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Transport and infrastructure: A summary of IGC research

Highlights of the IGC's research over the past 10 years

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SEPTEMBER 2019

Transport and infrastructure are fundamental aspects in economic development. By lowering movement costs, improving transport and infrastructure help stimulate inclusive economic growth. However, the nuanced effects of transport and infrastructure projects need to be empirically understood if they are to play an effective role in a country's broader development strategy. The IGC has commissioned research across sub-Saharan Africa and Asia to examine these effects, and demonstrate the economic case for allocating often scarce state resources to transport and infrastructure projects.

IGC projects have looked at the effects of improving transport links across countries and cities through various lenses. The IGC's research around roads suggests that their economic effects are not as straightforward as commonly assumed. Roads can spread the benefits of trade, but only if other issues of connectivity are addressed as well. Furthermore, roads may not necessarily increase economic activity in previously unconnected areas, but they may give people in those areas access to higher-value non-farm work elsewhere. Taken together, the IGC's research suggests road connectivity plays an important role in the spatial transformation of countries undergoing a structural transformation of their economy away from agriculture to manufacturing and services.

Along with projects on national road building schemes, the IGC has built a substantial cluster of research around public transport systems in developing cities – particularly bus rapid transit systems (BRTs). As populations shift away from the countryside, cities will need to be the engines of growth for developing countries, especially in sub-Saharan Africa. Transport authorities should ensure roads and public transport systems facilitate rather than impede the economic dynamism of urban centres. Too often, crippling congestion hinders the productive potential of urban centres. Together, the IGC's evaluations of various BRTs represent a valuable stock of knowledge for policymakers in cities globally.

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1. Effects on trade and firm performance

IGC research suggests that in terms of facilitating trade, building roads can be beneficial, but only one step in decreasing the cost of transporting goods into and around developing countries. Barriers that increase the price of transporting goods, such as poor quality vehicles, poor practices within logistics firms (e.g. big trucks carrying small loads over short distances, or excessive loads that damage trucks), and excessive regulations should also be addressed. As argued in an [IGC Growth Brief](#), these shortcomings affect growth prospects in sub-Saharan Africa. A weak transport sector can inhibit countries taking advantage of global value chains, both in moving goods nationwide for export and in bringing in competitively-priced international goods to consumers nationwide.

- **Trade liberalisation, infrastructure and firm performance: Evidence from Ethiopia** (Marco Sanfilippo, Asha Sundaram, Fitsum Zedwu Mulugeta, 2018). IGC research has investigated the complementarity between trade liberalisation and infrastructure in Ethiopia. Ethiopia is a particularly relevant case when it comes to assessing the effects of road infrastructure on economic activity. It is landlocked, does not have easily navigable rivers or any substantial rail network, and so relies heavily on roads for the transportation of goods. In the 1990s, the country embarked on a scheme of trade liberalisation, which has been followed by an ambitious plan of infrastructure development through the Road Sector Development Programme. The research shows that falls in input tariffs during the liberalisation programme are associated with an increase in firm productivity in places that had access to quality road infrastructure. However, for towns with poor road infrastructure, a decrease in these tariffs often did not lead to an increase in firm productivity.

