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The role of the construction sector

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Abstract: The construction sector plays a key role in providing structures for economies. This paper surveys the literature on key issues pertaining to the construction sector. It starts by summarizing our knowledge about differences in unit costs across time and space. It then discusses key bottlenecks in the sector related to organization and capabilities, institutional constraints, critical inputs, and governance and corruption. It concludes by outlining policy options related to institutional and regulatory reforms as well as procurement and local content.

Keywords: construction, infrastructure, procurement, unit costs
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1 Introduction

The construction sector plays a central role in the economy of any country, providing essential structures such as public and private infrastructure and housing. Even the most advanced economies would be incapable of maintaining a high standard of living without continuous investments in infrastructure, such as for waste management, water provision, or transport. A poorly functioning sector has two primary consequences: first, it tends to translate into high prices, leading to low levels of output for a given level of expenditure. For instance, if a kilometre of road costs US$1 million in country A and US$2 million in country B, the latter can afford exactly half the length of road. This paper will show that such differences in unit costs are fairly common, and differences in unit costs frequently exceed a factor of 2. Second, when local capacity is low, countries need to purchase construction services from foreign firms, limiting local employment generation and local content. Many developing countries have low levels of infrastructure and often the existing infrastructure is not well maintained. How productive the construction sector is in translating a given amount of input into output has therefore wide-ranging consequences for the provision of basic infrastructure and services.

The aim of this paper is to survey the current state of knowledge on key issues of the construction sector. Overall, there is little systematic knowledge on the construction sector in Africa. With an aim of contributing towards filling this gap, I draw on evidence from a wide range of sources, including journal articles, industry reports, and enterprise maps (Sutton and Olomi 2012). Further, to show general trends and patterns, I use data from National Accounts Statistics (United Nations 2018), the World Development Indicators (World Bank 2018a), databases of unit costs (World Bank 2006), the World Bank Procurement database (World Bank 2018b), as well as the International Comparison Project 2011 (World Bank 2015).

The paper is structured as follows. Section 2 sets the stage. It starts by reviewing some of the key characteristics of the sector that distinguish it from any other sector of the economy. It then shows trends in the share of construction in value added, and gross fixed capital formation, both for the world, as well as for the countries selected for five case studies: Ghana, Mozambique, Tanzania, Uganda and Zambia.[1] I discuss why the construction sector might be under particular pressure in natural resource-rich countries, and how this affects prices depending on the slope of the supply curve of the construction sector. Section 3 reviews what we know about differences in the unit cost of constructing infrastructure and discusses how construction costs affect the link between investment efforts and investment outcomes. Section 4 discusses some of the key bottlenecks in the construction sector. Section 5 outlines policies to improve the sector's ability to respond to surges in demand. Section 6 draws some conclusions.

Throughout the paper I focus on the more formal aspects of the construction sector, in the measurement of the size of the sector across time and space, price levels, and capacity of the sector. This is not a statement about the relative importance of the formal versus the informal segment of the market; rather, it is driven by the availability of data. Arguably, when considering large-scale infrastructure construction, this is the relevant segment of the sector to analyse. While some of the issues touched upon in this paper will apply to all subsectors within construction, I make sure to highlight whether an issue is particularly important for a certain subsector.

[1] These country case studies are presented by Owoo and Lambon-Quayefio (2018), Cruz et al. (2018), Kikwasi and Escalante (2018), Colonnelli and Ntungire (2018), and Cheelo and Liebenthal (2018), respectively.

2 Background

The construction sector has a number of characteristics that—when considered together—distinguish it from other sectors in the economy (Moavenzadeh 1978). First, goods in the construction sector are highly differentiated, often purpose-built, and financed by the customer. Contrast this with manufacturing, where products are traditionally designed by the producer, built by the producer, and then sold to the customer. In particular in developing countries, financing is frequently provided by external parties, who have a substantial influence on the procurement and construction process of the infrastructure. Second, stockpiling of infrastructure is seldom possible, and most products are difficult to transport across space. Third, due to the high level of differentiation, size of projects, and limits to stockpiling infrastructure, the construction of infrastructure frequently responds precisely to demand. Overall, these features lead to unstable demand that depends on resource availability and often political factors. Fourth, maintenance of the constructed good has a strong effect on the return on a piece of infrastructure. Finally, it is worth mentioning that governance issues—for example, transparency in project selection, procurement, and construction—pose challenges for countries across all levels of development.

Table 1 shows the shares of value added as a percentage for five different years between 1995 and 2015. Across sub-Saharan Africa, value added in the construction sector accounted for about 3.3–4.5 per cent and has been increasing over time. This is slightly below the average value added for the world, which is between 5.5 and 6.3 per cent. Over the two decades 1995–2015 there has been an increase in value added in construction in South Asia and a decrease in East Asia.

Table 1: Share of construction in value added (%)

	1995	2000	2005	2010	2015
Panel A: Aggregates					
Sub-Saharan Africa	3.7	3.4	3.5	3.7	4.5
East Asia	8.3	7.6	6.4	5.5	5.6
South Asia	5.9	5.4	6.0	7.7	8.1
South America	6.0	5.7	5.4	5.1	6.6
World	6.3	5.9	5.5	5.7	5.5
Panel B: Case study countries					
Ghana	4.8	5.5	5.6	8.5	13.5
Mozambique	3.0	4.1	1.5	2.1	2.5
Tanzania	4.2	5.3	8.3	8.3	14.6
Uganda	3.7	4.8	5.6	6.2	8.0
Zambia	3.8	4.4	7.7	10.6	10.6

Source: author's calculation based on data from the United Nations (2018).

Turning to the case study countries, there is a marked increase in value added in construction in Ghana, Tanzania, Uganda, and Zambia, with the share of value added generated in the construction sector being relatively low in Mozambique (between 1.5 and 4.1 per cent).

