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Chinese Overseas Contracted Projects and Economic Diversification in Angola and Ethiopia 2000-2017

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Abstract

This paper looks at Chinese construction projects in Angola and Ethiopia, which receive disproportionately little research attention compared to Chinese FDI, despite the fact that Chinese construction projects are much more important in terms of magnitude. This paper shows that Chinese construction projects have important economic spill-over effects by way of providing critical infrastructure for productive sector activities. What is more, the construction deals, often financed by Chinese state banks, have created profitable markets for building materials and spurred the production of building materials in Angola and Ethiopia thereby contributing to economic diversification in both countries. The growth of these industries is supported by policy incentives on the Chinese side and but also faces various challenges that ultimately have to be addressed by domestic industrial policy.

INTRODUCTION

This paper investigates the nature and dynamics of Chinese construction projects in Angola and Ethiopia regarding their magnitude, sectoral composition, major contractors, drivers and wider economic spill-over effects. Chinese overseas projects are more important in magnitude than Chinese FDI in Africa (and especially so in Angola and Ethiopia). Yet, they receive little attention compared to Chinese FDI. This is mirrored in a wider lack of empirical and theoretical literature on the role of the construction sector in economic growth and especially in the diversification of production structures. Organic inter-sectoral output growth is well-established as key to late-industrialisation but is usually understood as the development of demand- and supply chains between the agricultural and manufacturing sectors, while the role of the construction sector is conceptually reduced to providing an 'enabling environment' for industrial development, i.e. transport and electricity infrastructure. Using the examples of the booming construction sectors of Angola and Ethiopia, this paper investigates to what extent and under which conditions the construction sector can play a role similar to agriculture in terms of linkage formation to the manufacturing sector. It shows that infrastructure development and the construction sector more generally contribute to economic diversification, not just by way of ensuring stable access to electricity and water or cost-efficient transportation of goods, but also by increasing demand for building materials, some of which start to be produced domestically in both Angola and Ethiopia. This finding is particularly important in light of ongoing debates around China's contribution to (de-)industrialisation in Africa and raises further questions, in particular about the role of policy in maintaining symbiotic growth between the two sectors. This paper synthesises secondary

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macro- and sector level data as well as findings from existing research outputs but will not present fieldwork-based evidence undertaken in the context of the research project on 'Chinese Firms and Employment Dynamics in Sub-Saharan Africa: A Comparative Analysis' funded by ESRC-DFID.

Section 1 provides a brief overview of the empirical and theoretical literature on inter-sectoral dynamics in late-industrialisation and argues that the construction sector can be the basis of powerful linkages and feedback loops with the manufacturing sector. Section 2 traces the origins of the construction boom in SSA and the emergence of Chinese construction firms since the turn of the century in SSA in general and Angola and Ethiopia specifically while also reviewing existing evidence on the economic spill over effects of Chinese construction activities. Sections 3 focusses on linkage formation between the construction and manufacturing sector in Angola and Ethiopia, investigating the importance of building materials manufacturing in both countries and the challenges faced by these industries.

1. THE AFRICAN CONSTRUCTION BOOM AND ITS ECONOMIC SIGNIFICANCE

Understanding the economic significance of the construction sector in sub-Saharan Africa (SSA) is a crucial part in the puzzle of the continent's development patterns since the turn of the century. The construction sector was the only sector of the real economy, which realized higher growth rates than total GDP in all developing regions over the 2000s. Yet, this trend is most pronounced in SSA, where average annual growth rates of the construction sector exceeded those of GDP by more than 3%. Growth rates of the construction sector in SSA were highest across developing regions with 9.6% over the period 2000-13, even ahead of the BRICS (9%) (***Table 1***). What is more, the African construction market withstood the global slow-down in the construction industry following the debt crisis in Europe and the slowdown of the Chinese economy. While, on a global scale, 2014 revenues of the top 250 contractors listed by the Engineering News Record[1] from projects outside of their home country were 4.1% lower than in 2013, revenues of international contractors in Central and Southern Africa increased by 14.7% relative to 2013. The share of Africa in the revenues of the top 250 international contractors realised abroad has increased from 9% in 2004 to 14% in 2014 (calculations based on Engineering News Record). The African construction boom has reshaped the political economy dynamics in SSA countries. Business interests, ranging from the import of construction materials, manufacturing of inputs to trade and development of real estate, formed in relation to the construction boom. These business interests are, depending on the variety of residential capitalism, in some cases (e.g. Kenya) largely dominated by private capital (MNE and large family firms) and in other cases (e.g. Angola) serve to consolidate the power position of the ruling elites with new business opportunities linked to the construction boom being closely tied to support for the ruling party (Pitcher 2017).

[1] A world leading construction industry magazine, news forum and data base.

