IGC Research strategy

September 2023

DIRECTED BY

FUNDED BY

Contents

Introduction

Growth is the driver of long run prosperity. It is the result of actions of millions of people and firms. People have ideas for new goods and services and create and grow firms that bring these ideas to the market. When many people develop firms and persuade consumers to part with their hard-earned income for these products, well-paying jobs are created, workers gain new skills, cities expand, and exports grow.

However, the challenge to balance economic growth with environmental sustainability is especially pronounced for low- and middle-income countries. As highlighted in the recently published IGC white paper, "Innovation, growth, and the environment", three facts make achieving sustainable growth in developing countries a global imperative: the need for economic growth to raise living standards is greatest; the burdens from climate change are heaviest, and emissions will grow most quickly in these countries

Achieving the global goal of eliminating extreme poverty by 2030 is about promoting growth and ensuring that poor populations are included in the growth process. But it is also about making sure that production and consumption are cleaner, and that poor populations are protected from the negative effects of climate change. Otherwise, key externalities from growth – climate change, pollution, and environmental degradation – may ultimately block the path to prosperity. Striking a balance between human activity and the natural environment is no longer a choice but an imperative. While economic development can catalyse transformative societal benefits – exemplified by the rise of countries like South Korea – it can also generate substantial environmental externalities. These range from greenhouse gas (GHG) emissions, which exacerbate climate change, and air and water pollution as well as the degradation of vital natural resources such as forests, oceans, and biodiversity. This delicate equilibrium between growth and preserving our planet underscores the need for development that is both robust and environmentally sustainable.

Productivity and innovation are central to driving the economic transformation needed to achieve inclusive, sustainable, and resilient growth . While this transformation is most visible in macroeconomic outcomes, it is microeconomic processes – such as technological innovations, organisational changes, and policies that correct market and government failures – that drive this transformation and are instrumental to achieving economic growth.

The goal of the IGC's research programme is to understand how and why these microeconomic processes vary across countries, and to identify policies that can accelerate the transformation of economies. We organise our research under four key microeconomic transformations: in the capabilities of **firms** and the functioning of markets, in the capacity of the **state**, in the organisation of **cities**, and in the provision of **energy** and environmental protection to achieve sustainable growth.

An effective long-term growth strategy must be inclusive and increase the resilience of people and businesses to climate change by making them more productive. The root cause of mass poverty is that most people, despite working long hours, remain acutely unproductive. Thus, the transformation needed to achieve higher rates of growth is one that generates a large number of productive jobs, one where people shift *en masse* into higher productivity activities. This, in turn, will increase resilience.

Firms: We seek to understand the sources of the productive potential of all firms in an economy, from large formal firms to small-scale family farms. Our focus is on interventions and policies that reduce barriers preventing firms from developing their capabilities and accessing local and global markets. Recognising that many firms currently lack the incentives for sustainable innovation, governments need to promote green innovation through firm-upgrading policies using a blend of subsidies, tax instruments, and regulations. Furthermore, supporting employment creation takes on added importance in the context of climate change, as formal jobs offer protection against climate adversities.

State: The development of an effective state, able to raise revenues and implement policies, and able to ensure welfare, stability, and security against violence, remains central to our research. This development must also address the challenges presented by environmental externalities, including through the extension of social protection frameworks to help protect individuals from climate shocks and promote adaptive decisions.

Cities: Recognising that the future of developing countries is urban, we emphasise the central role of cities in promoting productivity and growth as well as their potential downsides, such as congestion, emissions and crime that limit growth. Climate change is likely to accelerate urbanisation, requiring governments to protect individuals from these downsides while minimising impediments to innovations in how firms and markets are organised. Place-based strategies can facilitate productivity gains while supporting areas expecting significant emigration.

Energy and environment: Affordable and reliable energy is essential for growth. Our research will explore sustainable avenues to expand electricity access and consumption while addressing the associated externalities, both global and local. The transition to renewable energy will be central to achieving the right balance between economic growth and environmental sustainability, and issues of innovation and political economy will cut across all these areas of research.

These four transformations do not operate in isolation. For instance, the lack of energy access limits firm capabilities, and the state can implement labour policies that enhance firm productivity. Similarly, the externalities from energy consumption in the form of climate change permeate all sectors making state intervention necessary. While we present each theme separately below, we are also interested in how these transformations interact.

Informed policymaking is crucial to achieving sustainable growth and the foundation of effective policy decisions lies in robust data and independent, innovative research. In many of the critical areas identified in this strategy, one or both are limited. We therefore seek to promote innovative data, methods and research. With 14 years of experience and a robust network of researchers and country teams, the IGC is well-positioned in this field. Our objective is to collaborate with policymakers in developing countries to advance inclusive and sustainable growth based on rigorous research.

The IGC's four themes:

Firms, trade, and productivity – Increasing productivity through structural changes in firms' capabilities, the functioning of markets and how firms interact with world markets, while promoting green innovation and enhancing resilience against climate shocks.

State effectiveness – Escaping fragility and improving the capabilities and effectiveness of states to deliver higher rates of inclusive growth, while addressing the challenges of environmental externalities.

Cities – Making cities more productive and inclusive while addressing the downsides of density and ensuring resilience to climate change.

Energy and environment – Improving access to reliable, cost-efficient energy, supporting the transition to clean energy, reducing global and local environmental externalities, and more effectively managing natural capital.

IGC research priorities

Firms, trade, and productivity

Main themes of research under firms, trade, and productivity

Firm capabilities:

- Entrepreneurship, management practices, training programmes
- Technology adoption, innovation, and quality upgrading
- Labour market policies
- Access to finance, venture capital, material inputs, electricity, and other inputs

Promoting green innovation:

- Firm driven environmental externalities
- Government infrastructure, subsidies, and other fiscal tools
- Agricultural innovation and resilience

Markets:

- Misallocation of factors of production and structural transformation
- Value chains, firm-to firm relationships, intermediaries, access to markets
- Market power and competition policy
- External economies and industrial policy

International trade:

- Impact of trade in presence of distortions
- Export promotion, trade policy and other related policies
- Trade integration and trade infrastructure
- FDI policy (attraction, SEZs, spillovers)
- Trade and inequality

Rural development

- Agricultural climate adaptation
- Rural infrastructure development
- Economic potential of natural assets

The goal of the IGC research programme on firms, trade, and productivity is to identify mechanisms that can enable firms in developing countries to more efficiently deliver products and services that consumers at home and around the world are willing to pay for, in a way that is environmentally sustainable. We find it useful to think about the necessary transition as arising from four types of transformations: in the capabilities of firms, in the green innovation of production, in the functioning of markets, and in the interaction of firms with world markets. These four transformations form the basis of our four areas of research for this theme.

Firm capabilities

The objective of our first area of research is to identify barriers that prevent firms from developing their capabilities and the effectiveness of policies that could remove these constraints. There is a large body of evidence showing that a typical firm in low- and middle-income poor countries is poorly managed (Bloom et al. 2012). However, there is much less evidence on what works to improve management practices. For example, there is now a large body of evidence that shows that provision of management training to entrepreneurs has little effect (McKenzie and Woodruff 2014; Grimm and Paffhausen 2015).

There is also some evidence that focused consulting services have a larger effect and are cost-efficient (Bloom et al. 2013; Bruhn et al. 2018). However, the question this raises is why firms do not pay for these services themselves. Another approach to improving firm capabilities focuses on coaching, mentoring, and peer interactions programmes. Cai and Szeidl (2017) and Fafchamps and Quinn (2018) generate networking opportunities among business owners and show promising effects on firm performance. More evidence on the effectiveness and scalability of such programmes would be useful. We also seek to understand the diffusion of good management from the entry of foreign-owned firms, or those in international supply chains, as well around the market for managerial talent more broadly.

Another possible explanation for the observed low productivity of firms in developing countries relates to the use of the technologies or inputs. We have some patchy evidence on this from agriculture. But recent work from the soccer ball industry in Pakistan suggests that barriers to technology adoption may exist outside of agriculture (Atkin et al. 2017). We want to build on this evidence in more sectors. Even if we find evidence of low adoption, we need to understand why firms do not adopt inexpensive production processes that would bring them closer to the production frontier.

We also want to understand what policy interventions can promote the use of better technologies. For example, producers may not have enough information about technologies, or the returns to such technologies. Another possibility could be that credit constraints prevent them from acquiring technology, despite the high returns. Lastly, risk aversion and incomplete insurance markets can also lead to inefficient adoption. We have very little information on which explanations are the right ones, and what policy interventions are effective at addressing the relevant constraints. We will prioritise research that seeks to find answers to these issues.

The evolution of large, technologically advanced firms offers a promising pathway to sustainable development. Due to their scale and access to resources, such firms are better positioned to innovate and mitigate environmental externalities, such as enhancing production efficiency and implementing pollution reduction strategies (Cainelli et al., 2012; Perkins and Neumayer, 2008). These firms, especially those with multinational linkages, exhibit greater resilience to environmental shocks, thereby safeguarding jobs both physically, through safer indoor environments, and economically, through enhanced market integration and credit access (Otto et al., 2021; Balboni et al., 2023b; Castro-Vicenzi, 2022; Blakeslee et al., 2020; Colmer, 2021).