I next investigate gross fixed capital formation, which measures the additions to fixed capital in an economy, including land improvements, plant, machinery, and equipment purchases, and the construction of fixed infrastructure. Panel A in Table 2 shows aggregates for gross capital formation. The table shows that sub-Saharan Africa experienced an increase in gross capital formation as a percentage of gross domestic product (GDP) in the past two decades, from 17 per cent to almost 21 per cent. This level remains lower than the average for South Asia and East Asia and the Pacific, which have capital formation levels of close to 30 per cent or more for the past two decades. In 2015, sub-Saharan Africa's gross capital formation is in line with the level found in Latin America and the Caribbean.

Table 2: Gross fixed capital formation (percentage of GDP)

	1995	2000	2005	2010	2015
Panel A: Aggregates					
Sub-Saharan Africa	16.5	15.2	15.4	19.9	20.5
South Asia	24.7	23.8	30.5	30.7	27.7
East Asia and Pacific	31.2	29.1	30.7	31.5	31.8
Latin America and Caribbean	18.7	18.8	18.6	20.1	19.9
World	23.3	23.5	24.0	23.1	23.4
Panel B: Case study countries					
Ghana	21.1	23.1	29.0	24.7	23.8
Mozambique	19.9	22.1	13.2	17.9	32.0
Tanzania	19.6	16.4	25.2	28.7	34.3
Uganda	16.4	19.2	22.2	25.2	24.2
Zambia	..	..	..	25.9	38.5

Source: author's calculation based on World Bank (2018a) data.

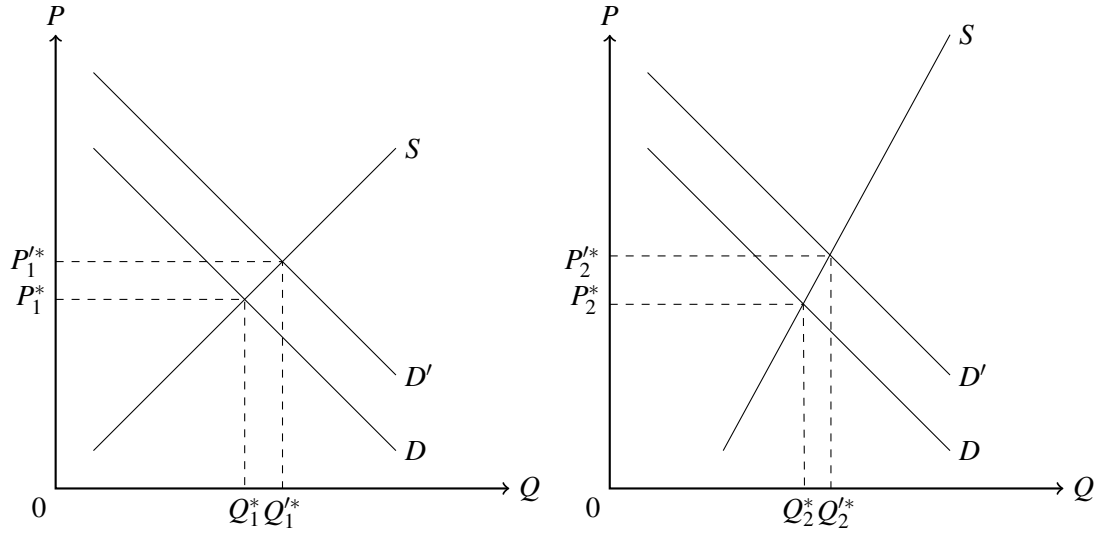
Panel B shows that there is a substantial amount of heterogeneity across both time and space in the countries studied in more detail. In 2015, all countries show gross capital formation at a level above the sub-Saharan African average, ranging from 39 per cent in Zambia to 24 per cent in Ghana and Uganda. Mozambique and Tanzania have levels of gross fixed capital formation of 32–34 per cent, which are close to the level prevailing in East Asia and the Pacific. Table 2 shows that, across time, there is substantial variation across the five-year periods shown. Mozambique is the only country in which value added in construction and gross fixed capital formation do not move together. A possible explanation is that this is due to the fact that gross fixed capital formation includes land improvements as well as plant, machinery, and equipment purchases, and this has been the main driver of the rise in gross fixed capital formation.

There are several reasons for a link between natural resource discovery or exploitation and the construction sector. First, infrastructure investments might be driven by an anticipation of future exploitation. Expectations of future discoveries might further drive investment in private and public infrastructure in an area. Second, new infrastructure might be required to facilitate the discovery or exploitation of natural resources, such as housing for workers, or roads and railroads to bring machinery in and take resources out. Third, natural resources lead to additional spending capacity at the level of governments. Particularly when countries lack basic infrastructure, governments might want to use the additional fiscal space to build new and upgrade existing infrastructure.

All these factors imply that there is an increase in the demand for goods produced by the construction sector. Whether this increase in demand leads to an increase in the unit price and the extent of that increase depends on the slope of the supply curve, as illustrated in Figure 1.

The left-hand graph in Figure 1 shows the effect of an increase in the demand for goods produced in the construction sector when the supply curve is unit elastic. The increase in demand leads to a shift in the quantity produced from Q_1^* to $Q_1'^*$. The equilibrium price shifts up from P_1^* to $P_1'^*$. The right-hand graph shows the same shift in the demand curve, but now with a supply curve that is less elastic. The graph shows that the same increase in demand leads to a smaller increase in the quantity produced, which shifts from Q_2^* to $Q_2'^*$, but at a higher price. Therefore, a given increase in the demand for goods produced in the construction sector can lead to different levels of new equilibrium prices and quantities. Note that the graphs show aggregate supply. One important concern for policy makers is the composition of local and foreign firms, which in turn has effects on employment generation and likely dynamic effects on local capacity.