Table 1. Evolution of GDP in the Developing World 1990-2013									
		Manufacturing VA*		**Average real annual growth rates by sector**					
		per capita (2005 USD)	% of GDP	agri.	manuf.	constr.	Mining	non-mining	GDP total
Dev. Asia (ex. China)	1990-2000	188.1	19.3%	1.9%	4.5%	1.9%	3.7%	3.7%	3.7%
	2001-2013	379.3	20.1%	3.4%	5.0%	6.2%	3.5%	5.4%	5.2%
BRICS	1990-2000	188.1	19.9%	2.6%	5.7%	1.8%	2.7%	4.2%	4.0%
	2001-2013	758.8	27.6%	3.7%	8.8%	9.0%	5.2%	7.5%	7.3%
Lat. America (ex. Brazil)	1990-2000	587.9	19.8%	2.0%	3.3%	2.4%	3.6%	3.2%	3.3%
	2001-2013	796.7	17.5%	2.5%	2.6%	5.0%	2.1%	3.7%	3.5%
SSA (ex. S. Africa)	1990-2000	68.4	11.8%	3.1%	0.2%	3.7%	2.0%	2.6%	2.5%
	2001-2013	78.1	8.7%	5.6%	5.9%	9.6%	3.9%	7.0%	6.5%

By contrast, the performance of the manufacturing sector in SSA economies since the turn of the century was mixed. Average real annual GDP growth rates in SSA (excl. South Africa) have picked up, averaging 6.5% in the period 2001-2013 against 2.5% over the 1990s. Average annual growth rates of manufacturing and agricultural output were higher when compared to the 1990s but fell slightly short of overall GDP growth rates. These increases in output growth below GDP average did go together with slow increases or even decreases in indicators of structural change. Average annual growth rate of real manufacturing output per capita in SSA countries were merely 3% in the period 2001 to 2013, compared to 7.5% in the BRICS. Though a substantial improvement when compared to the period 1990 to 2000 (-2.5%), this is second lowest in the developing world. What is more, SSA's real manufacturing value added per capita increased only from $68.40 in 1990 to $78.10 in 2013. In 2013, manufacturing value added per capita ranged from $5.60 in Somalia to $1,054 in Mauritius. By comparison, in 2013 manufacturing value added per capita in China amounted to $1,267 and as much as $8,013 in high income countries like Germany. Relative to GDP, manufacturing value added even decreased in SSA from 11.8% in 1990 to 8.7% in 2013 (***Table 1***).

Interestingly, Angola and Ethiopia are not only among the top destinations of Chinese construction activities in SSA but also among the SSA countries in which the average growth rate of the manufacturing sector exceeded those of GDP. Average GDP growth rates in both countries increased substantially in the period 2002-2013 when compared to the period 1991-2001, going up from 2.0% to 10.4% in Angola and from 3.5% to 9.1% in Ethiopia. Interestingly though, average annual growth rates of the construction and the manufacturing sector exceeded average GDP growth and growth of the agricultural and mining sectors (***Table 2***). Although the manufacturing sector remained small in both countries accounting for 3.5% in Ethiopia and 5.9% of GDP in Angola in 2013 (calculations based on UN National Accounts), both countries have realised fast growth rates of manufacturing output relative to other SSA countries. Measuring the % increase of manufacturing value added per capita over the past decade (2011 relative to a baseline given by the 1996-2000 average), Angola records an increase of nearly 250%, Ethiopia of about 90% (Wolf 2016). It should be noted, however, that Angola and Ethiopia follow very different patterns of structural transformation. Manufacturing output growth in Angola is largely driven by sectors experiencing high rates of domestic demand growth but largely limited to sectors associated with high transportation costs such as beverages and capital intensive building materials (Wolf 2017). What is more, Angolan manufacturing is not very labour intensive, employing, according to official figures, only 100,810 workers in 2015 roughly in par with the oil sector (92,241) (UCAN 2016). By

contrast, some authors view Ethiopia as an aspiring developmental state (Fourie 2015; Clapham 2017) seeing that Ethiopia's efforts to build supply capacity in a vast range of domestically and export-oriented sectors are supported by coordinated government policies (Oqubay 2015; Abebe and Schaefer 2015).

Table 2. **Angola and Ethiopia – Average real GDP growth rates by sector**							
	Period	**Agriculture**	**Manufacturing**	**Construction**	**Non-oil**	**Oil**	**GDP**
Angola	1991-2001	0.5%	0.8%	3.6%	1.8%	2.8%	2.0%
	2002-2013	10.5%	13.5%	15.6%	12.6%	8.7%	10.4%
Ethiopia	1991-2001	3.0%	2.0%	4.8%	3.5%		3.5%
	2002-2013	6.7%	9.3%	15.0%	9.1%		9.1%
Source: UN National Accounts Main Aggregates Database							

Organic inter-sectoral output growth is well-established as key to late-industrialisation, though theoretical and empirical contributions mainly refer to demand- and supply chains between the agricultural and the manufacturing sector (see for instance: Thirlwall 1986; Kaldor 2007; Canning 1988; McCombie and Roberts 2008; Skott 1999 for theoretical contributions and Brautigam 1995; Ikpe 2013; Kay 2002; Bhaduri 2006 for empirical contributions). By contrast, construction is not generally thought to play an important role in the process of economic diversification beyond providing the enabling environment for firms to operate. Indeed, the causal links between construction and growth/ diversification are conceptually limited to the reduction of production costs (Moreno, López-Bazo, and Artís 2002) and spill-over effects of infrastructure on human capital formation (Agénor 2010).