Firms may also not reach their full capabilities because they do not have access to necessary inputs such as labour, capital, material inputs or electricity. Labour market search frictions may make it difficult for small firms to find the workers necessary to grow. It could also be the case that the supply of skilled workers is very thin, or that there is a skills mismatch. We will work to understand ways to build the supply of workers with relevant skills, for example through vocational training, apprenticeships, and the provision of information on the returns to such programmes. There is also some suggestive evidence that firms in developing countries do not support the acquisition of skills by their workers (Lagakos et al. 2018).

We are also interested in understanding the role informal firms can play in buffering workers from formal firms when they are hit by shocks. Additionally, do they reduce misallocation by allowing already-distorted small firms to avoid the additional distortion coming from taxation or onerous regulation?

Governments might use vocational training to foster green skills, essential for areas like renewable energy. While it's unclear if a skill shortage hinders green sector growth, addressing this could benefit the environment. Moreover, vocational training should consider roles in adaptation and resilience, as climate change may cause mismatches in local labour supply and demand, hindering individuals' adaptation opportunities.

Credit constraints may also be important for firms in developing countries. A large body of evidence suggests that the marginal return to capital is large for small businesses (De Mel et al., 2008; McKenzie and Woodruff, 2008). However, microfinance does not seem to have transformative effects on target populations (Meager 2019). Further research would be useful on innovative contracts to address the challenges presented by identifying, vetting, and monitoring firms, and on models for angel investors, venture capital, incubators, and accelerators in developing countries. Evidence on the marginal product of capital for large firms is also needed. Removing credit constraints for large firms could have important spillover effects upstream and downstream. Finally, many firms in developing countries suffer from the lack of access to a reliable source of electricity.

The average time 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. Linking this theme with Energy and Environment, the IGC seeks to build evidence on the impact of the lack of access to reliable electricity on firm performance. Here it will be interesting to see how energy systems that rely more on renewables affect firm productivity and growth.

Promoting green innovation

Our second area of research is on how to promote green innovation. There are overlaps between these areas of research across our four themes. For example, government subsidies to promote green energy sectors fall under Firms, Energy and Environment, and State Effectiveness. However, because they relate primarily to Firms, we have focussed on it here.

In the broader environmental context, a pressing concern pertains to the negative externalities produced by firms. These encompass not only GHG emissions but also air and water pollution (Ayres and Kneese, 1969; Hong et al., 2021). Although some sectors have witnessed a shift driven by socially-minded consumers (Aghion et al., 2023; Hiscox et al., 2020), the economy, at large, remains vulnerable to excessive environmental degradation.

Governments have a central role in guiding this trajectory. Primarily, infrastructure provision is crucial. The relationship between economic development and infrastructure can be observed in Chile's targeted investment in its electricity grid (Reguant and Kellogg, 2021), which has facilitated the growth of sustainable energy sources. Additionally, directing subsidies to sectors inclined towards sustainable growth enables governments to pave the way for an environmentally-conscious future. The expanding solar energy sector, backed by several subsidies (Banares-Sanchez et al., 2023; Burgess et al., 2023), exemplifies this approach.

Innovation is also crucial in the agricultural sector. As climate change drives increases in temperature, in weather variability and in flood risk, innovations are central to reducing vulnerability to risks, enhancing adaptive capacity and strengthening resilience. Also important is the role of larger agricultural firms in driving these changes.

As regards fiscal policy, there is a clear role for Pigouvian taxes, especially those targeting pollution. Carbon tax schemes are increasingly common globally (Metcalf, 2021; Timilsina, 2022). Experience in the EU and Canada suggests they can be effective (Metcalf, 2021). Cap-and-trade systems provide an alternative. While offering flexibility, these systems pose their own set of challenges, particularly in terms of establishment and of achieving desired carbon prices (Metcalf, 2021).

Governmental regulation, in the form of production standards or quotas, offers yet another set of policy instruments. Examples such as fuel efficiency standards in automobiles (Metcalf, 2021) and pollution quotas, as seen in India and China (Duflo et al., 2013; Zheng and Kahn, 2017), illustrate the scope and challenges of this approach.

At the crossroads of innovation and policy lies the framework proposed by Acemoglu et al. (2012), advocating for a blend of R&D subsidies and environmental taxes. The balance between these tools, particularly in developing countries, remains a subject of ongoing research.

The functioning of markets

Our third area of research seeks to transform the way markets function in developing countries. There is a large body of evidence that resources are not only scarce but also misallocated in developing countries (Hsieh and Klenow, 2009). The misallocation can be between firms, industries, or regions in a country. We have, however, much less evidence on what exactly are the policies and institutions that generate factor misallocation. The list of potential candidates is very large and likely to vary across countries and time. There is also suggestive evidence that distortions or frictions on the demand side might reduce market access or misallocate demand across firms and in turn, can slow down the integration of firms into value chains. These potentially include high trade costs, search costs, or contractual frictions. We encourage further research in this area.

Some markets in developing countries are captured by powerful firms. For example, there is evidence that the trading and transportation sectors are often captured by a small number of large companies. The retail sector, in particular, appears to be less competitive in developing countries than in high-income countries (Atkin et al, 2018). The cement industry is another example. This, in turn, can have a large impact on the upstream and downstream sectors. We aim to better document the patterns of market power in developing countries, and also examine possible interventions to improve the functioning of these critical sectors. The needs here include measuring mark-ups, understanding in which contexts lower competition is welfare-improving, documenting better how competition and market structure at different levels impact the entire value chains, and identifying effective policy measure to enhance competition.

The existence of externalities such as external economies of scale, agglomeration economies and technological or human capital spillovers create a rationale for state intervention, usually referred to as industrial policy. While many governments in developing countries already implement industrial policy in some way, there is very limited evidence on the size of the externalities that justify these interventions and where – in which firms and which sectors – they are the strongest. Conditional on the existence of certain externalities, there is also a need for more evidence on how governments should respond to them, especially when states have limited capabilities and coordination to implement complex policies effectively, and how they might design policies in the face of uncertainty over which firms and sectors to target.

Trade

Our fourth area of research relates to how domestic firms interact with international markets. We see four important dimensions of this interaction, all of which have important implications for promoting sustainable growth and environmental protection.

The first is how opening to trade affects the functioning of markets and firms. For example, does it worsen or alleviate resource misallocation and market power? Does the allocation of factors resulting from trade openness promote production externalities? How are different types of firms impacted by trade policy? The ramifications of climate change on trade patterns, especially in agriculture, cannot be overlooked. With agriculture constituting a significant portion of global exports, the effects of climate change, such as diminished yields in developing countries, pose a challenge. However, global trade networks and more open trade policies could mitigate these spatial shifts. This raises questions regarding the efficiency and adaptability of the current trade infrastructure in developing countries, from physical infrastructure to tariff barriers.

The second is whether access to world markets facilitates transfer of knowledge and adoption of best practices and technologies. Atkin et al. (2017) show that firms' performance improves when they start selling to foreign buyers and a growing body of evidence suggests that foreign direct investment entry generates productivity spillovers for domestic firms (Alfaro-Urena, et al 2021).

Such spillovers also potentially promote sustainable production methods, and enforce environmental standards, particularly in developing countries. Moreover, larger firms, given their superior technological capabilities, are more inclined to adopt environmentally friendly processes. As high-income countries alter their trade policies, low- and middle-income countries must anticipate and adapt. Initiatives like the EU's carbon border adjustment mechanism (CBAM) underline the shifting landscape. Research is needed on how such policies influence developing countries, as evidence on the magnitude of these externalities and effects of these new policies remains thin.

The third aims at measuring the economic returns of public goods such as transport infrastructure and export promotion services that facilitate integration into global value chains. While the benefits of these interventions are clear, there is limited evidence as to whether they are effective and cost-efficient.

Lastly, an important question is the extent to which opening to trade redistributes income within the domestic economy, either mitigating or exacerbating existing inequality. Inequality can take various forms. A large literature has shown that the skill-wage premium increases with trade openness, increasing income inequality (Goldberg and Pavcnik 2007). Evidence on the impact of trade liberalisation on consumer prices in developing countries is lacking. There is also less evidence on which firms in the value chains – in which sectors and which locations – are most affected by trade shocks and regional trade integration policies. If access to world markets increases inequality, a central question is how redistribution can be done efficiently. Similarly, who bears the cost of adjustment to trade shocks is a question that deserves more attention.

Rural development

Agriculture remains a key pillar of rural economies, with a predominant share of the workforce engaged in this sector across developing countries like India, Mozambique, and Zambia (Roser, 2023). However, persistent rural poverty, especially amongst labourers who do not own any assets, magnifies the inefficiencies and vulnerabilities of this sector (Balboni et al., 2022; Banerjee et al., 2015; Bandiera et al., 2022). The interplay between climate change and agriculture necessitates innovative adaptive measures, ranging from improved farming practices to efficient land use and clean energy. Addressing risks, such as those from uncertain climatic events, is pivotal; innovative insurance models have shown promise in promoting investment and mitigating the adverse effects of unpredictable events on farming (Karlan et al., 2014; Lane, 2023; Donovan, 2020).

A key challenge of rural development is transportation infrastructure. As of 2016, a staggering one billion individuals lived more than 2 km from paved roads, limiting their ability to trade and seek employment opportunities (Roberts et al., 2006; Donaldson, 2018; Atkin and Donaldson,

2015). The ripple effect of limited transport, especially in low-income countries, amplifies trade costs and restricts mobility, crucial for accessing urban employment markets (Asher and Novosad, 2020). Complementing transportation, electrification is another important element in rural empowerment. It is not merely about lighting and phone charging; electrification, especially when combined with better roads, has the potential to significantly raise employment levels and overall welfare in rural areas (Allcott, 2018; Dinkelman, 2011; Lipscomb et al., 2013; Moneke, 2023).