Figure 1: Demand shift with different supply elasticities



Source: author's illustration.

3 Construction costs across time and space

This section discusses our basic knowledge of construction costs across countries and time. I start by highlighting measurement issues when aiming to measure unit costs in construction, where a core difficulty is to find comparable projects. I then review recent evidence on the cost of road infrastructure across 99 low- and middle-income countries.[2] Finally, I discuss how construction costs affect the link between investment efforts and investment outcomes.

3.1 What do we know about differences in unit costs?

Measuring the cost of construction across space is difficult for a number of reasons. First, the construction sector produces highly differentiated goods, such as roads, buildings, and bridges. Considering only one type of good makes comparisons slightly more feasible. However, there are still enormous differences. For example, consider building a non-paved road and a four-lane highway. These two types of infrastructure are likely to include a different set of raw materials, equipment, and types of labour. Comparing narrowly defined work activities—such as an asphalt overlay of a specific thickness—is one possible way forward. Still, different types of construction methods (e.g. labour-intensive versus capital-intensive) might still lead to very different unit costs.

For building construction, comparisons are even more difficult: a database might consist of costs of different types of buildings, including residential buildings, public buildings such as schools and hospitals, and industrial buildings. Several margins could be responsible for differences in costs. First, all of these will have different specifications that likely manifest themselves in differences in unit costs. Safety requirements will differ across these different building types, affecting the materials chosen and type of labour involved in the construction. Even within a category, comparison of costs is complicated by differences in building codes across time and space which might lead to differences in costs of a particular project that are due to different specifications, even when holding construction unit costs constant. Knowledge of differences in building codes is not readily available, such that it is difficult to control for

[2] See Collier et al. (2016) for a review on the literature on differences in unit costs.

them. Even if they exist, compliance with building codes might vary across countries and be correlated with factors that also drive the costs of construction, such as corruption.

Second, there are different types of costs: estimated costs, which are typically estimated by construction engineers familiar with the project; contracted costs, which is the amount that figures in the contract with the construction firm; and actual costs, which are the sum of contracted costs and cost adjustments such as cost overruns. Cost overruns are fairly typical in the construction sector, such that the differences in these cost types can be substantial and one needs to be careful when making comparisons across them. Finally, rarely are data on costs stored centrally. Most commonly, they are part of reports held by different ministries and entities, making comparison difficult. The lack of overview of the costs of construction for a particular country also means that it is difficult to compare a set of bids for a project with similar projects.

To illustrate the magnitude in differences in construction costs for similar activities, Table 3, taken from Collier et al. (2016), shows the unit cost per kilometre of an asphalt overlay of 40–59 mm across countries. The upper panel shows projects undertaken in the period 1996–98 and the lower panel shows activities undertaken between 2005 and 2007. These years are shown together to allow comparability and to minimize differences in costs that are due to exchange rate fluctuations or changes in input prices. All costs are in 2000 US dollars.

The table shows that differences in unit costs are large: an asphalt overlay of 40–59 mm for 100 km of road would cost US$3.3 million in the Dominican Republic, compared to US$10.5 million in Pakistan and US$11.1 million in Tanzania. Ghana is somewhat in the middle, with activities costing US$4.3–5.2 million. There are large differences in unit costs even in the same country. In the period 2005–07, an asphalt overlay for a length of 100 km in Brazil could cost between US$55.2 and US$82.9 million. Some of the dispersion in the database could be explained by differences in the measurement of roads—for example, using costs per square metre compared to costs per metre—or estimated versus contracted or actual costs. Collier et al. (2016) show that the ranking is largely unaffected when using different levels of unit costs. What drives these differences in the costs of construction and maintenance projects across countries? The next section discusses evidence on drivers of costs.

3.2 How do construction costs affect the link between investment effort and investment outcomes?

In light of the scarce knowledge on construction costs across space, literature on the link between investment effort and investment outcomes is even more scarce. Theoretically, higher costs of infrastructure affect outcomes in at least three ways. First, they mechanically decrease the amount of infrastructure a country can afford to get for a given budget. Consider that the annual budget available for road construction of country C amounts to b. Assume that the unit cost per kilometre is p, and for simplicity, assume that there are no fixed costs. The country will then be able to afford $r = b/p$ kilometres of roads. The higher p, the lower the number of new roads a country is able to afford. Second, costs might affect project selection. Assume that projects are selected if they have a certain rate of return. High construction costs will decrease the likelihood that a particular project is selected. If construction costs differ systematically by sector, this will have an effect on spending across sectors. Third, there are important possible dynamic effects. High costs in the construction sector might reduce the number of projects being carried out in the sector, lowering the ability of the sector to expand its capacity. If maintenance costs are high, this might reduce expenditures on maintenance and thereby reduce the lifespan of a piece of infrastructure and thereby its rate of return.