Yet, in analogy to agricultural productivity and demand growth, the construction sector can provide a source of linkage development. The construction sector also relies on a wide range of manufactured inputs, ranging from cement over roofing to pipes, glass and door frames, which was already recognised by Hirschman (1958) as a source of induced investment demand:

> "An example (…) is cement and reinforcing steel rods in the construction (…) the existence of new office buildings strengthens demand for a great variety of goods and services: from modern office furniture and equipment (still fairly rigid), to parking and restaurant facilities, stylish secretaries and eventually perhaps to more office buildings as the demonstration effect goes to work on the tenants of the other buildings." (Hirschman 1958: 68)

To illustrate the potential economic significance of building materials manufacturing, ***Table 3*** shows output, the number of enterprises, employment and wages for building materials manufacturing in Germany and the UK. Based on output and employment data from 2014 following the NACE Rev. 2 classification,[2] each 4 digit codes was attributed to one of the following categories: food and beverages, other consumer goods, medical equipment and pharmaceuticals, machinery, military equipment, luxury products, public transport equipment and intermediate inputs. Out of the group of intermediate inputs, 32 product codes have been classified as building materials (see ***Annex 1*** for details). Building materials manufacturing made up for around 8% of total manufacturing output in Germany and 11% in the UK while constituting 15% of manufacturing enterprises in Germany and 14% in the UK and

[2] NACE Rev. 2 is the statistical classification of economic activities in the European Community. NACE Rev. 2 is a modification of ISIC Rev. 4. Although a larger set of countries publishes manufacturing output data at the 4 digit level following ISIC Rev. 4, NACE Rev.2 allows for a more accurate distinction in the economic end use of the various product groups. For instance, a much larger number of 4 digit product groups is specifically classified as building inputs, especially in the glass, wood and plastic sectors. Data were obtained from annual enterprise surveys published by the national statistics offices in the UK and Germany.

employing 10% of Germany's manufacturing workforce in 2014. This is not to suggest that building materials manufacturing is a lead industrial sector in either of the two countries but one among other significant components of mature manufacturing sectors. What is more, building materials' share in manufacturing enterprises in Germany is bigger than its share in the manufacturing workforce, suggesting that, in Germany, building materials manufacturing relies substantially on SMEs and may be more automated than other sectors.

Table 3. Building materials manufacturing in the UK and Germany

	Output (% of total manufacturing)		**Employees (% of total manufacturing)**	**Enterprises (% of total)**	
	GER	UK	GER	GER	UK
food and beverages	10%	16%	11%	14%	6%
consumer goods	29%	26%	22%	18%	38%
medical equipment	4%	4%	4%	4%	2%
Machinery	21%	15%	26%	25%	16%
Military	2%	5%	1%	0%	1%
Luxury	0%	0%	0%	0%	0%
public transport	1%	2%	1%	1%	2%
intermediate inputs	33%	32%	34%	39%	35%
Building Materials	8%	11%	10%	15%	14%

Data source: Office for National Statistics "Annual Business Survey data at four digit SIC for all Government Office Regions for 2014" and Statistisches Bundesamt "Kostenstrukturerhebung im Verarb. Gewerbe, Bergbau" (42251-0001)

2. CHINESE CONTRACTORS IN ANGOLA AND ETHIOPIA: MAJOR CONTRACTORS AND CONSTRUCTION SECTORS

2.1. THE EMERGENCE OF CHINESE CONTRACTORS IN SUB-SAHARAN AFRICA, ANGOLA AND ETHIOPIA

Over the past 20 to 30 years, China has been urbanising at a historically unprecedented speed. The correspondingly breath-taking growth of China's construction sector is exemplified not least in China's astonishing levels of cement and steel consumption. China was consuming 1,768kg of cement per capita in 2014, i.e. nearly ten times cement consumption per capita in the UK (184kg p.c.) and more than 5 times US levels (329 kg p.c.) (Armstrong et al. 2015). Chinese steel consumption per capita (crude steel equivalent) in 2015 is with 509 kg p.c. on par with Germany (523.9 kg p.c.), 1.5 times that of the US (336.7 kg p.c.) and nearly 3 times that of the UK (182.5 kg p.c.) (World Steel Association 2017). China's construction business has grown at an unprecedented rate from its base in China since the turn of the century. While in 2004, Chinese companies made up for 5% of the top 250 contractors' revenues realised abroad, this figure has increased to 17% in 2014, largely overtaking French international construction companies whose share in the internationally realised revenues of the top 250 decreased from 15% in 2004 to 10% in 2014. Equally telling is that six out of the top ten globally operating contractors are Chinese (by and large SOEs) as measured in annual revenue in 2014 (calculations based on ENR).

In the dynamically expanding African construction market, Chinese contractors have secured an increasing share. In 2004, the African construction market was still dominated by

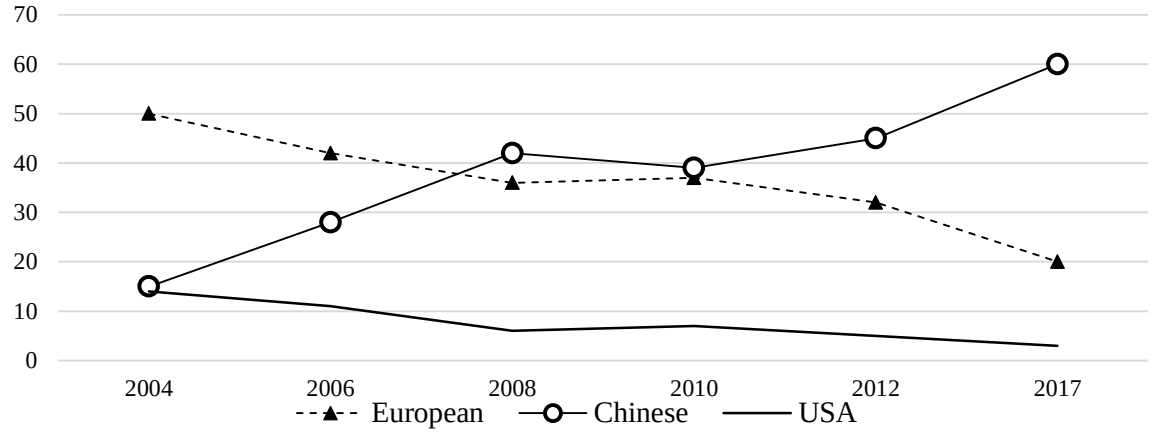
European contractors, who realised 50% of total revenues. Fully 25% of the African market was covered by French firms alone. This picture changed dramatically within just a few years, leading to substantial dominance by Chinese contractors: by 2006 Chinese contractors had overtaken French contractors and by 2008 the revenues of Chinese firms realised in the African market exceeded those of all European countries taken together. By 2017, 60% of contract revenues by the top 250 international contractors in Africa were for Chinese firms, up from 15% in 2004. The spectacular rise of Chinese construction firms in Africa is mirrored by the decline of European contractors, whose share in revenues in the African market decreased from 50% in 2004 to 20% in 2017, even though revenues still increased in absolute terms. American contractors lost in relative terms and stagnated even in absolute terms, with revenues in the African market staying roughly at $1.9 billion in 2004 and 2017. Some non-Chinese and non-European players increased their market shares and revenues over the past years, namely Turkey and Brazil (see ***Table 4*** and ***Figure 1***).