Rural areas possess considerable natural assets, and their conservation can yield significant economic benefits. Implementing nature-based solutions can mitigate environmental impacts, such as CO_2 emissions, and introduce sustainable revenue opportunities for these communities (Mercer, 2022; Jayachandran, 2022). The potential of the tourism industry, influenced by well-conserved natural assets, can support economic development and underscore the importance of conservation (Faber and Gaubert, 2019). A central challenge remains in achieving growth while maintaining the integrity and sustainability of these assets.

Research questions under *firms, trade, and productivity*

- What types of entrepreneurship training programmes are cost-efficient? Can these programmes be scaled?
- Should entrepreneurs be selected into training programmes? Do governments need to identify and support 'younger, fast-growing enterprises?
- What barriers prevent firms from adopting technology? Which policy measures are most effective in reducing these barriers?
- What is the magnitude of search costs for skilled workers? How can the supply of skilled labour be increased?
- How can vocational training address, skill shortages, including skills for newly emerging green technologies, and enhance adaptation to climate-induced labour mismatches?
- Can new forms of capital (micro-equity, angel investors, VC...) provide a solution for access to finance in developing countries?
- Are large firms credit constrained in developing countries? How does removing these constraints affect firms upstream or downstream?
- How are firms using cutting edge technologies equipped to drive innovation, mitigate environmental externalities, and display resilience to environmental shocks?
- How can government subsidies, particularly in emerging sectors like solar energy, effectively stimulate green innovation and sustainable economic growth?
- In what ways does infrastructural investment, such as electricity grids, facilitate the adoption and growth of sustainable energy sources?
- What are the comparative environmental and economic outcomes of carbon tax schemes versus cap-and-trade systems in different regions?
- How can a blend of R&D subsidies and environmental taxes best promote sustainable innovation, especially in developing countries?
- What factors are responsible for the misallocation, such as that of factors of production across firms and of labour across sectors?
- Is there less disruptive entry of productive firms and exit of less productive firms in developing countries? If so, why?
- What is the magnitude of market failures that reduce market access for firms? How can they be addressed?
- How strong are competition forces in developing countries? Which sectors are the least competitive? How should competition policy be conducted?

- What is the size of production externalities? In which sectors and for which firms are they the strongest?
- How should industrial policy be designed in an environment with low state capacity and coordination?
- Does trade reduce or increase existing distortions? Does the reallocation that results from opening to trade promote positive production externalities? What is the impact of trade policy on informality and connected firms?
- How do technological spillovers impact sustainable practices in developing countries, and are larger firms leading in ecofriendly adoption?
- How do evolving trade policies, such as the EU's CBAM, affect low- and middle-income countries and their related externalities?
- 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? What policies are effective and cost-efficient in promoting spillovers?
- Where are the returns of building new trade infrastructure the highest? What interventions should export promotion activities be focused on? Are they effective and cost-efficient?
- Which firms in value chains are the most affected by trade shocks and changes in trade policy?
- How can the gains from trade be more equally shared? How can redistribution be done efficiently?
- What is the distributional impact of regional trade integration?
- What are the factors responsible for the slow adjustment to trade shocks?
- What will encourage the diffusion of green technologies into developing countries?
- How can firms adapt to climate change?
- How will trade policy affect where polluting firms are located?
- How will energy and transportation systems that rely more on renewables affect firm productivity?
- How can agricultural practices in developing countries be adapted to mitigate climate change vulnerabilities, and how effective are current insurance models in safeguarding against climatic uncertainties faced by asset-less labourers?
- What is the impact of transportation infrastructure on rural trade and employment, and how does the combination of electrification and improved transportation influence rural welfare?
- Which industries can be profitably set up in rural areas that are financially sustainable with less environmental externalities, and establish sustainable revenue models, especially in the context of tourism?
- How do mentorship, peer interactions, and societal norms influence entrepreneurial support programmes?
- Does discrimination contribute to diminished wage growth in developing countries?
- What strategies can minimise input market distortions and promote efficient labour allocation?
- How do intermediaries, frictions, and market power shape agricultural value chains?
- Develop analysis methods for trade infrastructure and investigate the influence of corruption and lobbying on trade policy.

State effectiveness

Main themes of research under state effectiveness

Fragility and economic development:

- Escaping extreme fragility
- Inclusive institutions: political selection and state accountability
- New challenges of fragility: populism and economic integration of refugees

Poverty, labour markets, and inclusive growth policies:

- Social protection
- Adaptation to climate change
- Occupational transformation, inclusive labour market policies

State revenue and effective state policies

- Tax capacity (equitable and efficient revenue collection; tax morale
- Public sector organisation, effective bureaucracies, policy implementation
- Spending effectiveness (procurement rules and systems, PPPs, targeting)

International policy and coordination

- Climate finance
- Loss and damage funds
- Climate agreements

An effective state operating in a functioning and stable political environment is a necessary condition to achieve higher rates of inclusive growth (Besley and Persson 2009). The state not only designs economic policies but also provides key public services that are essential for growth, structural change and poverty reduction. However, in a large number of developing countries, the state does not deliver on these responsibilities (Collier 2007).

In light of climate change and environmental degradation, the responsibilities of states are evolving rapidly. Especially in poorer, agriculture-dependent countries with limited resources, the state has a central role to play in crafting and supporting innovations to support transitions to cleaner energy and production and increase resilience to environmental risks.

We see future research that can help fulfil this objective falling into four key areas. The first area focuses on how state fragility affects economic development and how states can escape fragility by building a functioning state, strengthening institutions, and making them more inclusive. Amidst this, states must also confront the mounting challenges of climate change and how to navigate political gridlocks to enact robust policies to support sustainable growth.

The second area focuses on what the state should do to promote inclusive growth and reduce poverty. Here, innovative thinking is needed to recast the set of policies used by the state to promote the welfare of its citizens. A critical new dimension is the role of the state in addressing the impacts of climate change and environmental degradation. These are notable new barriers to economic growth and require significant innovations in state policy. Climate-induced shocks will necessitate states to be agile and adaptive, especially in the context of developing countries, which tend to be more vulnerable due to geographical, economic, and infrastructural characteristics. Innovations, especially in regulations, taxes, and infrastructure, will be essential.

In the third area, we look at how state policies can be made more effective. Here, improving state effectiveness revolves around mobilising domestic resources, building effective bureaucracies to implement key economic policies, and making state expenditures more impactful. The evolving climate context introduces additional complexities to this framework. Effectiveness in this realm will also involve overcoming political barriers to integrate mitigation and adaptation strategies, refining governance structures, and fostering international cooperation geared towards sustainable growth.

The fourth area focuses on international policy and coordination. Climate change is a global problem that requires new thinking in areas such as climate finance, loss and damage funds, and climate agreements. A whole body of new research is required to think through how to design these policies and mechanisms in a way that low- and middle- income countries can benefit from them.

State fragility

The starting point for our first area of research is that state fragility is a trap from which it is difficult to escape. The uncertainty, low state capacity and absence of public goods that come with fragility all constrain the private sector. Firms are then reluctant to invest or create jobs, economic development stalls and the growth needed to support increases in state capacity does not take place. We welcome research on how the core economic functions of the state can be established and sustained in extremely fragile political and economic environments. Research is also needed on the set of economic factors and policy priorities that allow peace to be sustained and put countries on a path out of extreme fragility.

State fragility extends beyond just political and economic dimensions and now crucially encompasses environmental vulnerabilities. Growing evidence suggests that state fragility is intensified by climate change and environmental damages (Peters et al., 2020). Climate-induced events, such as spells of bad weather, can result in poor agricultural yields, leading to economic shocks that amplify conflict and violence in fragile states (Miguel et al., 2004). Such disruptions can significantly hinder development, and in some cases, reverse its progress. Unplanned and large-scale human displacements due to climate changes further induce fragility, straining economies and widening social divides. Moreover, a state's legitimacy, historically rooted in its adherence to a social contract emphasising public safety and economic fulfilment, is now intertwined with its responses to environmental challenges. Aligning economic policy with the urgent demand for environmental protection, especially in countries most affected by climate effects, not only ensures growth but also enhances government legitimacy. Ambitious climate adaptation and mitigation policies have the potential to both counteract environmental challenges and strengthen the bond between governments and their citizens.

In light of these complex challenges, our inquiry into how institutions in developing countries can be fortified and made more inclusive is even more urgent. Institutions that are robust and inclusive can mitigate the economic and political uncertainties that hinder investment and job creation, fostering economic growth (Acemoglu and Robinson 2012). Research is pivotal, especially in areas like political selection, where leaders across government levels play crucial roles in determining economic policies (Burgess et al. 2015; De Luca et al. 2018). Understanding the ties between political selection, representation, and inclusion in the political process to economic outcomes becomes essential. Acemoglu and Robinson (2012) underscore state accountability as pivotal for economic growth. There is a pressing need to delve deeper into the ways to bolster accountability, especially in states marked by fragility. Given the sensitivities associated with political selection and state accountability in numerous countries affiliated with the IGC, we aim to capitalise on our longstanding ties with policymakers to pioneer innovative projects in these domains.