Table 3: Unit costs per kilometre of asphalt overlays of 40–59 mm

Country	Cost per kilometre (US$,1000)	Number	Year	Country	Cost per kilometre (US$1,000)	Number	Year
Work activities undertaken 1996–98							
Dominican Republic	33.5	1	1997	Argentina	69.7	1	1997
Ghana	42.9	5	1998	Brazil	74.4	1	1998
Lithuania	44.4	1	1996	Argentina	74.9	1	1996
Indonesia	48.5	1	1996	Cameroon	76.8	4	1997
Lithuania	49.7	1	1998	Bangladesh	79.1	26	1998
Mexico	50.7	1	1997	Viet Nam	79.6	2	1998
Ghana	52.7	1	1996	Bangladesh	83.6	1	1997
Costa Rica	57.9	1	1996	Panama	84.1	1	1997
Armenia	60.7	1	1997	Nigeria	95.1	1	1997
Brazil	62.5	2	1996	El Salvador	102.2	1	1998
Bolivia	67.4	1	1997	Pakistan	105.0	1	1997
India	68.1	3	1997	Tanzania	111.7	1	1996
Work activities undertaken 2005–07							
Paraguay	31.2	1	2005	Botswana	68.0	1	2006
India	35.9	2	2006	Nigeria	73.0	1	2007
Bulgaria	40.7	1	2006	Argentina	76.2	3	2006
Ecuador	41.6	1	2005	Georgia	82.6	1	2006
India	45.6	1	2005	Brazil	82.9	2	2005
Burkina Faso	48.0	1	2007	Georgia	84.9	1	2005
Brazil	55.2	3	2006	Viet Nam	85.4	1	2005
Brazil	58.2	1	2007	Macedonia	85.7	1	2007
Thailand	59.5	1	2005	Rwanda	90.6	1	2006
Philippines	60.8	1	2006	Philippines	94.8	1	2005
Bosnia and Herzegovina	61.9	2	2006	Chile	98.9	1	2006
Nepal	63.1	1	2006				

Notes: all costs are in 2000 US dollars; number denotes the number of work activities in a given country over which a simple average is taken.
Source: Collier, Kirchberger, and Söderbom (2015), reproduced under License: CC BY 3.0 IGO.

4 Key bottlenecks in the construction sector

This section discusses key bottlenecks in the construction sector. I start by discussing the capabilities of the sector by analysing data from the World Bank's Procurement Database. I present some key facts about origin of suppliers for projects carried out by different borrower regions. I show that sub-Saharan Africa fares poorly compared to all other regions in terms of regional firms winning contracts, in particular when contract size increases. What constrains growth of firms in the construction sector? I discuss institutional constraints such as procurement and financing, the role of critical inputs, and governance and corruption.

4.1 Organization and capabilities

There is little systematic knowledge about the market structure of the construction industry in Africa, as well as the origins of construction sector firms operating in sub-Saharan Africa.[3] This is important: when competition is limited, firms can extract rents, increasing the cost of infrastructure. Further, the construction sector has the possibility to create large numbers of jobs. If local firms cannot participate in the sector, these effects will be limited. To shed some light on this question in the broader regional context and to provide more detail on the case study countries, I use the major contracts award database, which contains World Bank-financed prior-review contract awards from the period 2004–18 (World Bank 2018b).

This is a selected number of projects and likely not representative of the universe of projects. Still, it is likely a good proxy for the capabilities of the sector in successfully bidding for World Bank projects that are auctioned off via internationally competitive tendering. For each project, the database contains the name of the country borrowing, the supplier country, the amount of the contract, and further details on the sector and procurement method. The country listed as the supplier represents the place where the supplier is registered, so this may or may not be the supplier's actual country of origin. For example, if a firm sets up a subsidiary in a foreign country and employs mainly staff from its origin, this would look in the data as if the country has substantial local capacity. The figures might therefore be overestimating local capacity. I select projects in civil works that were tendered via international competitive bidding to examine the relationship between borrowing country and supplier country.

Table 4 tabulates the percentage of projects by region that are carried out by different suppliers. Panel A shows all contracts in the database. It shows that at least 74 per cent of civil works contracts tendered via international competitive bidding are carried out by suppliers within the same region, suggesting that there is capacity within each region for the type of civil works carried out under World Bank contracts.

The region that carries out most of its projects through regional suppliers is East Asia and the Pacific, where 9 per cent of projects are carried out by a supplier in the region. In Europe and Central Asia, as well as Latin America and the Caribbean, 90 per cent or more of contracts are awarded to suppliers within the region. The region with the lowest percentage of overall contracts being awarded to suppliers in the same region is sub-Saharan Africa, where one out of four contracts gets procured outside the continent. Given that contracts have varying sizes, I next explore whether there is heterogeneity in this dimension. The database contains information on the size of the contract (in US dollars, based on the US Treasury's rate of exchange) when it was awarded.[4] Therefore, this does not include cost overruns. Unless cost overruns are so substantial that they lead to a country being placed in a different category, this does not affect the results. The asymmetry in borrower–supplier relationships becomes more pronounced when exploring borrower and supplier origins for contracts above US$2 million. Table 4 shows that while the fractions remain relatively similar for most regions, in sub-Saharan Africa about one out of every two contracts gets supplied by a company outside sub-Saharan Africa when looking at contracts above US$2 million.

[3] One notable exception is Zhang and Gutman (2015), who construct a dataset from the World Bank's Summary and Detailed Borrower Procurement Reports.

[4] I use the consumer price index (CPI) of the United States to deflate the contract amount to the base year 2010. For 2018 the CPI data were not yet available so I use the same value as 2017.

Table 4: World Bank contract awards by borrower and supplier region

	Supplier region						
Borrower region	East Asia and Pacific	Europe and Central Asia	Latin America and Caribbean	Middle East and North Africa	South Asia	Sub-Saharan Africa	North America
Panel A: All awards							
East Asia and Pacific	97.87	1.51	0	0	0.41	0	0.21
Europe and Central Asia	2.45	95.24	0.29	1.52	0.15	0	0.34
Latin America and Caribbean	0.49	8.09	90.02	0.33	0	0	1.06
Middle East and North Africa	0.88	13.44	0	84.8	0.44	0.22	0.22
South Asia	7.74	7.59	0.56	0.56	83.26	0	0.28
Sub-Saharan Africa	11.48	8.9	0.24	1.59	2.98	74.65	0.16
Total	21.8	28.58	13.3	5.52	8.07	22.38	0.36
Panel B: Awards > US$2,000,000							
East Asia and Pacific	97.27	1.82	0	0	0.68	0	0.23
Europe and Central Asia	5.42	91.13	0.37	2.71	0.37	0	0
Latin America and Caribbean	0.26	6.45	92.13	0.52	0	0	0.65
Middle East and North Africa	1.55	17.05	0	80.23	0.78	0	0.39
South Asia	10.84	8.92	0.72	0.96	78.07	0	0.48
Sub-Saharan Africa	21.28	14.59	0.37	1.86	5.76	55.95	0.19
Total	27.97	24.77	17.18	6.1	9.42	14.28	0.28
Panel C: Awards > US$50,000,000							
East Asia and Pacific	93.75	6.25	0	0	0	0	0
Europe and Central Asia	8.22	83.56	0	6.85	1.37	0	0
Latin America and Caribbean	0	32.26	67.74	0	0	0	0
Middle East and North Africa	12.5	62.5	0	12.5	12.5	0	0
South Asia	18.87	13.21	0	0	67.92	0	0
Sub-Saharan Africa	43.55	24.19	0	0	4.84	27.42	0
Total	31.8	37.46	7.42	2.47	14.84	6.01	0