- **Who's getting globalised? Intra-national trade costs and world price pass-through in South Asia and sub-Saharan Africa (David Atkin, David Donaldson, 2012).** IGC research suggests that the cost of transport of goods could be up to five times higher (per unit distance) in some sub-Saharan African countries than in the US. In the case of Ethiopia, the “cost of distance” is estimated to be about 3.5 times higher relative to the US, while in Nigeria, it is 5.3 times higher. Roads across many countries in sub-Saharan Africa are in notoriously bad condition - [around 53% remain unpaved](#). Whilst it is tempting to attribute the high cost of intra-national trade down to poor quality roads, IGC research suggests that roads themselves may only be one of many factors affecting the cost of transporting goods in African countries. Even when taking into account that there are both more and better quality roads, the cost of distance is still 2.5 times higher in Ethiopia and four times higher in Nigeria than the US. This suggests that other factors are at play in keeping the costs of transportation high e.g. high maintenance and fuel costs for poor quality vehicles, excessive regulations, and above all long waiting times and heavy duties at international borders. This has important implications for transport and infrastructure policies in sub-Saharan Africa. Rather than focusing solely on improving the quality and availability of roads, policymakers should consider other interventions that could lower the price of road freight transport. Other factors need to be addressed, such as restricted market competition in logistics, low-quality vehicles that have high maintenance and fuel costs, and corrupt practices by government officials alongside roads, as is argued by Dave Donaldson, Amanda Jinhage and Eric Verhoogen in an [IGC Growth Brief](#).
- **Poor infrastructure and lack of competition in the transport industry: Evidence from Liberia (Jonas Hjort, Golvine de Rochambeau, 2017).** In Liberia, a recently completed IGC project has assessed the key challenges facing the country's transport industry based on interviews with more than 70 companies and 200 drivers in the country's main transport hubs. These interviews represent a valuable qualitative addition to the IGC's stock of knowledge of the transport industry in sub-Saharan Africa. The biggest challenges quoted by transport companies were poor road conditions, the cost of trucks, maintenance, and corrupt practices. The truck market in Liberia is not well developed. Trucks need to be imported from abroad, but are subject to high shipment costs and import taxes in the country, meaning they are much more expensive in Liberia than in other parts of the world. The maintenance costs for trucks in Liberia are also high because of poor quality roads, which deteriorate a truck's condition quickly. IGC research found 19% of total expenditure of transport firms in the surveyed sample went towards maintenance costs. Trucking companies surveyed may also spend up to 8% of their expenditure on bribes. Much of the time bribes are paid for overloaded trucks – itself a cause of poor road conditions, and a consequence of the high price of trucks in the country. Overall, the message echoes the findings of Atkin and Donaldson above – that road quality and access are important, but not necessarily sufficient conditions to improve a country's connectivity.
- **Railroad to growth: Evaluating the impact of investments in railroads on firm behaviour (Sandra Sequeira, Neil Andrew Rankin, 2013).** The importance of considering non-infrastructure barriers to the costs of trade

for firms is echoed by a paper based on [IGC research in Mozambique](#). The research looks at how firms along the main transport corridor between South Africa and Maputo, the capital of Mozambique, respond to changes in tariffs between the two countries. The corridor in Mozambique studied is relatively well connected via road and rail compared to the rest of the country. The research suggests that despite the relatively high-quality infrastructure conditions of rail and road links, and other favourable policies aimed at encouraging trade along the route, corrupt and collusive practices amongst firms kept the cost of transport high along the corridor.

2. Effects on livelihoods and labour markets

The above research looks at the effect of roads through the lenses of trade, prices, and firm productivity. Other IGC projects have assessed the effects of roads from the perspective of individual consumption and access to labour markets. Both sets of projects contribute to the same picture of the relationship between infrastructure and economic prosperity but with different particles of analysis – the former projects focus more on static firms and how increased connectivity affects their economic outcomes, whilst the latter projects looking more at mobile individuals, and how transport and infrastructure projects affect their movement, and in turn, their livelihood and wellbeing. IGC projects that have focused on road effects on labour markets overall show that, although they may not have significant impacts on economic activities in rural areas themselves, they do allow people in rural areas to move more easily to non-farm employment. Together, IGC research from India, Bangladesh, and China suggest road-building programmes should perhaps not be conceived as a way to even out geographical disparities in economic opportunities across a country, but instead as a way to allow those in rural areas to more easily access work in urban areas (where there are more opportunities in higher-value economic activities in industry, manufacturing, and services).