Poverty, labour markets, and inclusive growth policies

Our second main area of research concerns what the state can do to reduce poverty and generate higher rates of inclusive growth. This objective is important in its own right but also because it helps to re-establish a social contract between the state and the population, especially where poverty rates are high. Interventions designed to enable poor populations to make more productive use of their abilities are not only more likely to result sustained reductions in poverty (Balboni et al, 2022), but also help tackle the lack of social mobility that is often at the root of political dissatisfaction and conflict.

Recent changes in the distribution of poverty around the world heighten the need to re-think growth policies and poverty reduction programmes. Most of the poorest populations in the world live either in fragile states or are being left behind in rapidly growing economies (Page and Pande 2018). With the emerging evidence on the increasing importance of environmental externalities like climate hazards, the expansion of social protection in low-income countries is becoming even more urgent (Lane, 2023; Narayan et al., 2023; Surminski, 2014). Climate-induced vulnerabilities further underscore the risk of persistent slowdowns in progress towards poverty elimination (Hallegatte, 2016).

The rising threats posed by climate change underscore the urgent need for transformative social protection strategies. To begin with, despite its expansion – covering approximately 2.5 billion people globally (Banerjee et al., 2022) – the reach of social protection remains limited, particularly in low-income countries where only 15% have access to such interventions (Parekh and Bandiera, 2020). With climate hazards disproportionately affecting low-income countries, expanding these programs is a priority.

Innovative approaches are also needed. Traditional interventions have often prioritised immediate consumption support, but as the Nicaraguan study reveals, combining conditional cash transfers with innovative elements like vocational training or business loans can empower communities against the volatile effects of climate change (Macours et al., 2012). An enhanced focus on designing adaptive and flexible interventions that not only address immediate needs but also equip individuals and communities to better navigate the climate-altered future is essential. With climate change threatening to impede poverty elimination efforts and exacerbate vulnerabilities, pioneering research and approaches that integrate both immediate and long-term challenges are vital.

In line with this, we will also support research that identifies labour market policies to promote productivity-enhancing occupational transformation for poor populations. Policies that foster growth and occupational change are also crucial for aiding poor populations in adapting to these environmental changes, making them central to the design of social protection systems.

State revenue and effective state policies

The set of economic policies that are essential for inclusive growth are generally designed and delivered by bureaucracies. Making these policies more effective also requires building more efficient, capable, and impactful state organisations. A number of studies have documented the power of incentives in driving bureaucrats' performance (Khan et al. 2016; Bertrand et al. 2019). There is less research however on how government officials at different levels interact: whether poor management at the top impacts civil servants and more generally how the state can build stronger bureaucratic systems. This need is particularly important for thinking about policy implementation. A wide range of policies, from industrial policy to competition, require the setup of complex agencies where governance plays an important role, for example with respect to identifying the key market failures that need to be addressed or positive externalities that should be promoted. For example, establishing effective regulatory institutions and mobilising political will are both key hurdles in the fight to mitigate climate change.

Recent climate events, such as the floods in Pakistan in 2022, underscore the need for agile state responses. Efficient early warning systems and groundwork, from resilient building

materials to updated zoning rules, are pivotal. Such strategies demand coordination across government departments, the private sector, and international partners. Institutional innovations, like climate change commissions, can bolster these efforts. For instance, establishing potent regulatory institutions and galvanising political will are quintessential challenges in our battle against climate change. It is imperative to understand the divergence between established regulations and actual outcomes in the context of environmental degradation. In the current scenario, some influential enterprises benefit from overlooking environmental rules, often at a societal cost (Balboni et al., 2023a). Strategies for better hiring, incentivisation, and bureaucrat performance, especially in confronting climate challenges, need further exploration. As climate disturbances that can span multiple jurisdictions become frequent, there is a need for federal synchronisation and localised disaster responses, including in areas such as refining water management or updating insurance markets for natural disasters.

A major constraint on global climate action is the financial capacity and resilience of developing economies, particularly in regions like sub-Saharan Africa and South Asia where the tax-to-GDP ratios are typically below 20%. Against an estimated need for investments of US$ 190 billion per year until 2030 for mitigation and US$ 50 billion per year by 2050 for adaptation, sub-Saharan Africa received only US$ 15.7 billion in concessional climate finance in 2020, a small fraction of the collective goal of US$ 100 billion per year agreed globally in the 2015 Paris Agreement.

While efforts to increase the volume of climate finance are critical (see below), developing countries need also to prioritise domestic revenue mobilisation. We are keen on research that proposes novel ways to increase tax revenues while supporting sustainable growth. Pigouvian taxes, particularly in the form of carbon taxes, are of special interest. Studies that address compliance challenges – for example, by taking advantage of the concentrated sources of significant CO_2 emissions – as well as the broader economic and distributional implications are especially welcome.

Methods that enhance tax enforcement, as exemplified by technology-driven approaches like those in Ghana, can counteract evasion in areas with lax oversight. Efficiently harnessing and managing revenues from natural resources such as oil, gas, and minerals is also pivotal for sustainable growth. Here, sovereign wealth funds like those in Chile and Norway offer useful insights, but require adjustment in the developing country context.

Another area of inquiry is the development of mechanisms that enable fiscal authorities to access climate finance, including rigorous assessment of investment impacts.

Finally, in providing public goods and services, the state disburses large amounts of resources and there is significant dispersion across countries as to how effective this spending is. Leakages in spending are prevalent in developing countries (Niehaus and Sukhtankar, 2013; Olken 2006). In this area, we would like more research on how to reduce passive waste, in particular by improving government procurement rules and management systems, as well as expanded research on reducing active waste and overt corruption. We would also like to see more research on policy tools to enable governments more effectively to target expenditure programmes, such as social assistance, to ensure spending efficiency.

International policy and coordination

The global scope of climate change mitigation and adaptation brings policy challenges, and research is needed on how to incentivise and sustain international collective action to coordinate international mitigation efforts and support loss and damage funds. There is also an urgent need to understand if trade policies can reduce environmental degradation and whether unilateral green policies will result in carbon leakage.

Research questions under *state effectiveness*

- What interventions can promote key development objectives in extremely fragile environments, in particular in the presence of conflict or organised violence?
- How can economic governance make peace more durable? What economic policies decrease the likelihood of future conflict?
- What are the key factors that facilitate the selection of representative and competent leaders?
- How do politicians react to interventions aimed at promoting accountability? How do these interventions affect economic policy?
- What economic factors are responsible for the rise of populism in developing countries?
- What are the constraints on implementing state-run social protection programmes at scale?
- What are the general equilibrium effects of social protection programmes?
- How can transfer programmes and other policies be designed to protect populations from climate change?
- How can we design institutions to plan for the transition to net zero and to protect populations from environmental shocks?
- What measures are most effective for improving tax compliance by individuals and firms?
- What are the optimal tax instruments in an environment with low compliance?
- What is the incidence of different tax instruments? What are people's perceptions of fairness in tax systems and how do equity considerations influence the use of specific tax instruments?
- How can states improve tax morale? Do policies that increase morale help to foster quasi-voluntary compliance?
- How can states build more efficient governance structures for natural resource revenues? How should states tax natural resources?
- How can the design of screening mechanisms for bureaucrats be improved? How can bureaucrats at the top of the hierarchy be better selected, incentivised, and monitored?
- What are the most effective ways of targeting state programmes? How can technology facilitate the identification of the appropriate beneficiaries?
- Should there be more autonomy in procurement systems? If so, what type of management structures give more autonomy while maintaining oversight?
- How do climate-induced events, such as adverse weather patterns, exacerbate conflict and violence in states already grappling with fragility?
- What evidence-based methods can be developed to ensure social protection systems are both adaptive and forward-looking, in light of climate challenges?
- What labour market policies can best promote occupational transformation for vulnerable populations facing the adverse impacts of climate change?
- In what ways can the integration of conditional cash transfers with tools like vocational training or business loans enhance resilience against climate-induced vulnerabilities?
- How can climate commissions improve climate resilience coordination?
- What solutions optimise emerging economies' tax systems for climate funding?
- What are the implications and benefits of implementing carbon taxes in emerging economies?
- How can international cooperation effectively design and implement loss and damage funds to ensure equitable distribution among affected nations?
- What mechanisms enhance global policy coordination in the context of climate change, ensuring both mitigation and adaptation support for low-/middle-income countries?
- How do political incentives influence politicians' responsiveness to climate challenges, and can they be realigned for proactive policies?

- How do firsthand climate-related experiences affect voter support for environmental policies across different groups?
- How do election cycles impact the timing and intensity of environmental actions?
- How does political decentralisation affect environmental policy effectiveness, especially with significant pollution externalities?
- How does campaign financing source influence environmental policy decisions and outcomes?

Cities

Main themes of research under *cities*

Firms and employment in cities:

- Industrial parks and clusters
- Labour market policies
- Slums and inclusive cities

Rural to urban migration

- Drivers of migration
- Impacts of migration

Urban amenities and downsides of density:

- Housing and slums
- Crime
- Pollution
- Water
- Waste management
- Other local public services

Municipal finances and urban governance:

- Tax policy and compliance
- Governance and public finance management

City systems and infrastructure:

- Land ownership
- Urban planning
- Transport infrastructure
- Adaptation infrastructure

The future of the developing world is urban. According to the United Nations, Africa's urban population will triple by 2050. South Asia, and India in particular, will also witness a significant growth in its urban populations in the forthcoming decades. This profound spatial transition, which is critical to structural transformation in these economies, creates both challenges and opportunities.

The density of urban areas facilitates interactions between people and firms that catalyse innovation and productivity growth. At the same time, however, this density intensifies challenges like traffic congestion, contagious disease and environmental externalities.