Source: author's calculations based on World Bank (2018b) data.

In panel C, I limit contracts to a size of at least US$50 million. There are 276 contracts in the database for this amount. Even for contracts of this size, East Asia and the Pacific, as well as Europe and Central Asia, procure more than 94 and 83 per cent, respectively, from companies in the region. For both the Middle East and North Africa and sub-Saharan Africa there are big shifts in the region of suppliers.

Out of the 62 contracts in sub-Saharan Africa, about one-quarter are carried out by suppliers in the region. For this size of contract in sub-Saharan Africa, 44 per cent are carried out by suppliers from East Asia and the Pacific, and about 24 per cent are carried out by suppliers from Europe and Central Asia. It is also worth pointing out that sub-Saharan African suppliers are virtually inactive in other regions. These regional averages mask important heterogeneity across countries.

Table 5 shows country-level heterogeneity for the case study countries for the 515 contracts taking place there. The first panel again shows all contracts, while the second limits contracts to those above US$2 million, which is about the median contract value for the civil works in the database for our case study countries. The third panel shows contracts above US$10 million.

Table 5: World Bank contract awards by borrower and supplier region

	Supplier region					
	East Asia and Pacific	Europe and Central Asia	Latin America and Caribbean	Middle East and North Africa	South Asia	Sub-Saharan Africa
Panel A: All contracts						
Ghana	27.63	6.58	0	3.95	6.58	55.26
Mozambique	33.04	16.07	0	0.89	2.68	47.32
Tanzania	10.26	4.27	0	0.85	2.56	82.05
Uganda	17.78	7.41	2.96	2.22	3.7	65.93
Zambia	6.67	0	0	5.33	10.67	77.33
Total	19.22	7.38	0.78	2.33	4.66	65.63
Panel B: Awards > US$2,000,000						
Ghana	40.38	9.62	0	3.85	5.77	40.38
Mozambique	31.03	22.41	0	1.72	3.45	41.38
Tanzania	20.34	8.47	0	1.69	3.39	66.1
Uganda	33.9	6.78	6.78	3.39	8.47	40.68
Zambia	13.79	0	0	6.9	13.79	65.52
Total	29.18	10.51	1.56	3.11	6.23	49.42
Panel C: Awards > US$10,000,000						
Ghana	66.67	16.67	0	0	0	16.67
Mozambique	42.11	31.58	0	0	5.26	21.05
Tanzania	44.44	22.22	0	5.56	11.11	16.67
Uganda	50	18.75	12.5	6.25	12.5	0
Zambia	50	0	0	0	0	50
Total	49.3	21.13	2.82	2.82	7.04	16.9

Source: author's calculations based on World Bank (2018b) data.

The first panel shows that about 65 per cent of all contracts awarded across the case study countries are carried out by suppliers in the region, which is lower than the average across all sub-Saharan African countries. There are significant differences across countries: in Mozambique 47 per cent of the contracts were awarded to suppliers from sub-Saharan Africa, compared to Tanzania where 82 per cent were awarded to regional suppliers. In Zambia and Uganda, 77 per cent and 66 per cent of contracts were carried out by suppliers from sub-Saharan Africa, compared to Ghana, where just over half of the contracts were carried out by suppliers from sub-Saharan Africa. Suppliers from East Asia and the Pacific deliver about one out of every five contracts in these countries.

When looking at the 257 contracts above US$2 million, Tanzania still procures the highest fraction of contracts using suppliers from the region, compared to Ghana where only 40 per cent of contracts are carried out by suppliers from the region. An equal amount of contracts are carried out by suppliers from East Asia and the Pacific. In Mozambique, Tanzania, and Uganda, between one-fifth and one-third of contracts are carried out by suppliers from East Africa and the Pacific. In Zambia, the most important supplier regions apart from sub-Saharan Africa are South Asia and East Asia and the Pacific, carrying out more than one-quarter of contracts above US$2 million.

Panel C shows data for the 71 contracts above US$10 million. At this threshold, only one out of every six contracts is supplied locally, while about half of the contracts are supplied by firms from East Asia and the Pacific and South Asia. About one in five contracts is supplied by firms from Europe and Central Asia.

The database also records the major sector in which the project is carried out. I therefore examine heterogeneity with respect to whether a supplier is from the same region as a borrower across sectors in the five case study countries. Among the 515 contracts for the five case study countries, there are four sectors that have more than 50 contracts: energy and extractives; the transport sector; water, sanitation, and waste management; and public administration. The data suggest that local suppliers are chosen in only 35 per cent of the contracts in the energy and extractives sector and the transport sector. About 63 per cent of suppliers come from the same country as the borrower in the water, sanitation, and waste management sector, and about 85 per cent in civil works in public administration.