- **[How do Rural Roads Affect Development? Evidence from India \(Paul Novosad, Samuel Asher, 2018\)](#)**. In India, IGC-funded research measured the impacts of the country's \$40 billion rural road construction programme. The Pradhan Mantri Gram Sadak Yojana (Prime Minister's Village Road Programme, or PMGSY) was conceived originally as a way to allow previously unconnected areas of India to 'catch-up' to more economically developed regions. The research shows that these roads do not have significant effects on the economic activities taking place within the villages themselves with only a slight increase in non-farm employment, and no significant increase in consumption or assets. However, the roads allow the movement of workers from villages to access non-farm work outside the village. The research has since been presented to the Ministry of Rural Development and the Economic Advisory Council in India, who are using it to inform state-level and national-level investment strategies (investment in rural and urban areas, and investment in roads and human capital).
- **[Infrastructure and well-being: Impact of Jamuna Multipurpose Bridge on jobs and livelihood in Bangladesh \(Yasuyuki Sawada, Minhaj Mahmud, 2018\)](#)**. In Bangladesh, research observes similar effects after the construction of the Jamuna multipurpose bridge (JMB) connecting the east and west of

Bangladesh. The results suggest that the JMB “facilitated farm to non-farm shift of employments”. However, the research does not determine whether this shift in employment “reflects an overall gain for Bangladesh from bridge construction, or if it merely implies a displacement of jobs from one area to another”.

- **Transport infrastructure, urban growth and market access in China** (Nathaniel Baum-Snow, Loren Brandt, Vernon Henderson, Matthew Turner, Qinghua Zhang, 2018). In China, IGC research studying the impact of the recently constructed Chinese national highway system on economic outcomes across rural and urban areas, shows similar patterns to the trends in the research in India and Bangladesh. Roads connecting ‘hinterlands’ to regional centres or ‘primate cities’ actually concentrate higher-value activities like manufacturing and services more in these centres, and lead rural areas to specialise more in agriculture. The research suggests that in China, roads did not distribute higher-value economic activities more evenly across a country, but instead allowed urban and rural areas to fulfil their comparative advantages in manufacturing and services, and agriculture respectively.

3. Cities: Bus Rapid Transit (BRT) systems

The above projects show that in understanding countries’ broader economic development, transport and infrastructure projects should be conceived as facilitating efficient labour market outcomes, as well as allowing the smooth flow of goods. This issue is magnified when it comes to the planning of cities. Public transport systems that alleviate congestion are vital for cities to become economically dynamic hubs that drive growth in developing countries.

Bus rapid transit (BRT) systems can be cost-effective ways to manage traffic in rapidly-expanding cities across the developing world. BRT systems dedicate lanes separate from main traffic for buses, and utilise other methods, like pre-paid ticketing, to ensure buses are on the move as much as possible to alleviate congestion. Though they are cheap relative to other transport projects, like light rail, BRTs still require significant investment from transport authorities and setting them up can inspire significant political opposition. This makes rigorously evaluating their economic and social impacts especially important. In various cities, IGC-funded research, and research from IGC affiliates, has shown these BRT systems can significantly reduce transport costs and travel times for commuters, and expand job opportunities.

IGC-funded studies in this area are important because as highlighted, transport and infrastructure projects are expensive – there is little planners can do in being ‘incremental’ or ‘experimental’ with transport interventions. These evaluations help transport planners in other contexts understand the effects of similar projects in practice, rather than just theory.

- **The aggregate and distributional effects of urban transit infrastructure: Evidence from Bogotá’s TransMilenio (non-IGC funded)** (Nick Tsivanidis, 2017). In his job market paper, IGC Cities Research Programme Director Nick Tsivanidis shows how in Bogota, Colombia, a new BRT line improved average welfare and increased overall output across the city. Parts of the BRT lines that connected poorer neighbourhoods to areas with unskilled jobs were particularly beneficial.