Table 4. Market shares of top 250 international contractors in Africa (selected years)

	2004		**2006**		**2008**		**2010**		**2012**		**2017**	
Contractor	rev. Mil.$	%	rev. Mil.$	%	rev. Mil.$	%	rev. Mil.$	%	rev. Mil.$	%	rev. Mil.$	%
All firms	**14,284**	100	**17,911**	100	**50,885**	100	**60,592**	100	**56,865**	100	**62,423**	100
European	**7,130**	50	**7,442**	42	**18,166**	36	**22,530**	37	**17,963**	32	**20,322**	20
French	3,527	25	3,804	21	5,033	10	5,903	10	5,063	9	6,084	5
Italian	1,294	9	1,200	7	8,309	16	9,999	17	7,401	13	7,917	5
Spanish	348	2	355	2	1,707	3	1,890	3	1,458	3	2,414	2
Other Europe	1,960	14	2,083	12	3,116	6	4,738	8	4,041	7	3,906	8
Chinese	**2,107**	15	**5,084**	28	**21,578**	42	**23,468**	39	**25,487**	45	**37,315**	60
USA	**1,977**	14	**2,015**	11	**3,028**	6	**4,396**	7	**2,652**	5	**1,887**	3
Brazilian	**0**	0	**0**	0	**0**	0	**0**	0	**2,305**	4	**2,717**	4
Turkish	**285**	2	**556**	3	**1,871**	4	**2,198**	4	**2,316**	4	**3,170**	5
Others	**2786.3**	20	**2815.3**	16	**6242.7**	12	**8000.9**	13	**6142**	11	**4,111**	7

Source: Engineering News Record

Figure 1. International contractors by origin: market shares % in Africa 2004-17



Source : Engineering News Record

Out of the top ten international contractors in Africa whose revenues accounted for 47% of total construction revenues in Africa in 2017, six are Chinese. The dominance of Chinese

contractors in the African market becomes even more apparent when looking at the top five only, all of which are Chinese up from four in 2014 (see ***Table 5***). The top Chinese contractors still remain highly reliant on their domestic market (around 90% of total revenues) but they already show a significant degree of internationalization by 2017, especially Powerchina (Power Construction Co of China) with 27% of international revenues and CCCC with 30%. European companies, by contrast, are clearly more dependent on global markets as in the case of ACS with nearly 87% from international revenues and Vinci with over 40% in 2017.

Table 5. Top 10 international contractors in Africa 2014-18

Rank 2018	**Rank 2014**	**Company Name**	**Home Country**
1	1	China Communications Construction (CCCC)	China
2	**	China Railway Construction Corp. (CRCC)	China
3	**	China State Construction Engineering Corp (CSCEC)	China
4	2	Power Construction Corporation of China	China
5	4	China Railway Group (CRG)	China
6	**	Technipfmc	France
7	**	ORASCOM	UAE
8	6	Vinci	France
9	**	Bouygues	France
10	**	China National Machinery Corp (CMC)	China
**	3	Saipem	Italy
**	5	China Civil Engineering Construction Group	China
**	7	CN Odebrecht SA	Brazil
**	8	CITIC Construction Co. Ltd.	China
**	9	Ozturk Holding Co.	Turkey
**	10	China State Construction Engineering Corporation Ltd.	China

Source: Engineering News Record

The China Statistical Yearbook provides data on Chinese construction activities abroad, recording the total turnover of overseas construction contracts for the year in which the project was completed by Chinese firms in the host country. These include construction contracts financed through Chinese, host country or third sources:

> "Chinese Overseas Contracted Project refers to projects undertaken by Chinese contractors (project contracting companies) through bidding processes. They include: (1) overseas civil engineering construction projects financed by foreign investors; (2) overseas projects financed by the Chinese government through its foreign aid programs; (3) construction projects of Chinese diplomatic missions, trade offices and other institutions stationed abroad; (4) construction projects in China financed by foreign investment; (5) sub-contracted projects to be taken by Chinese contractors through a joint umbrella project with foreign contractor(s); (6) housing development projects. The business income from international contracted projects is the work volume of contracted projects completed during the reference period, expressed in monetary terms, including completed work on projects signed in previous years." (National Bureau of Statistics of China 2009).