Finally, I explore whether there are differences across the study countries in the proportion of suppliers that are from the same country. I construct a dummy variable that is equal to 1 if a supplier comes from the same country as the borrower. I then regress this on a set of country dummy variables. I use Tanzania as the base country, where 79 per cent of suppliers come from Tanzania. The country fixed effects are statistically significant for Ghana, Mozambique, and Uganda, who are 33 per cent, 45 per cent, and 14 per cent, respectively, less likely to have a supplier that is from their country.

This section brought together evidence from World Bank procurement of civil works that underwent an internationally competitive tendering process. These findings are in line with Zhang and Gutman (2015), who find that sub-Saharan Africa is an outlier in participation in supplying civil works. They show that as a share of total contracts, sub-Saharan African suppliers have actually lost market share since 1995. More comprehensive data are needed to get a fuller understanding of the capabilities of the sector, as well as to understand differences across sectors within countries and how they relate to differences in procurement rules. One dimension that has not been taken into account in this section due to data availability is the role of sub-contracting, a common practice in the construction sector. It would be helpful to know to what extent different government organizations, and local and foreign contractors sub-contract differentially with local suppliers.

4.2 Institutional constraints

Procurement

Governments willing to invest in infrastructure usually award contracts via national and international competitive bidding. Mostly these contracts are one-off contracts. This poses several constraints for local suppliers. First, they might be constrained in the preparation of the bidding documents. For example, Asher et al. (2018) collected 381 Procurement Evaluation Reports for road maintenance projects from six regional offices in Tanzania. They show that about 30 per cent of bids submitted for road maintenance contracts get disqualified immediately. Failure to conform to the terms, conditions, and specifications stipulated in the bidding documents is the main reason for this disqualification. Language—such as being required to submit all documents in English—can become an important barrier in particular for smaller contractors with lower levels of knowledge. Second, when contracts are based on price only, local contractors in Africa are often unable to win bids due to lack of access to financing, as I discuss in more detail below. Third, contractors often have to prove that they have experience in handling a similar project in the past, limiting the type of contracts a given firm can take on.

The fact that contracts tend to be one-off contracts has further consequences. First, it fails to internalize design decisions during construction and resulting maintenance costs if the firm that carries out the construction is different from the firm that maintains an asset. Second, it leads to a discontinuous and unpredictable workflow for contractors. Third, it results in hold-up problems: once a contractor wins a project and starts construction, the bargaining power has shifted.

A further dimension that is important in determining costs is the role of competition. Unfortunately, the procurement database used in this paper only contains information on the company winning the bid, but does not contain information on the name and origin of all bidders, and the value of their bids.

Financing

Financing is often mentioned as key constraint for local firms, in particular when trying to compete with international firms. One reason for this is that international firms might have access to lines of credit at low interest rates, making it impossible for local firms to compete. This appears to be a major issue in particular in trying to compete with Chinese firms (Zhang and Gutman 2015).

Lack of upfront financing affects firms in the construction sector by making it difficult to purchase or rent the equipment necessary to carry out a contract. Rental markets for equipment are often missing due to failures of banks to provide access to finance. Sometimes it is the government itself that is failing to pay contractors. In 2012, the Tanzanian government reported owing US$300 million to firms (Sutton and Olomi 2012). Delays in payments are particularly problematic for smaller contractors as they do not have the necessary liquidity to purchase further materials or pay their workers. They are further negatively affected by being forced to have equipment idle at construction sites until they receive payment. There is anecdotal evidence that firms prefer contracts by international donors for the reason that they know they will be paid on time, and charge higher prices to government in anticipation of payment delays. It would be helpful to have systematic evidence on this.

4.3 Critical inputs

The availability and cost of critical inputs is an important determinant of the slope of the supply curve in the construction sector. Frequently discussed constraints include the availability of skilled labour, raw materials, and the cost of hiring and purchasing equipment. There is little knowledge to what extent these different factors affect the slope of the supply curve in the construction sector.

One helpful comparable measure for the overall price level of key inputs into construction is the data collected by the International Comparison Project (World Bank 2015), in which Eurostat–OECD countries and CIS countries followed a bill-of-quantities approach in which hypothetical projects were priced.[5]

Table 6 shows differences in price levels across regions and the case study countries. The benchmark price level is the world, which is set equal to 100. Price levels in construction are 85 per cent and 55 per cent higher in the Eurostat–OECD and CIS areas, respectively, compared to the global average. In light of the fact that the CIS and Eurostat–OECD regions use a different methodology to compute construction sector prices, the comparison is likely more relevant across the remaining regions that use a similar method. For completeness, I leave them in the analysis.

Africa and Western Asia have the lowest price levels, about 45 per cent lower than the global average. When looking at the case study countries, price levels in the construction sector are highest in Mozambique, at 83 per cent of the global level. Zambia, where price levels in construction are about 50 per cent of the global level, is roughly in line with the African average. Overall construction price levels are much lower in Ghana, Uganda, and Tanzania, at 37, 31, and 29 per cent of world levels, respectively. Further research outlining heterogeneity in input costs across space would be helpful to better understand differences in price levels.

[5] See World Bank (2015) for more detail on how the construction sector purchasing power parities were constructed.