- **Urban transportation, labour markets and access to economic opportunity: Evidence from Lahore’s Bus Rapid Transit System** (Hadia Majid, Katherine Helen Anne Vyborny, Ammar Anees Malik, Mir Anjum Altaf, 2018). In Lahore, Pakistan, IGC research has rigorously demonstrated the beneficial impacts of a BRT system on labour market outcomes, particularly for women. The research demonstrates that the BRT line in Lahore has led to a 24% increase in public transport use among commuters in areas nearby the route, with approximately 35,000 commuters switching to public transit citywide. The effects that expanding public transport interventions in Lahore could have on women are particularly notable. A [follow up project](#) surveyed 1,000 households, which showed 70% of male family members said they would discourage female family members from taking public buses. Further, 30% of women surveyed said they felt their neighbourhoods were unsafe to walk to and wait at a bus stop. This evidence has helped support an on-going scheme in Lahore for ‘Pink Buses’ – women-only buses that seek to connect women in previously poorly connected neighbourhoods with jobs and education opportunities. This work in Pakistan shows that future studies evaluating transport and infrastructure interventions should be cognisant of the potential gendered dimension of their effects.
- **Urban transport systems and commuter mode choices: A field experiment in Ghana** (Gordon Abekah-Nkrumah, Patrick Opoku Asuming, Henry Telli, 2017). In Accra, Ghana, researchers compared the effect of the introduction of a ‘BRT-lite’ – the Aayalolo Bus Service – on a road to the central business district to a similar arterial highway with no BRT system. Currently in Accra, many commute by tro-tro – unregulated minivans with capacity for 10-18 passengers that run ad-hoc and drop off at the request of passengers. The Aayalolo buses seemingly have advantages over the tro-tros – they are more comfortable, depart at regular times, and drive safer. However, researchers found from a survey of nearly 6000 individuals that there were no significant changes in the mode of transport used by commuters near the new bus route. This is despite the fact that there is a high awareness of the Aayalolo buses in both surveyed areas. Amongst the main reasons cited by those surveyed was that the buses do not run their desired commuting route, and that the cards needed to pay for the bus are hard to access. This suggests that the uptake of BRT systems by commuters may not be straightforward. Smaller impediments that may discourage commuters to make a switch in the mode of transport they use may need to be addressed for BRTs to be successful.
- **Evaluating the impacts of the Dar es Salaam Bus Rapid Transit (BRT) system** (Gharad Bryan, Bilal Murtaza Siddiqi, Melanie Morten, 2017). In Dar es Salaam, Tanzania, the IGC is funding an on-going evaluation of the city’s BRT system. Researchers have surveyed 1,750 households to evaluate Phase 1 of the city’s BRT system, and are comparing households at varying distances to the first phase and the later phases of the BRT yet to be built. The research team have collected data on a wide range of social and economic outcomes using mobile surveys. It is hoped that the evaluation when it is ready will help guide the BRT in future phases.
- **Scoping trip – Introducing a formal bus service to Kampala** (Jitendra Bajpai and Astrid Haas, 2017). In Kampala, Uganda, the IGC has been helping

policymakers explore options in establishing a formal bus system, and ways to finance their infrastructure investments. Both these areas have been informed by the previous experience of researchers in other cities in the developing and developed world.

4. Way forward

Based on the evidence on transport and infrastructure, the IGC is exploring the costs and benefits of regional integration, particularly in East Africa, and of global trade. We are also studying the impact connectivity has on urbanisation, congestion, productivity, and inequality. An interesting area of research is the effect transportation has on the distribution of economic activities, and whether it encourages structural change towards manufacturing and services. This area is closely linked to our work on firms and policies regulating the movement of goods and the management of logistics companies. Further, the IGC is looking to more explicitly link up the ground-breaking work it has funded on management practices, to examine the logistics firms shown to be so instrumental to the cost of movement of goods in sub-Saharan Africa.

On top of this, the on-going IGC-funded BRT evaluations in Tanzania and Pakistan will continue to shed light on their benefits, and potential improvements. Elsewhere the IGC has on-going projects where findings are not yet available, like in Myanmar, where the IGC is funding a cost-benefit analysis of low-volume rural roads.

Finally, in our next phase of research, we aim to understand what type of physical and policy infrastructure is most needed to boost exports and how the cost-benefit analysis of transport infrastructure changes with the volume of trade.



The International Growth Centre (IGC) aims to promote sustainable growth in developing countries by providing demand-led policy advice based on frontier research. The IGC directs a global network of world-leading researchers and in-country teams in Africa and South Asia and works closely with partner governments to generate high quality research and policy advice on key growth challenges. Based at LSE and in partnership with the University of Oxford, the IGC is majority funded by the UK Department for International Development (DFID).