Chinese contracted overseas projects (COPs) should not be conflated with 'investment' (as is often done, especially in news media). Investments involve the acquisition of liquid and/ or fixed assets in the interest of generating a future stream of profits. By contrast, COPs are merely market outlets of Chinese construction firms overseas, i.e. strictly speaking Chinese

service exports (Pairault 2018). Note that in various instances they are closely linked, Chinese companies entering the market as contractors and eventually setting up subsidiaries, thereby adding to FDI in the construction sector. This is of particular relevance for the case of Angola, where about 81% of Chinese investment projects registered with the former investment promotion agency ANIP between 2002 and 2013 were in 'Construction, Wholesale, Retail and Tourism' (calculations based on ANIP data). A prominent example of such a connection between construction services and investment includes CITIC Angola – having entered Angola in 2008, CITIC developed major construction projects in Angola including the Kilamba housing project and, from its base in construction, became an investor in aluminium processing as well as farms (McKinsey 2017). Since then CITIC does not only engage in construction but has also become an important vehicle for infrastructure finance.

Chinese newly signed international contracts expanded rapidly until 2014. This reflects, on the one hand, Chinese contractors' drive for expansion given their growing capacity and, on the other hand, policy and financial support from the Chinese government for "go global" enterprises as well as increasing competitiveness of the "go global" enterprises – not only in transport infrastructure and housing, but also in electrical power generation, telecommunications and petrochemical areas (CICA 2014: 3).

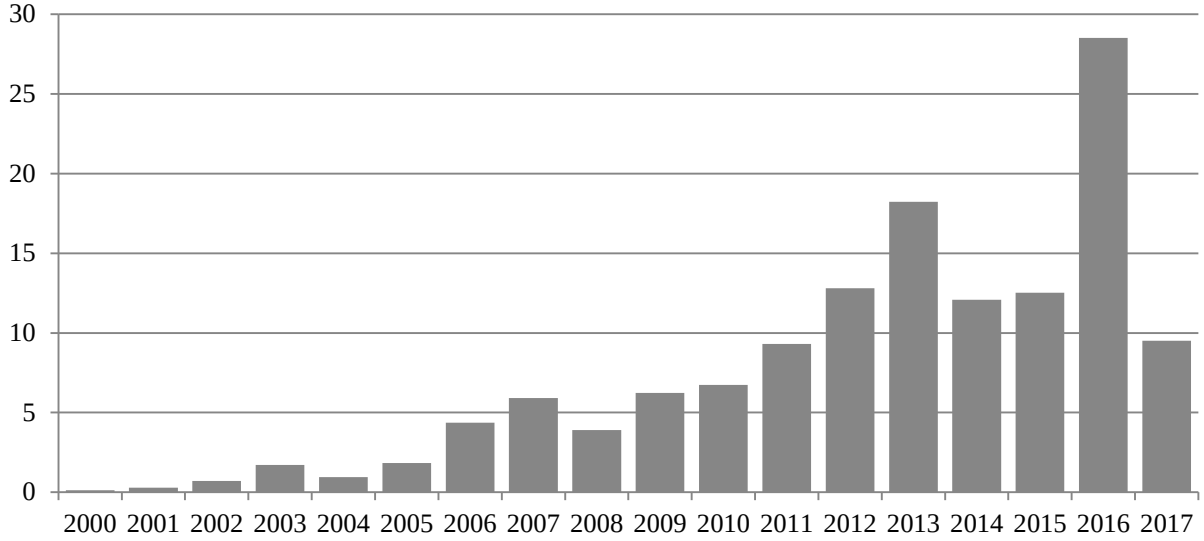
To support the expansion of Chinese overseas construction activities, institutions like the China Development Bank or China Exim-Bank finance many of these projects. Chinese lending to Africa amounted to a total of USD 143 billion over the period 2000 to 2017.[3] These loans were extended to both African governments and Chinese SOEs. Until 2014 68% of all loans coming from China Exim-Bank, 16% from the China Development Bank and 16% from other sources (Hwang, Brautigam, and Eom 2016). The expansion in infrastructure lending was steady until 2013, then suffered a dip to bounce up again in 2016 and decline in 2017 (***Figure 2***). Angola, according to these sources, is the top recipient of Chinese loans, with $42.8 billion disbursed over 17 years, i.e. nearly 30% of the total, followed by Ethiopia with $13.7bn (about 10%). In terms of sector allocation, power (24%) and Transport (31%) accounted for 55% of total loans during this period, confirming the importance of basic economic infrastructure (roads, bridges, railways, dams, grid, wind farms, etc.) in these deals.

It should be noted, however, that not all Chinese-contracted projects are also Chinese-financed projects (see definition above). Between 2007 and 2015 Chinese firms, have for instance, won 30.3% of World Bank financed infrastructure projects in SSA, up from 18.1% between 2000 and 2006 (Farrell 2016). More generally, the monetary value of Chinese-built infrastructure in Africa (measured in COPs) outstrips that of Chinese-financed infrastructure implying that Chinese contractors win a lot of projects not financed by Chinese sources.[4] While Chinese finance may have acted as a catalyst for the expansion of mostly Chinese SOEs in the African market, their competitiveness and own financial muscle has done the rest, thereby reducing the dependence on Chinese loans over time.

[3] See latest data from http://www.sais-cari.org/data-chinese-loans-and-aid-to-africa

[4] The Infrastructure Consortium for Africa of the African Development Bank estimates Chinese finance in African infrastructure at USD 13.9 billion a year between 2011 and 2013 (ICA 2014). This compares to USD 40.6 billion of COPs completed in 2013.