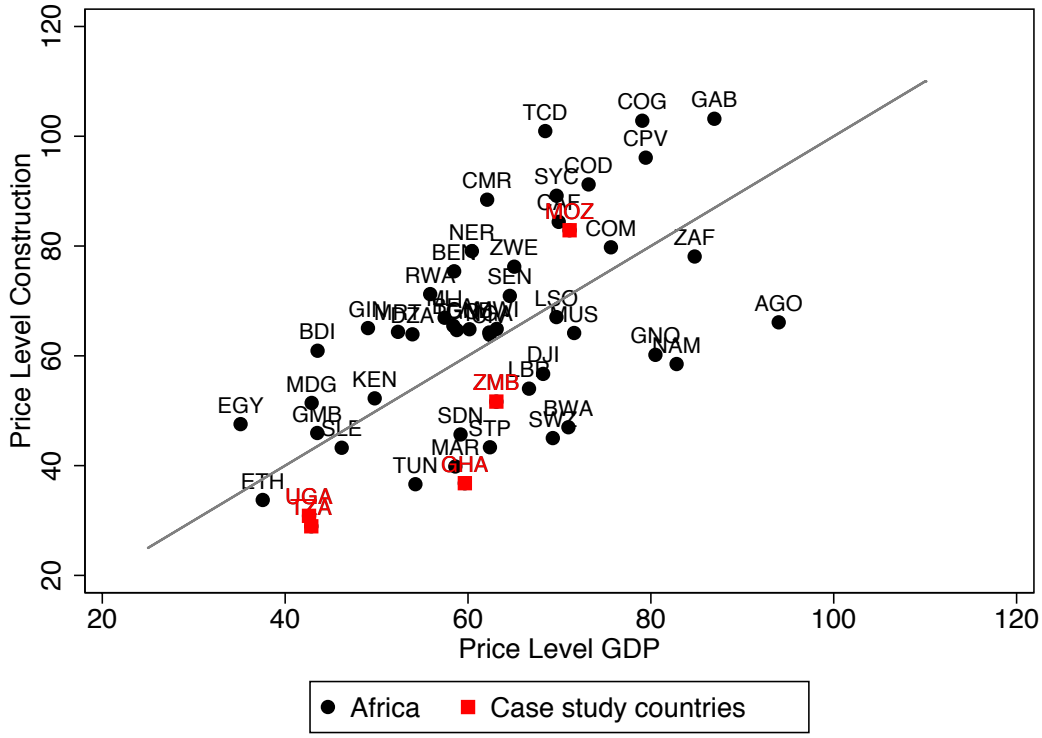
Table 6: Differences in price levels across regions

Panel A: Aggregates		
Regional rank	Region	Price level (world = 100)
1	Eurostat–OECD	184.6
2	Commonwealth of Independent States	154.7
3	Latin America	84.8
4	Asia and the Pacific	60.5
5	Africa	55.8
6	Western Asia	55.2
Panel B: Case study countries		
Case study rank	Region	Price level (world = 100)
1	Mozambique	82.9
2	Zambia	51.7
3	Ghana	36.8
4	Uganda	30.9
5	Tanzania	28.9

Notes: Panel A shows the regional aggregate provided by the International Comparison Program, Panel B shows country-level data.
Source: author's calculation based on World Bank (2015) data.

One interesting dimension to consider is the relationship between the price level in the construction sector and the price level in general in a country. Figure 2 plots the price level of GDP versus the price level in construction for all African countries in the International Comparison Project, again considering the world as the benchmark.

Figure 2: Price levels of GDP and construction



Source: author's illustration based on World Bank (2015) data.

The diagonal shows the 45-degree line. The closer countries are to the line, the more similar are price levels of GDP and construction. The upper triangle shows countries that have price levels in construction exceeding GDP price levels, and vice versa for the lower triangle. The figure shows that the only case study country in which construction has higher price levels than GDP is Mozambique; all other countries are in the lower triangle. Overall, within Africa, the ratio of the price level of GDP to construction is lowest (between 0.6 and 0.7) in Ghana, Swaziland, Botswana, Tunisia, Tanzania, Morocco, Sao Tome, and Principe, and highest (between 1.3 and 1.4) in the Congo, Niger, Guinea, Egypt, Burundi, Cameroon, and Chad.

4.4 Governance and corruption

Public works contacts and construction have been found to be the most corrupt sectors globally (Transparency International 2011), and this might significantly affect costs in the construction sector (Kenny 2009; World Bank 2011).[6] Collier et al. (2016) use data on 3,322 unit costs of work activities collected by the World Bank to examine correlates of construction costs, with a focus on government capacity, corruption, and political stability. They control for drivers of unit costs related to the ruggedness of the terrain as well as market access. Using various measures for corruption and conflict, they find that both more corrupt countries and those in conflict have significantly higher unit costs of construction. Costs are on average about 30 per cent higher in conflict countries. They are 6.8 per cent higher when moving a country from the twenty-fifth percentile of corruption to the seventy-fifth percentile. There are a number of channels through which conflict or corruption might affect unit costs. First, higher levels of corruption might drive up costs as firms' prices take into account any additional side payments that are required to the government to be selected as a contractor. Second, contractors might inflate costs and take the difference in costs as payments.

Political instability and conflict can have severe consequences for construction costs, arising through various mechanisms: staff security, supply chains, disputes, and industrial organization. Companies operating in conflict countries might require higher awards to cover security of their staff on site. Disruptions to supply-side networks might delay arrival of important inputs, leading to higher costs as machinery stands idle on the construction site. Benamghar and Iimi (2011) analyse 155 rural road upgrading contracts in Nepal and find that cost overruns and delays in project completion were significantly correlated with security incidents. Bidders appear to anticipate these costs by submitting higher bids. Disputes over land rights might slow down the construction process. Finally, political instability might affect the market structure of the construction industry, leading to fewer firms and lower competition. In these circumstances, few of the operating firms will be able to capture the rents.

All these discussed bottlenecks might prevent countries from being able to facilitate increased levels of investment. The ability of a country to translate an additional unit of investment into outcomes in times of accelerated growth in investment is known as absorptive capacity. Presbitero (2016) shows that a 3 per cent increase in the ratio of public investment to GDP with respect to its five-year average is correlated with a 3.9 percentage-point reduction in project outcomes, as measured by the World Bank. While project outcomes are not telling us about the relationship between surges in demand and costs, this suggests that there are limits to the capacity of the construction sector when there is an increase in demand.