Climate factors are likely to accelerate urban migration. Designing urban policies that capture the benefits of urbanisation while addressing its challenges, particularly the environmental ones, is increasingly important.

The IGC research programme on Cities will concentrate on three pivotal areas: firms and employment in cities, rural to urban migration, challenges posed by density, and spatial dynamics of transportation and housing in urban contexts. Moreover, understanding how cities can be adaptive and resilient in the face of changing conditions, while providing consistent public goods and services, will be crucial for future research.

Firms and employment in cities

Our first area of research relates to firms and agglomeration economies in cities. The central question is whether cities enhance the productivity of people and firms, or if the positive relationship between density and income is largely a byproduct of the influx of more skilled individuals into urban areas. The growing urban development literature, including works by Chauvin et al. (2017) and others, underscores the inherent benefits of cities. In particular, the disparities in productivity and wages between urban and rural regions arise not only from skilled workers' preferences for city life, but also from true productivity premiums and agglomeration benefits intrinsic to urban environments (Gollin et al., 2014; Young, 2013). However, the exact mechanisms behind this productivity advantage remain unclear: is it optimal firm-worker matchups, or an accelerated pace of human capital development within cities?

Understanding how to make cities platforms of opportunity for all is crucial. Factors like regulatory restrictions, limited skilled labour, and prevailing informality may reduce the productivity-enhancing potential of cities. Slums and informal housing settlements represent a particular challenge (Marx et al. 2013).

The rapid pace of urbanisation also brings new challenges, especially where it intersects with environmental change. Projections show that by 2050, a considerable number of people will inhabit vulnerable coastal cities with risks of flooding and heat extremes (Cities, 2018). This trend is especially pronounced in low- and middle-income countries that have limited infrastructure budgets to protect citizens. Work is needed on policies that can both mitigate urban climate risks and harness the economic potential of cities for sustainable growth.

These issues cannot be examined in isolation from those relating to rural development (see the section on rural development under the Firms theme above). Not only is climate change aggravating the already serious challenge of rural poverty, but urban and rural development need to be viewed as collaborative efforts, not competing priorities. A key reason for this is migration.

Rural to urban migration

Our second area of research is on rural to urban migration. In 2020, an estimated 281 million people were international migrants, which underscores the substantial magnitude of global migration both across and within borders (Migration, 2021). This vast migration, fuelled by individuals seeking better economic prospects and protection against environmental externalities, takes place against a backdrop of persistent wage and productivity disparities across regions and nations. These discrepancies are exacerbated by various barriers such as insufficient information about job opportunities, the inherent risks and costs of migration, and challenges in adjusting to new environments (Bryan et al., 2014; Diop, 2023).

Different regions are projected to experience varied climate-induced impacts, with urban areas potentially offering more resilience against environmental shocks (Byers et al., 2018). By 2050, climate change is anticipated to internally displace about 260 million people, with sub-Saharan Africa accounting for a significant portion of this migration (Clement et al., 2021). While such migrations may reduce the economic and social costs of climate change by facilitating the relocation of the most affected individuals to less vulnerable regions, they also create difficult policy challenges.

Diverse effects on local labour markets, coupled with the need for strategies that ensure effective social integration of migrants into host communities, are key elements of the research agenda. Recognising and addressing these challenges is vital, not only for supporting the affected individuals but also for the socio-economic stability of host regions. Research is urgently needed on the relationship between migration, economic dynamics, and impending climatic variations, with the aim of providing policymakers with actionable insights.

Urban amenities and downsides of density

Our third research focus pertains to addressing urban disamenities. While urbanisation can facilitate economic connections between workers and employers, it simultaneously increases vulnerabilities to disease, congestion and crime. As centres of economic activity, cities are substantial contributors to pollution and emissions, and they face growing challenges from climate change. And climate migration risks exacerbating the shortage of decent housing, especially in informal settlements. In-depth research and informed policy interventions are essential to enhance the liveability and sustainability of these urban centres.

Recent research underscores the significance of transportation infrastructure. Congestion, particularly in cities within low- and middle-income countries, not only hampers urban productivity but also contributes to environmental challenges, including greenhouse gas emissions. Potential solutions encompass pricing modifications and the implementation of efficient transportation modalities, such as Bus Rapid Transit (BRT) systems, which have demonstrated economic advantages (Tsivanidis, 2022). The imperative of shifting towards environmentally sustainable transportation methods, including electrification, underscores the critical nature of this sector.

Housing, another significant challenge, in cities in low- and middle-income countries, can often include slums. These informal settlements, often marked by poor housing standards and inadequate services, might inadvertently trap residents in poverty cycles (Marx et al., 2013). Strategies such as early public investment and property rights reform could potentially enhance housing quality, but the intricacies of social networks and potential rental markets within these areas warrant further research.

Utilities, primarily encompassing water, sanitation, and waste management, have health and economic implications that cannot be overlooked (Hamory et al., 2020). Efficient provision of these services in dense urban areas is closely tied to strong municipal finance, highlighting the importance of tax reforms and resource allocation.

Evaluating the effectiveness of policies addressing rapid urbanisation remains central. The IGC is committed to supporting research analysing the role of incentives in shaping behaviour. The impact of subsidies for water connections, road usage patterns, and the pivotal role of municipal governance on infrastructure and housing will also be areas of interest. Additionally, with cities accounting for about 75% of global carbon emissions, incentives must also work to reduce global and local externalities.

Municipal finances and urban governance

Many urban centres are constrained by limited municipal revenues, which impede their ability to fund increasing public spending requirements. Simultaneously, urban policy decision-making is frequently impeded by the absence of a clear, authorising framework, leading to institutional overlaps and ambiguities in mandates that often sideline pressing cross-district urban concerns. This context presents a distinct challenge for policymakers and necessitates an expanded research focus. Investigating cross-country strategies and evidence-based solutions, such as urban land value capture, is pivotal. Specifically, exploring mechanisms like annual land and property taxes could provide cities with an equitable and efficient revenue stream. This revenue, sourced from enhanced urban land and property values, could then be strategically redirected to finance public initiatives that boost urban productivity. Further research is needed into these policy instruments, to support sustainable fiscal solutions that ensure urban growth aligns with equitable development goals.

City systems and infrastructure

Our final area of research is on city systems and infrastructure – in particular land, transport, and adaptation infrastructure, and the innovation in research needed to study them. While the field of development economics has greatly benefited from the widespread use of randomised control

trials, cities are complex systems and most research questions in the field of urban economics cannot be answered solely with research interventions that can be randomised at the individual level. For example, studying how land use impacts the performance of cities involves a full spatial model that can inform on the general equilibrium effect of transforming a metropolitan area. Similarly, since zoning policies that attempt to promote certain agglomeration externalities are difficult to randomise, there is a role for quantitative models to use these estimates to inform policymakers about the consequences of alternative zoning or land use policies.

Urban infrastructure investments, especially in the realm of mitigation and adaptation, present another series of policy challenges that warrant deep-dive economic evaluations (Delbridge et al., 2022). A compelling area for future research lies in the economic implications of flooding defences. Although green spaces, shade-providing infrastructures, cooling centres, and emergency evacuation routes are integral, flooding stands out due to its pronounced impact on cities, especially in developing countries.

While the set of available structural models for cities is large for high-income countries, very few low-income country cities have been modelled so far. This is particularly important as developing country cities differ in many ways from those in Europe or the US. For example, the type of transportation infrastructure available and the distribution of sectoral activities and skills vary across cities. Thus, the model parameters that govern the locations and employment decisions of people and firms need to be estimated for low-income country cities. These can be estimated directly from the data, as it becomes more available, or by using other sources of information, including randomised control trials. These fully developed models can then be used to simulate different policy interventions. The IGC will support the development and use of structural models in urban economics to assess these questions. These models are just starting to be applied to contemporary policy challenges, but structural spatial models seem particularly adapted for land use and transportation decisions in developing countries.

Research questions under *cities*

- Do cities facilitate matching between firms and workers and encourage the exchange of goods and services?
- Are cities escalators that facilitate rapid learning of new skills and techniques?
- Do slums help or hinder access to economic opportunity and social mobility?
- Which local constraints on firms — such as a lack of skills, access to input and output markets, burdensome regulations or limited energy access — constrain labour demand and contribute to high unemployment amongst the young and vulnerable population?
- What limits workers' abilities to acquire skills and learn from employers and co-workers?
- How do the specific features of developing country cities — such as unplanned spatial expansion and the persistence of informality across land and labour markets — drag down economic performance?
- What should be the role of local government in local economic development policy?
- What are the social benefits of sanitation and health services? How can these services be better provided? How do these benefits vary across population groups?
- What is the impact of public housing projects, slum upgrading programmes, and land readjustment, on residents' welfare, land prices, productive activity and fiscal revenues?
- What is the effect of land use regulations, including the rules that promote or reduce economic inclusion?
- What is the impact of informal networks in facilitating transit and reducing congestion?
- How can municipal governance be improved?
- What can new instruments, such as programmes that capture land value, do for areas with low state capacity and high rates of informality?
- How can municipalities and local governments enhance tax enforcement and compliance?