Figure 2. Chinese Loans to sub-Saharan Africa: 2000-2017 (USD billion)



Source: SAIS-CARI database http://www.sais-cari.org/data-chinese-loans-and-aid-to-africa

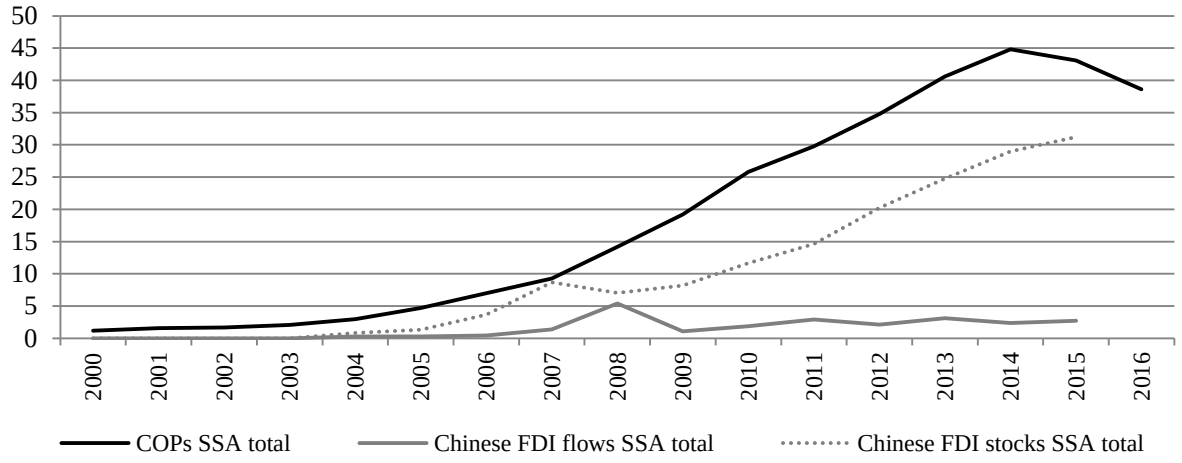
In this context, the question of debt-sustainability and China's role in SSA's growing public debt has sparked renewed debate. Indeed, while the median sovereign debt level in SSA had fallen to 30% of GDP by 2012, debt to GDP in the region is trending upwards again since then reaching 56% in 2016. China's infrastructure driven lending, itself further pushed following the one-belt-one-read initiative, is an important driver of the region's growing exposure to debt alongside falling government revenues after the fall in commodity prices. China holding 14% of SSA's debt stock in 2016, the region's exposure to Chinese held debt is substantial. How concerns about the sustainability of debt will ultimately play out, will depend on whether debt payments will eventually impair governments' ability to pay for essential goods and services, whether debt is diverted into illicit purposes and whether debt is economically productive in the sense of generating future streams of revenue out of which debt can be repaid and based on which the tax basis can be expanded (Were 2018). Thus the question of linkage formation between the construction and manufacturing sector is indeed crucial.

Seen from the Chinese perspective, sub-Saharan Africa is the second most important overseas market for Chinese construction firms, second only to Asia, with USD 76.8 billion contracted value completed in Asia in 2016 against USD 38.6 billion in SSA, i.e. 24% of all overseas construction projects. SSA is not only the second most important overseas market for Chinese construction firms, the contract value of projects carried out in SSA also increased more rapidly than in any other regions, which is reflected in SSAs growing share of total COPs increasing from 10.6% in 2000 to 31% in 2014. Chinese firms' revenue from construction projects completed in SSA peaked 2014 reaching USD 44.8 billion and somewhat declined since then as a consequence of the drop in oil prices leading to a recession and decline in contracted construction projects in resource rich SSA economies (calculations based on China Statistical Yearbook).

Seen from the sub-Saharan African perspective, in terms of magnitude, COPs are far more important than Chinese firms operating through FDI (see ***Figure 3***), with USD 2.7 billion in FDI flows standing against a face-value of USD 43.1 billion of COPs completed in 2015 and USD 38.6 billion in 2016. Investigating the characteristics and spill-over effects of Chinese

contracted overseas projects is therefore essential, not least because macro-level effects are more likely to come through COPs given their sheer size.

Figure 3. Chinese FDI and COPs in SSA 2000-2016 (USD billion)



Source: China Statistical Yearbook (various years) and Statistical Bulletin of China's Outward FDI

Prior to the decline in oil prices in late 2014 and subsequent recession, Angola was the largest market for Chinese construction firms in SSA, Ethiopia was third. Despite Chinese firms carrying out projects in nearly all SSA countries, the top ten markets accounted for 72% of all Chinese contracted overseas projects in SSA in 2013.Such high rates of concentration are to be expected though given Chinese contractors' expansion into Africa is a relatively recent phenomenon. Indeed, by 2016 the share of the top 10 SSA economies in terms of Chinese construction projects has dropped to 66%. Noteworthy is in particular that both shares and levels of completed construction contracts declined in oil-rich SSA economies like Angola, Nigeria and Equatorial Guinea where Chinese firms' turnover from completed projects declines by 55% to 39% relative to 2013. By contrast, in Kenya revenue from completed construction contracts more than trebles between 2013 and 2016 indicating that Chinese construction firms diversify into economies less affected by the oil price drop induced recession (***Table 6***).

