*, 7-23.

Rosenzweig, C., Elliott, J., Deryng, D., Ruane, A. C., Müller, C., Arneth, A., et al. (2013). Assessing agricultural risks of climate change in the 21st century in a global gridded crop model intercomparison. Proceedings of the *National Academy of Sciences*, 111(9), 3268–3273.

Ross, M. L., and Werker, E. (2024). Diversification in resource-rich Africa, 1999–2019. *Resources Policy*, 88.

Rotemberg, M., and White, T. K. (2017, July). Measuring Cross-Country Differences in Misallocation". In North East Universities Consortium annual conference, Tufts University, Medford, MA, November (pp. 4-5).

Rua, G. (2014). Diffusion of Containerization. Finance and Economics Discussion Series 2014-88, *Board of Governors of the Federal Reserve System (US)*.

Ryan, N. (2018). Energy productivity and energy demand: Experimental evidence from Indian manufacturing plants. *National Bureau of Economic Research* Working Papers 24619.

Ryan, N. (2021). The competitive effects of transmission infrastructure in the Indian electricity market. *American Economic Journal: Microeconomics*, 13(2), 202-242.

Saavedra, S. (2023). Technology and state capacity: Experimental evidence from illegal mining in Colombia.

Schoar, A., Iyer, R. K., and Kumar, S. (2008). Importance of Ethnic Networks for Business Transactions of the Small Enterprises. Working Paper.

Sequeira, S., and Djankov, S. (2014). Corruption and firm behavior: Evidence from African ports. *Journal of International Economics*, 94(2), 277- 294.

Shapiro, J. S. (2016). Trade Costs, CO2, and the Environment. *American Economic Journal: Economic Policy,* 8(4), 220-254.

Shapiro, J. S. (2021). The Environmental Bias of Trade Policy. *The Quarterly Journal of Economics*, 136(2), 831–886.

Shapiro, J. S. (2023). Institutions, comparative advantage, and the environment. ideas.repec.org.

Shapiro, J. S., Copeland, B. R., and Taylor, M. S. (2022). *Handbook of International Economics*, Volume V. In G. Gopinath, E. Helpman, and K. Rogoff (Eds.), Elsevier, pp. 61-146.

Somanathan, E., Somanathan, R., Sudarshan, A., and Tewari, M. (2021). The impact of temperature on productivity and labor supply: Evidence from Indian manufacturing. *Journal of Political Economy*, 129(6),

Song, J., Price, D. J., Guvenen, F., Bloom, N., and Von Wachter, T. (2018). Firming up inequality. *The Quarterly Journal of Economics*, 134(1), 1-50.

Spray, J. and Steenbergen, V., (2018). The potential for backward linkages in Rwanda: A data-driven approach to supplier development programmes. Policy Note. Technical report, *International Growth Centre*.

Startz, M. (2016). The value of face-to-face: Search and contracting problems in Nigerian trade. Available at SSRN 3096685.

Steenbergen, V., and Sutton, J. (2017). Establishing a Local Content Unit for Rwanda. ***Policy Note***.

Steinwender, C. (2018). Real effects of information frictions: When the states and the kingdom became united. ***American Economic Review***, 108(3), 657-96.

Stern, N. (2007). The Economics of Climate Change. ***Cambridge University Press***.

Storeygard, A. (2016). Farther on down the road: transport costs, trade and urban growth in sub-Saharan Africa. ***The Review of Economic Studies***, 83(3), 1263-1295.

Suri, T. (2011). Selection and comparative advantage in technology adoption. ***Econometrica***, 79(1), 159–209.

Suri, T., and Udry, C. (2022). Agricultural technology in Africa. ***Journal of Economic Perspective***, 36(1), 33-56.

Suri, T., Udry, C., Aker, J. C., Bergquist, L. F., Goldstein, M., Jayne, T., et al. (2022). Agricultural technology in Africa. VoxDevLit, 5.1.

Sutton, J. (2014). An Enterprise map of Mozambique. ***IGC publication***

Sutton, J. and Kellow, N. (2010). An Enterprise map of Ethiopia. ***IGC publication***

Sutton, J. and Kpentey, B. (2012). An Enterprise map of Ghana. ***IGC publication***

Tanaka, S., and Teshima, K. (2022). North-South Displacemen***t Effects of Environmental Regulation: The Case of Battery Recycling. American Economic Review: Insights***. 4(3), 271-288.