[6] Arguably, corruption has detrimental effects on the quality of infrastructure as well, as shown by Olken (2007). It might also affect project selection, either directly or via an increase in costs, thereby lowering rates of return.

5 Policy options

This section discusses some policy options to enhance the sector's ability to respond to surges in demand. Ofori (2012) highlights that many of the bottlenecks prevailing in the construction sector, some of which were discussed in the previous section, have not changed over the past decades. Much more research is needed on the effects of different policies on the quality and quantity of construction.

5.1 Institutional and regulatory reforms

An institutional feature of the construction sector is that it often lacks strong representation in government (Ofori 2012). In a study on the Zambian construction sector, Uriyo et al. (2004) state that 'A number of Studies have been conducted and recommendations made, but with limited success in implementation, due to absence of an institution to champion and steer the industry'. In effort to bring together actors in the construction sector and promote a set of priorities in the sector, several countries have established such representations, known as national construction councils. These have been established in a number of countries, including Tanzania in 1979 and Zambia in 2003.

In a seminal paper on corruption in construction projects, Olken (2007) evaluates different approaches to monitoring construction works on road construction in Indonesia. He conducts a randomized controlled trial in which 600 communities were selected. Some villages were told that an audit was to take place with certainty. The second experiment involved bottom-up monitoring by inviting villagers to accountability meetings and distributing comment forms along with the invitations. He then used an innovative measure of missing expenditures based on core samples of the roads. Olken (2007) finds that the audit experiment reduced missing expenditures by 8 per cent, while bottom-up monitoring did not reduce missing expenditures significantly. An important dimension to consider might be the effect of audits on subsequent procurement behaviour: Gerardino et al. (2017) find that audits led to more instances of direct contract selection. Using data from Italy, Decarolis (2014) presents evidence that suggests that first-price sealed bid auctions are suitable when contracts are enforceable.

One possibility to improve corruption in procurement is to use technology to augment state capacity via electronic procurement. However, one concern is that this might exclude smaller firms that are still unable to access procurement information. Lewis-Faupel et al. (2016) investigate bidding data for roads constructed under India's Pradhan Mantri Gram Sadak Yojana (PMGSY) programme and for construction and consulting services in Indonesia. They find that the shift to e-procurement has no effect on costs in both countries, but improves quality (India) and reduces delays (Indonesia).

An important initiative is the Construction Sector Transparency Initiative (CoST), a multi-stakeholder effort to increase transparency in the construction sector (Construction Sector Transparency Initiative 2011). The core idea is that greater transparency reduces corruption in the construction sector and thereby improves the quality of construction sector outcomes. Kenny (2010) discusses the costs and benefits of increased levels of transparency in the sector and possible implementation issues. While strong regulatory frameworks are important, a report by the Construction Sector Transparency Initiative (2011) shows that there can be substantial gaps between legal requirements and what information is actually disclosed in the eight pilot countries, with procuring entities claiming to 'always disclose' about 51 per cent of the material project information (key project information) that the law prescribes ought to be published. Knowledge appears to be a significant barrier, along with the availability of suitable systems for storage and retrieval of information. In 2015, CoST expanded to 15 members.

5.2 Procurement and local content

Purchasing construction goods from companies abroad allows countries to build their infrastructure even when local capacity is low. This means countries do not have to wait until they have developed local capacity to put in place key pieces of infrastructure. However, when local participation in the sector is low, possible additional benefits of infrastructure construction, such as employment and income generation, are lost. Wells and Hawkins (2008) argue for changes in demand-side policies, namely changes related to procurement rules which make participation of local companies difficult to impossible. The authors argue for changes in the regulatory frameworks in a number of areas. First, a move away from the requirement of donors that goods and services ought to be bought from donor countries. More data are required to get a better understanding of the scale of this problem. Second, access to capital at reasonable rates. In most countries this is a significant factor constraining firms. Third, examining potential disadvantages in fiscal policies which discriminate against local firms. It is possible that large firms are also at an advantage, for example, in their capacity to file for tariff exemptions.[7] Governments might also want to consider tying contracts over time rather than space, resulting in smaller-sized contracts and a more steady workflow, allowing mid-size contractors to compete. To understand to what extent a lack of skills are constraining the sector, more evidence is needed on different types of firm training and vocational training, with a focus on the construction sector.

6 Conclusion

The construction sector is unique in the types of goods that are produced. At the same time, it also has a unique position in providing the key structures for an economy and employing large numbers of people. For several reasons, the construction sector faces increasing demand in resource-rich countries. The slope of the supply curve determines to what extent increased demand leads to increases in output. The capacity of the local sector determines to what extent local firms can participate in the boom led by a natural resource boom.

There are a number of bottlenecks in procurement, financing, and corruption. Some of the discussed policies appear straightforward to fix, such as governments paying according to the schedule stipulated in the contract with the company, allowing companies to carry out projects on time. Donors could take a lead in publishing details of all contracts carried out in the infrastructure construction sector, including bidding data and why a certain contractor was awarded a contract, as well as cost overruns and reasons behind them. Providing assistance in the development of information management systems would be a further way to support countries recording information on contracts that are not financed by donors. If donors take building local capacity seriously, eliminating aid that is tied to the donor country is a natural consequence. With regard to other types of measures that promote the sector, much more knowledge of the relative importance of bottlenecks and the effects of policies is required.

Natural resource-rich countries have an advantage in the construction sector that other countries do not have. They typically have experience with local content policies and what works and does not work. They can view the construction sector as an important sector employing workers that were involved in projects directly related to the natural resources, taking advantage of the willingness of firms in the natural resources sector to train workers. An improved understanding of the sector and linkages with the rest of the economy will be useful to inform policy makers who aim to put in place a policy environment in which the construction sector can flourish.

[7] See Wells and Hawkins (2008) for a number of concrete policy proposals.

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