Table 6. Top 10 SSA economies for Chinese construction projects, USD billion

Country	Chinese contracted projects 2013	% total SSA COPs 2013	Chinese contracted projects 2016	% total SSA COPs 2016
Angola	7.45	18.3%	4.33	11.2%
Nigeria	4.27	10.5%	2.61	6.8%
Ethiopia	3.56	8.8%	4.71	12.2%
Eq. Guinea	2.63	6.5%	1.18	3.1%
Zambia	2.49	6.1%	1.79	4.6%
Sudan	1.98	4.9%	1.46	3.8%
Congo, Rep.	1.88	4.6%	2.17	5.6%
Ghana	1.77	4.4%	1.15	3.0%
Tanzania	1.71	4.2%	1.52	3.9%
Kenya	1.45	3.6%	4.55	11.8%

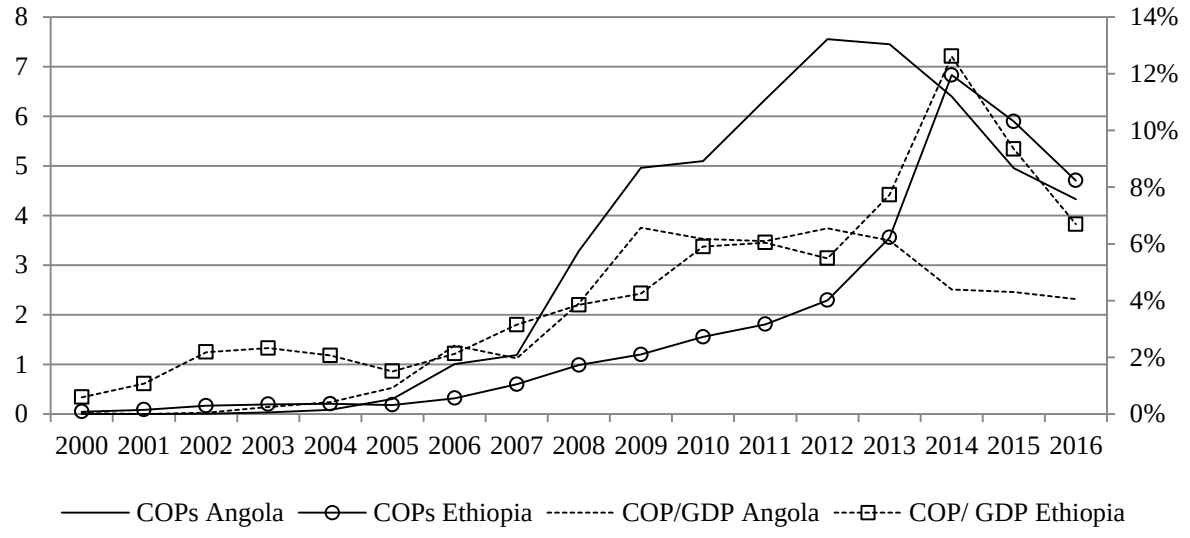
Source: China Statistical Yearbook

Angola and Ethiopia are also by far the largest recipients of loans from China, receiving USD 21.2 billion (23% of total Chinese lending to SSA) and USD 12.3 billion (14%) respectively. Often termed 'Angola model', Chinese construction contracts in Angola are mostly financed through oil-backed loans with Chinese policy banks. About half of all loans to Angola were China Exim-Bank (USD 7.4 billion) or China Development Bank (USD 11.3 billion) credit lines. The remainder were commercial rate loans to Sonangol from the China Development Bank and the Industrial and Commercial Bank of China (ICBC) (Hwang, Brautigam, and Eom 2016). To this adds the latest Chinese credit line over USD 5.27 billion signed in 2015, whose infrastructure construction counterparts are mostly implemented by the time of writing in 2017.

In Ethiopia, of the total USD 12.3 billion Chinese loans issued between 2000 and 2014, USD 7.1 billion were loans from China Exim-Bank loans and USD 630 million from China Development Bank. A noteworthy difference to Angola is that in Ethiopia about a third (USD 4,165) were suppliers' credits, i.e. loans held by the Chinese suppliers in Chinese policy banks (Hwang, Brautigam, and Eom 2016).

In 2016 alone, USD 4.3 billion worth of construction projects have been completed in Angola as a counterpart of these loans, and USD 4.7 billion in Ethiopia. USD 4.03 billion of new contracts (spread over 292 construction contracts) were signed in Angola in 2013. In Ethiopia, 77 new Chinese construction contracts were signed in 2013 for a total value of USD 3.5 billion (CICA 2014: 32). In Ethiopia, revenue from construction projects peaks in 2014 with USD 6.8 billion, at which point, it overtakes contract revenue realised in Angola. At this point, contract revenue from completed projects compares to around 12.6% of Ethiopian GDP. Contract revenue declined since then by around 31% reaching USD 4.7 billion in 2016 (6.7% of GDP). Revenue recorded for completed projects used to be much higher – in levels if not in shares of GDP - in Angola than in Ethiopia. The value of Chinese contracts completed in 2013 was more than twice as high in Angola than in Ethiopia, in terms of relative importance to the economy, the two countries are very similar, with COPs amounting to 7.7% of GDP in Ethiopia and 6.1% in Angola. Revenue from completed contracts in Angola declined by about 42% relative to its peak in 2012 and the importance of Chinese construction activity relative to GDP drops correspondingly (see ***Figure 4***).

Figure 4. COPs in Angola and Ethiopia (USD billion LHS and % of GDP RHS, 2000-2016)



Source: China Statistical Yearbook (various years) and UN National Accounts

The Angolan construction market is, in line with the African market in general, dominated by Chinese construction companies. In 2014, there were 43 main international contractors operating in Angola. According to data provided by the Engineering News Record, 21 of them (i.e. 49%) were Chinese contractors. However, we also find that 33% of contractors are European, especially Spanish, French and Italian (see ***Table 7***). Three years later that proportion had slightly exceeded 50%.