- How large are the aggregate gains from infrastructure investments at the local level?
- How large are the benefits from more compact cities, and what policies can incentivise this?
- What are the general equilibrium effects of increasing the housing stock?
- Is the current spatial configuration of a city (such as the location of ports, markets and schools in central areas) efficient given the current urban organisation and the opportunity cost of allocating that land to other purposes?
- What zoning or land use planning policies could improve the current and future spatial configuration of cities, given that so many of the world's cities have yet to be built?
- How can cleaner energy and transportation systems be built in cities and what impact will they have on living standards and productivity?
- How will climate change affect cities and how can citizens and firms be insulated against its effects?
- How do wage and productivity disparities influence rural-to-urban migration patterns, especially in the face of emerging climate-induced impacts?
- What are the socio-economic implications of large migration flows on local labour markets and how can policy measures address potential disruptions?
- How can strategies be designed to ensure the effective social integration of climate-induced migrants into host communities while balancing local economic dynamics?
- How does information access influence migration decisions in climate-vulnerable regions?
- How will climate-induced displacements impact urban infrastructure in regions like South Asia and sub-Saharan Africa?
- What are the cost-benefit outcomes of investing in flooding defences in cities in developing countries, especially in the context of rising urban infrastructure demands?

- How might climate-driven rural-to-urban migration alter the dynamics of urban agglomeration?
- How do urban labour market policies impact the outcomes of climate-driven migration?
- How can policy choices assist cities in making optimal adaptation decisions in response to climate threats?
- What are the socioeconomic consequences of climate-induced migration to cities?
- How can cities maximise agglomeration benefits for climate change protection?
- How can policies balance economic activity and safety in flood-prone urban areas?
- What strategies can harmoniously integrate climate migrants into urban areas, maximising agglomeration benefits and reducing tensions?

Energy and environment

Main themes of research under *energy and environment*

Access to energy:

- Impact of energy access on firms and households
- Energy market design
- Political economy of energy supply

Global externalities from energy consumption:

- Climate change mitigation and energy policy
- Adaptation to climate change and public goods
- Innovation and diffusion of green technologies

Local externalities from energy consumption:

- Consequences of pollution on health and human capital
- Willingness-to-pay for air and environment quality
- Governance and regulations

Conservation of natural capital:

- Economic valuation of environmental assets
- Effective policies for sustainable conservation

The path to economic prosperity requires the consumption of large amounts of energy. Americans consume an average of 12,000 kWh per year, Indians less than 1,300 kWh, and Ethiopians a meagre 70 kWh – just enough to power a 30-watt bulb for seven hours a day. Low-income countries will not grow out of poverty if they only provide enough energy to supply a single lightbulb for each citizen. More than a billion people, mostly in South Asia and sub-Saharan Africa, still live without reliable and affordable energy.

How can energy policy promote economic development? Since the first industrial revolution, key drivers of economic growth such as mechanisation, transportation, and electrification, have been powered by fossil fuels. This model has generated negative externalities from the beginning, and their accumulation over time has dire consequences today. Reliance on fossil fuels increases the risks of disruptive climate change while also generating local pollution that causes people to lead shorter and sicker lives (Greenstone et al. 2015; Jacobson 2015; WHO 2016, Burgess et al. 2017). Most of the future growth in energy consumption will occur in developing countries (Wolfram et al. 2012) causing damage to health but also to growth and economic development around the world (IPCC, 2014). For this reason, the energy use and the environment must be considered jointly, not in isolation from one another. Increasing access to energy is essential to generating the economic growth needed to eliminate extreme poverty by 2030. The growth needed to reduce poverty will generate harmful environmental externalities if the right policies are not in place and what constitutes “right” will vary around the world depending on factors like income and the existing climate.

This tension between improved energy access for growth and mitigating the externalities from growth is at the centre of the IGC research programme on Energy and Environment. We will support research in four main areas.

The first is energy access: how will the last billion get access to energy, and what benefits will it bring for their livelihoods? The second is climate change mitigation and adaptation: what are the most effective policies for developing countries to mitigate emissions in the energy sector and adapt to global climate change? The third is minimising local environmental damage: in countries with weak enforcement capacity, how can environmental regulations reduce the local harms from energy consumption? The fourth is work on the conservation of natural capital: how can international and local public goods such land and water ecosystems be valued and preserved?

Cutting across these four areas of research are the core themes of technology and political economy. New technologies can help provide access to inexpensive and reliable energy as well as limit the negative environmental side effects of energy consumption. But it is crucial to understand what policies are most effective in promoting local innovation and in facilitating the transfer of existing technologies to developing countries. Whole new energy and transportation systems will have to be developed. In addition, as the state plays a central role in energy markets in most developing countries, understanding the political economy of electricity generation and distribution is critical. How energy is priced and who gets access to energy depend on political factors. Strategies for improving environmental quality must take into account political incentives.

Energy access

Our first main area of research concerns the relationship between energy access and economic growth. The starting point for this agenda is understanding the demand side: how households and firms value and use energy (Lipscomb et al. 2013, Aberese, 2017; Lee et al. 2019). While a growing literature has documented the impact of energy access on firm performance and household welfare, research is needed on the long-term impact of energy provision on households and firms, as well as the general equilibrium effects of expanding access. Do energy investments crowd-in private investment and growth? More generally, we need to understand better the appropriate role of energy access in strategies for pro-poor growth.

Energy access might be constrained by demand but also by supply-side policies that undercut the profitability of serving poor customers (Burgess et al. 2019). We need to deepen our understanding of the optimal design of energy markets in developing countries. Research in this area will encompass the distribution side of the energy system and the generation and transmission of energy, all of which are often heavily controlled by the state. The politics of energy distort both the demand and supply of energy and may limit access. If research is to have an impact on energy policy, it must consider the constraints that derive from equity, redistribution and political concerns as well as governance failures. For example, a whole range of subsidies, from generation to distribution, have crept into energy supply. Beyond electricity pricing, the design of financial and institutional structures that promote investment plays a central role. A parallel question is how redistribution can be achieved through instruments other than the mispricing of energy. Having prices reflect the social costs of different forms of energy would reduce the externalities from energy consumption, but more research is needed on how this can be done in less regressive and more politically feasible ways.

Climate change mitigation and adaptation

How to address global externalities from energy consumption represents the second main area of research. Working out ways of reducing greenhouse gas emissions whilst expanding energy access represents a major challenge. We need to think about what policy instruments can be used to promote low carbon energy sources, how the prices of different sorts of energy can be set to reflect their social costs of consumption, and how various policy instruments, such as cap-and-trade systems and carbon taxes, can be used to incentivise carbon emission reductions. Addressing the intermittency problem faced by renewables through for example,

regional market integration, improving demand-side management and energy efficiency and working out how to expand investments all require significant research effort. Understanding what drives innovation and diffusion of green technologies (for example, solar) is particularly important as the adoption of cleaner energy transportation systems is central to mitigation. On adaptation, we need to design policies that help populations become less dependent on forms of employment and production, such as agriculture, that will be adversely affected by climate change. We will also support research on the set of public and financial services that are needed to support climate change adaptation and help people in developing countries cope with the impact of climate change. Part of this will link to the work on social protection and climate change under our State Effectiveness theme. Importantly, mitigation and adaptation are intertwined: we need to find ways of reducing emissions that are complementary to efforts to adapt, for example, with an energy mix that is resilient in moments of climate change-induced distress. More research is needed on how these complementarities can be adequately incentivised.

Local environmental damages

How to minimise local environmental damage is our third main area of research. Developing countries today have perhaps the most acute air pollution problem in world history and the associated costs can be staggering (Chen et al. 2013). Local pollution and climate change are not issues that operate in isolation. Harnessing rising concerns over local pollution represents an indirect but potentially powerful means of tackling climate change, not least by linking the short-term benefits of pollution reduction to the long-term benefits of climate action. Research on measuring the impact of pollution on outcomes such as health, human capital, and the productivity of firms and individuals is critical here (Ebenstein et al. 2017). This research raises awareness and can affect willingness to pay for environmental quality, thus improving the chances that policies to reduce local pollution become politically salient and hence implementable. Greater awareness can also change the social norms and values surrounding environmental quality and thereby facilitate a shift to an equilibrium where there is widespread political support for tackling local pollution – and climate change. We need research on how this can be achieved.

Key to this area of research is the design of environmental regulations. Here the gap between de jure and de facto environmental regulation is particularly wide in developing countries. Particularly important are regulations to constrain emissions, pollution and environmental degradation. Limiting these externalities becomes more important as countries grow. Here there is a considerable need for work identifying effective and politically feasible policies. One important question for research is how institutions and policies can be strengthened to ensure effective enforcement (including via new monitoring technologies). Another is how policymakers can be made more accountable for these costs by designing appropriate governance structures and policies.

Conservation of natural capital

Natural capital and environmental sustainability are foundational to economic development. We are currently experiencing the repercussions of depleting natural capital, including extinctions, deforestation driven by various needs such as agriculture and fuel, and a decline in coral reefs and peatlands. Our improving understanding of natural capital preservation owes much to technological advancements. Remote sensing products now enable detailed monitoring of land-use changes. The observation satellite data by Hansen et al. (2013), for example, provides a granular understanding of global forest loss and gain. Employing such data, research has started to explore the negative impacts of practices like using fire for land clearing in Indonesia. However, there is a pressing need to incorporate natural capital into economic policy more effectively. This can be segmented into two research priorities. The first is to quantify the benefits and costs of natural capital conservation and understand their distribution. The second is to formulate and evaluate policies to manage natural capital, taking into account the varying stakeholder interests in different regions.