Tarozzi, A., Desai, J., and Johnson, K. (2015). The impacts of microcredit: Evidence from Ethiopia. ***American Economic Journal: Applied Economics,*** 7(1), 54-89.

Technical report, ***International Growth Centre***.

Tendler, J., and Amorim, M. A. (1996). Small firms and their helpers: lessons on demand. ***World Development***, 24(3), 407-426.

The World Bank Group (2016). Breaking Down Barriers: Unlocking Africa's Potential through Vigorous Competition Policy. Washington, DC: ***World Bank Group***. p. 52 – 55

Topalova, P. (2010). Factor immobility and regional impacts of trade liberalization: Evidence on poverty from India. ***American Economic Journal: Applied Economics***, 2(4), 1-41.

Topalova, P., and Khandelwal, A. (2011). Trade liberalization and firm productivity: The case of India. ***Review of Economics and Statistics***, 93(3), 995-1009.

Torani, K., Rausser, G., and Zilberman, D. (2016). Innovation subsidies versus consumer subsidies: A real options analysis of solar energy. ***Energy Policy***, 92, 255-269.

Valdivia, M. (2015). Business training plus for female entrepreneurship? Short and medium- term experimental evidence from Peru. ***Journal of Development Economics***, 113, 33-51.

Van Biesebroeck, J. (2005). Exporting raises productivity in sub-Saharan African manufacturing firms. ***Journal of International Economics***, 67(2), 373-391.

van de Walle, D., Ravallion, M., Mendiratta, V., and Koolwal, G. (2017). Long-term gains from electrification in rural India. ***The World Bank Economic Review***, 31(2), 385-411.

Van Reenen, J., and Norris Keiller, A. (2024). Disaster Management. ***National Bureau of Economic Research*** Working Paper 32595.

Van Reenen, J., Amiti, M., Duprez, C., and Konings, J. (2023). FDI and superstar spillovers: Evidence from firm-to-firm transactions. ***CEPR Discussion Papers*** 18100.

Verhoogen, E. (2023). Firm-level upgrading in developing countries. ***Journal of Economic Literature*** (Forthcoming).

Verhoogen, E. A. (2008). Trade, quality upgrading, and wage inequality in the Mexican manufacturing sector. ***The Quarterly Journal of Economics***, 123(2), 489-530.

Vidart, D. (2021). Human capital, female employment, and electricity: Evidence from the early 20th century United States. Working Papers 2021-08, University of Connecticut, Department of Economics. Revised September 2022.

Wade, R. (1995). The ecological basis of irrigation institutions: East and South Asia. ***World Development***, 23(12), 2041-2049.

Wade, R. (2004). Governing the market: Economic theory and the role of government in East Asian industrialization. ***Princeton University Press***.

Who's getting globalized? The size and implications of intranational trade costs. (2023). ***Econometrica***. Revise and resubmit.

Wollni, M., and Brümmer, B. (2012). Productive efficiency of specialty and conventional coffee farmers in Costa Rica: Accounting for technological heterogeneity and self-selection. ***Food Policy***, 37(1), 67-76.

World Bank Group. (2012). World Development Report 20 12: Gender Equality and Development: Main Report. ***World Development Report***, World Development Indicators. Washington, DC: World Bank Group.

World Development Report (2020). Trading for Development in the Age of Global Value Chains. World Bank.

World Economic Forum (2019). ***Global Competitiveness Report.***

Yang, D. (2008). Can enforcement backfire? Crime displacement in the context of customs reform in the Philippines. ***The Review of Economics and Statistics***, 90(1), 1-14.

Zane, G. (2019). Sharing a Workforce: the Effect of Agricultural Productivity Shocks on Industrial Performance. Working Paper

Zhang, P., Deschenes, O., Meng, K., and Zhang, J. (2018). Temperature effects on productivity and factor reallocation: Evidence from a half million Chinese manufacturing plants. ***Journal of Environmental Economics and Management***, 88, 1-17.