Direct conservation, such as establishing protected areas for various ecosystems, is the most straightforward approach to counter environmental degradation. In addition to preserving these resources, it is critical to understand their intrinsic value. Ecosystems offer a myriad of services – trees sequester carbon, bees enable pollination, and water drives agriculture and hydropower. However, the valuation methods for these natural resources, especially suited for developing countries, need further refinement and input from a diverse set of experts, ranging from ecologists to local communities.

Recognising the value of natural capital alone does not ensure its sustainable use. Market and institutional frameworks must facilitate and incentivise preservation. For instance, while forests might represent a global asset for combating climate change, local interests might lean towards their exploitation for immediate economic benefits. This discrepancy creates a policy challenge, emphasising the need for strategies that harmonise local development aspirations with broader environmental concerns. Popular policies like payment-for-ecosystem-services (PES) have shown potential but with mixed outcomes. Other interventions like strengthening property rights have also demonstrated varied results. As efforts to conserve biodiversity continue, there is a clear call for further research into innovative, cost-effective incentive mechanisms to bolster natural capital protection.

Research questions under *energy and environment*

- What are the direct gains to households and firms of energy access?
- What are the external returns to energy access? What are the sources of external returns?
- What are the most cost-effective strategies for increasing energy access for poor populations?
- How does the hybrid construction of energy markets in developing countries, with both state and private actors, affect their efficiency?
- How can market rules, public investments in infrastructure and institutions affect energy efficiency?
- How do supply-side politics affect investment, contracting and the efficiency of energy markets?
- How do demand-side politics affect tariffs, reliability, and the benefits of energy access?
- What reforms can facilitate a successful transition from the “electricity is a right” equilibrium to one where electricity is treated as a private good? What are the welfare consequences of such reforms?
- Can unconditional transfers effectively replace energy subsidies? How can unconditional transfers be targeted to compensate the losers from energy subsidy reform?
- Can markets (for example, cap-and-trade) be used to incentivise carbon emissions reductions in developing countries?
- What is the magnitude of credit constraints and capital market imperfections in the adoption of renewables? Are there efficient solutions?
- Are there informational or other barriers to individuals and firms making energy efficiency investments in developing countries?
- How can trade, growth and structural change help households and firms adapt to the effects of climate change?
- How can innovation and diffusion of green technologies be encouraged?
- What actions by the state might encourage the adoption of cleaner energy and transportation systems in developing countries?
- What are the necessary public goods to aid adaptation to climate change for households and firms?
- How should insurance markets, financial markets and transfer schemes be designed to help vulnerable households, particularly in agriculture, adapt to the effects of climate change?

- What is the impact of pollution on productivity? Specifically on individual and firm outcomes including health, education and productivity.
- What is households' willingness to pay for environmental quality?
- What causes willingness to pay for environmental quality to change? Do public information campaigns alter willingness to pay?
- How can regulations meant to reduce local pollution emissions and improve environmental quality work when monitoring and enforcement are weak?
- How can the rapid degradation of natural capital, marked by deforestation and species extinctions, be economically quantified and addressed?
- What determines the demand for different energy sources and how does the introduction of low-cost renewables alter this demand?
- Do micro and macro estimates align regarding the returns to electrification, and why?
- How do energy provisions influence societal perceptions and norms about the state?
- Which institutional structures best resist political interference to minimise rent-seeking and elite capture?
- How can auction theory improve the efficiency of renewable energy auctions?
- How do investments in natural capital boost local economic growth?
- Should access to electricity, water and sanitation be viewed as rights or private goods that need to be paid for?
- How do congestion externalities influence energy demand, and vice versa?
- Why might governments hesitate to adopt environmental regulations, and how can new tech innovations influence this?
- What's the role of rent-seeking and bribery in shaping environmental quality, and how can these behaviours be mitigated?

References

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

Acemoglu, D., & Robinson, J. A. (2012). *Why nations fail: The origins of power, prosperity, and poverty*. Crown Books.

Acemoglu, D, Aghion P, Bursztyn L, and Hemous D. (2012). The Environment and Directed Technical Change, *The American Economic Review*, 102 (1), 131–166.

Aghion, P, Dechezleprêtre A, Hémous D, Martin R, and Van Reenen J. (2023) Carbon Taxes, Path Dependency, and Directed Technical Change: Evidence from the Auto Industry. *Journal of Political Economy* 124 (1), 1–51.

Allcott, H. (2018). Evaluating Energy Efficiency Policies. *NBER Reporter*, pp. 8–11.

Asher, S and Novosad P. (2020). Rural Roads and Local Economic Development. *American Economic Review*, 110 (3), 797–823.

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

Atkin D, Donaldson D (2015). Who's Getting Globalized? The Size and Implications of Intra-national Trade Costs. *NBER Working Papers* 21439, National Bureau of Economic Research.

Atkin, D., Faber, B., & Gonzalez-Navarro, M. (2018). Retail globalisation and household welfare: Evidence from Mexico. *Journal of Political Economy*, *126*(1), 1-73.

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

Ayres, R. and Kneese A, Production, Consumption, and Externalities. (1969). *The American Economic Review*, 59 (3), 282–297.

Balboni, C, Boehm J, and Waseem M, Firm Adaptation and Production Networks: Structural Evidence from Extreme Weather Events in Pakistan. (2023) *Technical Report, Structural Transformation and Economic Growth (STEG)*.

Balboni, C, Bandiera O, Burgess R, Ghatak M, and Heil A. (2022) Why Do People Stay Poor?, *The Quarterly Journal of Economics*, 137 (2), 785–844.

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, Elsayed A, Heil A, and Smurra A. (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, Goldberg N, Karlan D, Osei R, Parienté W, Shapiro J, Thuysbaert B, and Udry C. (2015) A multifaceted program causes lasting progress for the very poor: Evidence from six countries, *Science*, 348 (6236), 1260799.

Banerjee A, Hanna R, Olken B, and Sverdlin-Lisker D. (2022). Social Protection in the Developing World, *Journal of Economic Literature (forthcoming)*.

Bertrand, M., Burgess, R., Chawla, A., and Xu, G. (2019). The Glittering Prizes: Career Incentives and Bureaucrat Performance. *The Review of Economic Studies* (forthcoming)

Besley, T., & Persson, T. (2009). The origins of state capacity: Property rights, taxation, and politics. *American Economic Review*, *99*(4), 1218-44.

Best, M. C., Brockmeyer, A., Kleven, H. J., Spinnewijn, J., & Waseem, M. (2015). Production versus revenue efficiency with limited tax capacity: theory and evidence from Pakistan. *Journal of Political Economy*, *123*(6), 1311-1355.

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

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

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

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

Bryan, G., Chowdhury, S., & Mobarak, A. M. (2014). Underinvestment in a profitable technology: The case of seasonal migration in Bangladesh. *Econometrica*, *82*(5), 1671-1748.

Burgess, R., Deschenes, O., Donaldson, D., & Greenstone, M. (2014). The unequal effects of weather and climate change: Evidence from mortality in India. *Manuscript*.

Burgess, R., Greenstone, M., Ryan, N., and Sudharshan, A. (2019b). Electricity is not a right. *Journal of Economic Perspectives*, forthcoming

Burgess, R., Jedwab, R., Miguel, E., Morjaria, A., and Padro i Miquel, G. (2015). The Value of Democracy: Evidence from Road Building in Kenya. *American Economic Review,* 105(6):1817–1851

Burgess, R, Greenstone M, Ryan N, and Sudarshan A. (2023). Demand for Electricity on the Global Electrification Frontier, *Technical Report, Warwick Economic Research Papers 1*.

Byers, E, Gidden M, Leclère D, Balkovic J, Burek P, Ebi K et al. (2018). Global exposure and vulnerability to multi-sector development and climate change hotspots. *Environmental Research Letters*. 13 (5), 055012.

Cai, J., & Szeidl, A. (2017). Interfirm relationships and business performance. *The Quarterly Journal of Economics*, *133*(3), 1229-1282.
Cainelli, G, Massimiliano. M, and Sandro, M. (2012). Environmental Innovations, Local Networks and Internationalization, *Industry and Innovation*, 19 (8), 697–734.

Cameron, D., Kaberuka, D., Khan, A., Collier, P., Besley, T., Burgess, R., Fearon, J., Krasner, S. Mehyar, N., Shafik, M., Soyoye, B., Widner, J., and Woods, N. (2018). *Escaping the fragility trap*. Technical report, LSE - Oxford Commission on State Fragility, Growth and Development.

Cities, C40, “Heat Extreme,” 2018.

Castro-Vicenzi, J. Climate Hazards and Resilience in the Global Car Industry. (2022). *PhD dissertation, Princeton University*

Chauvin, J. P., Glaeser, E., Ma, Y., & Tobio, K. (2017). What is different about urbanisation in rich and poor countries? Cities in Brazil, China, India and the United States. *Journal of Urban Economics*, *98*, 17-49.

Chen, Y., Ebenstein A., Greenstone, M. and H. Li (2013). “Evidence on the impact of sustained exposure to air pollution on life expectancy from China’s Huai River policy”. PNAS, 110(32): 12936–12941.

Clement V, Kumari Rigaud K, Sherbinin A, Jones B, Adamo S, Schewe J, Sadiq N, and Shabahat E, . (2021). Groundswell: Acting on Internal Climate Migration. *Technical Report, World Bank*.

Collier, P. (2007). Bottom billion. *The Blackwell Encyclopaedia of Sociology*, 1-3.

Colmer, J, Temperature, Labor Reallocation, and Industrial Production: Evidence from India. (2021) *American Economic Journal: Applied Economics*, 13 (4), 101–24.

Delbridge V, Harman O, Oliveira-Cunha J, and Venables A. (2022). Sustainable urbanisation in developing countries: Cities as places to live. *Technical Report, International Growth Centre*.

De Luca, G., Hodler, R., Raschky, P. A., and Valsecchi, M. (2018). Ethnic favoritism: An axiom of politics? *Journal of Development Economics,* 132:115– 129.

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

Donaldson, D. (2018). Railroads of the Raj: Estimating the Impact of Transportation Infrastructure. *American Economic Review*, 108 (4-5), 899–934.

Donovan, K. (2020). The Equilibrium Impact of Agricultural Risk on Intermediate Inputs and Aggregate Productivity. *The Review of Economic Studies*, 88 (5), 2275–2307.

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

Diop, B. (2023) Upgrade or Migrate: The consequences of input subsidies on household labor allocation. *PhD dissertation, University of Oxford*.

Duflo, E, Greenstone M, Pande R, and Ryan N. (2013). Truth-telling by Third-party Auditors and the Response of Polluting Firms: Experimental Evidence from India*, *The Quarterly Journal of Economics*, 128 (4), 1499–1545.

Ebenstein, A., Fan, M., Greenstone, M., He, G., and Zhou, M. (2017). “New evidence on the impact of sustained exposure to air pollution on life expectancy from China’s Huai River Policy”, *PNAS*, 144:39, 10384-10389.

Faber B Gaubert C. (2019). Tourism and Economic Development: Evidence from Mexico’s Coastline. *American Economic Review*, 109 (6), 2245–93.

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

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

Gollin D, Lagakos D, and Waugh M.E. (2014) Agricultural productivity differences across countries. *American Economic Review*, 104, 165–170.

Gordon, R., & Li, W. (2009). Tax structures in developing countries: Many puzzles and a possible explanation. *Journal of Public Economics*, *93*(7-8), 855-866.

Greenstone, M., Nilekani, J., Pande, R., Ryan, N., Sudarshan, A., & Sugathan, A. (2015). Lower pollution, longer lives: life expectancy gains if India reduced particulate matter pollution. *Economic and Political Weekly*, *50*(8).

Grimm, M., & 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 low and middle income countries. *Labor Economics*, *32*, 67-85.

Hallegatte S. (2016). Shock waves: Managing the impacts of climate change on poverty. *World Bank Publications*.

Hamory J, Miguel E, Walker M, Kremer M, and Baird S. (2020). Twenty Year Economic Impacts of Deworming.*NBER Working Papers 27611, National Bureau of Economic Research, Inc*.

Hiscox, M, Broukhim M, and Litwin C, Consumer Demand for Fair Trade: New Evidence from a Field Experiment using eBay Auctions of Fresh-Roasted Coffee. (2020). *Working paper.*

Hong, C, Burney J, Pongratz J, Nabel J, Mueller N, Jackson R, and Davis S, Global and regional drivers of land-use emissions in 1961–2017. (2021). *Nature*, 589 (7843), 554

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

Imbert, C., & Papp, J. (2015). Labor market effects of social programmes: Evidence from india's employment guarantee. *American Economic Journal: Applied Economics*, *7*(2), 233-63.

Imbert, C., & Papp, J. (2019). Costs and benefits of seasonal migration: Evidence from India. *Working paper*

IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

Jacobson, M. (2015). *Air Pollution and Global Warming: History, Science, and Solutions*, Cambridge University Press, 2nd edition, Cambridge.

Jayachandran S. (2022). How Economic Development Influences the Environment. *Annual Review of Economics*, 14, 229–252.

Joskow, P. (2008). “Lessons learned from electricity market liberalization”. *The Energy Journal*, 29(2): 9 –42.

Karlan, D, Osei R, Osei-Akoto I, and Udry C. (2014) Agricultural Decisions after Relaxing Credit and Risk Constraints. *The Quarterly Journal of Economics*, 129 (2), 597–652.

Khan, A. Q., Khwaja, A. I., & Olken, B. A. (2016). Tax farming redux: Experimental evidence on performance pay for tax collectors. *The Quarterly Journal of Economics*, *131*(1), 219-271.

Lagakos, D., Moll, B., Porzio, T., Qian, N., & Schoellman, T. (2018). Life cycle wage growth across countries. *Journal of Political Economy*, *126*(2), 797-849.

Lane, G. (2023). Adapting to Floods with Guaranteed Credit: Evidence from Bangladesh. *Econometrica* (Revision requested).

Lee, K., Miguel, E., and Wolfram, C. (2019). Experimental Evidence on the Economics of Rural Electrification, *Journal of Political Economy*, forthcoming.

Lipscomb, M., Mobarak, A.M. and Barham, T. (2013). "Development Effects of Electrification: Evidence from the Topographic Placement of Hydropower Plants in Brazil." *American Economic Journal: Applied Economics*, 5 (02): 200–231.

Liu, M, Shamdasani Y, and Taraz V, Climate Change and Labor Reallocation: Evidence from Six Decades of the Indian Census (2023) *American Economic Journal: Economic Policy*, 15 (2), 395–423.

Macours K, Schady N, and Vakis R. (2012). Cash Transfers, Behavioral Changes, and Cognitive Development in Early Childhood: Evidence from a Randomized Experiment. *American Economic Journal: Applied Economics*, 4 (2), 247–73.

Marx, B., Stoker, T., & Suri, T. (2013). The economics of slums in the developing world. *Journal of Economic Perspectives*, *27*(4), 187-210.

McKenzie, D., & 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., & 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.

Meager, R. (2019). Understanding the average impact of microcredit expansions: A Bayesian hierarchical analysis of seven randomised experiments. *American Economic Journal: Applied Economics*, *11*(1), 57-91.

Mercer, L, (2022). What are nature-based solutions to climate change?.

Metcalf, G. (2021). Carbon Taxes in Theory and Practice, *Annual Review of Resource Economics*, 13 (1), 245–265.

Migration, UN, *World Migration Report 2022 2021.*

Miguel E, Satyanath S, and Sergenti E. (2004). Economic Shocks and Civil Conflict: An Instrumental Variables Approach. *Journal of Political Economy*. 112 (4), 725–753

Moneke, N. (2023). Can big push infrastructure unlock development?" PhD dissertation. *University of Oxford*. Narayan A, Ng O, Sinha Roy S, and Baseler T. (2023). Does Food Insecurity Hinder Migration? Experimental Evidence from the Indian Public Distribution System. *Journal of Development Economics (pre-results review)*.

Niehaus, P., & Sukhtankar, S. (2013). Corruption dynamics: The golden goose effect. *American Economic Journal: Economic Policy*, *5*(4), 230-69.

Olken, B. A. (2006). Corruption and the costs of redistribution: Micro evidence from Indonesia. Journal of public economics, 90(4-5), 853-870.

Otto, C, Dasgupta, S, Van Maanen, N, Gosling, S, Piontek, F, and Schleussner, C, (2021). Effects of climate change on combined labour productivity and supply: an empirical, multi-model study. *Articles Lancet Planet Health*, 5, 455–465.

Page, L., & Pande, R. (2018). Ending Global Poverty: Why Money Isn't Enough. *Journal of Economic Perspectives*, *32*(4), 173-200.

Parekh, N and Bandiera O. (2020). Poverty in the Time of COVID: The Effect of Social Assistance. *Technical Report*.

Perkins, R and Neumayer E. (2008). Fostering Environment Efficiency through Transna- tional Linkages? Trajectories of CO2 and SO2, 1980–2000. *Environment and Planning* A, 1 40 (12), 2970–2989.

Peters K, Dupar M, Opitz-Stapleton S, Lovell E, Budimir M, Brown S, and Cao Y. (2020) Climate change, conflict and fragility An evidence review and recommendations for research and action. *Technical Report, Overseas Development Institute*.

Reguant, M and Kellogg R. (2021). Energy and Environmental Markets, Industrial Organization, and Regulation," *National Bureau of Economic Research*, pp. 81–86.

Roberts, P, Shyam K, and Rastogi C. (2006). Rural Access Index: A Key Development Indicator. *Technical Report*.

Roser, M. (2023) Employment in Agriculture. *Our World in Data*. https://ourworldindata.org/employment-in-agriculture.

Slemrod, J. (2007). Cheating ourselves: The economics of tax evasion. *Journal of Economic Perspectives*, *21*(1), 25-48.

Surminski, S. (2014). The Role of Insurance in Reducing Direct Risk - The Case of Flood Insurance. *International Review of Environmental and Resource Economics*. 7 (3–4), 241–278.

Tsivanidis, N. (2022). Evaluating the Impact of Urban Transit Infrastructure: Evidence from Bogota's TransMilenio. *World Bank presentation*.

Timilsina, G. (2022). Carbon Taxes. *Journal of Economic Literature*, 60 (4), 1456–1502.

WHO (2016). "Ambient air pollution: A global assessment of exposure and burden of disease", ISBN 978 92 4 151135 3.

Wolfram, C., Shelef, O. and Gertler, P. (2012). How Will Energy Demand Develop in the Developing World? *Journal of Economic Perspectives* 26 (1):119–138

Young, A, (2013) Inequality, the Urban-Rural Gap, and Migration. *The Quarterly Journal of Economics.* 128 (4), 1727–1785.

Zheng, S and Kahn M. (2017). A New Era of Pollution Progress in Urban China?, *Journal of Economic Perspectives*, 31 (1), 71–92.