Table 7. Main International Contractors operating in Angola in 2014		
Country/ Region	**No. of firms**	**% of total firms**
BRICS	**24**	**56%**
Chinese	21	49%
Brazilian	3	7%
European	**14**	**33%**
Austrian	1	2%
Spanish	4	9%
French	4	9%
German	1	2%
Italian	3	7%
Portuguese	1	2%
MENA	**2**	**5%**
Israeli	1	2%
Turkish	1	2%
N. American	**3**	**7%**
USA	2	5%
Canadian	1	2%
Total	**43**	**100%**
Source: Engineering News Record		

Similar to Angola, the Ethiopian construction market is dominated by Chinese firms but the share of Chinese firms among international contractors is very high indeed. In 2017, there were 32 main international contractors operating in Ethiopia. According to data provided by the Engineering News Record, 26 of them (i.e. over 80%) were Chinese contractors. Only 18% of international contractors, i.e. is total of five firms, were European in 2014 and none in 2017. By then a host of firms from other non-European countries completed the picture of international contractors in Ethiopia (see ***Table 8***).

Table 8. Main International Contractors in Ethiopia 2017		
Country/ Region	**No. of firms**	**% of total firms**
China	**26**	**81%**
European	**0**	**0%**
N. American	**1**	**3%**
USA	1	4%
MENA	**4**	**13%**
Egyptian	1	3%
Kuwait	1	3%
Turkish	2	6%
Other	**1**	**3%**
Korean	1	3%
Total	**32**	**100%**
Source: Engineering News Record		

Globally, transport and logistics were the top areas in China's newly signed international contracts in 2013, standing at 21.9%; followed by housing construction at 18% and electricity construction at 15.9%. Telecommunications and petrochemical areas sat at 13.5% and 13.3% respectively. Other areas include irrigation system construction, manufacturing facilities construction, sewage systems and industrial infrastructure (CICA 2014: 7f).

For Angola, four different data sources provide information about the sectoral composition of Chinese construction projects:

- The Angolan Ministry of Finance provides a detailed breakdown of the use of the 2004 and 2007 Exim credit lines (total of USD 4.5 billion) (MINFIN 2008a) (MINFIN 2008b) and (MINFIN 2008c)
- The China International Contractors Association (CICA)
- The press-releases of Chinese contractors, notably CITIC and Guangxi Hydroelectric Construction Bureau Angola Company (GHCB)
- Expansao 2016 Newspaper coverage for the 2015 Chinese credit line (total of USD 5.28 billion)

Table 9 provides a sectoral breakdown of Chinese construction projects broken down by different data sources. Covering the period 2004 to 2015, a total of USD 17.4 billion of contracted projects (cons. 2005 USD, deflated by the Angolan GDP deflator provided by UN National Accounts) was traced through the four data sources (USD 2.9 billion through MINFIN data, USD 6.9 billion through CICA data, USD 2.5 billion through press releases and USD 3 billion through the *Expansão* newspaper coverage).[5] Chinese construction services in Angola focus primarily on redressing physical infrastructure (public works and water/ energy projects) and housing. In constant 2005 terms, USD 5.3 billion (31%) were housing construction projects, USD 4.7 billion (27%) are public works (notably road infrastructure construction) and 4.6 billion (27%) are energy and water construction projects including for instance the construction of (hydro) power stations or the rehabilitation of water supply networks. In current terms, energy and water projects make up for the largest share with a cumulative current contract value of USD 7.6 billion or 35% of all projects. This

[5] See *Expansão* print edition of 25 January 2016.

indicates a shift towards energy and water provision in more recent years (more recent projects appearing more strongly discounted in 2005 terms).

The remainder includes education projects (e.g. construction of schools and vocational training centres), health projects (e.g. construction of hospitals), manufacturing projects (e.g. construction of plants), agricultural projects (e.g. construction of irrigation systems), telecommunications and social projects (construction of national TV production centre).

Table 9. Angola: Chinese contracted projects by sector 2004-2015

	constant $2005 million	**current $ million**	**% of total constant $**	**% of total current $**
Housing	5,384.5	5,943.0	31%	27%
Public works	4,757.8	4,907.0	27%	22%
Energy and Water	4,682.2	7,616.5	27%	35%
Education	685.7	997.2	4%	5%
Health	452.2	702.8	3%	3%
Manufacturing	665.7	877.9	4%	4%
ICT	273.9	341.3	2%	2%
Agriculture	458.3	556.8	3%	3%
Social	43.4	66.9	0%	0%
	17,403.6	**22,009.5**	**100%**	**100%**

Compiled based on MINFIN, CICA, contractors' website and Expansao

According to CICA (2014: 32), the largest contracts obtained by Chinese firms in 2013 in Angola were a social housing project (USD 470 million) by CITIC Construction Co. Ltd and a power transformation project (USD 380 million) in Soyo by China Machinery Engineering Corporation. The main state-owned Chinese commercial bank (ICBC) agreed to lend USD 840 million to Angola to finance the Soyo power plant project (ICBC 2015).

In Ethiopia, Chinese contracts are mainly in railway, road building, telecommunications, electricity, housing and irrigation systems. Tracing COPs in Ethiopia for projects documented by CICA and the American Enterprise Institute between 2008 and 2015, what stands out is that in Ethiopia, as in Angola, a substantial part (49.9%) of Chinese construction projects were public works (i.e. road and rail infrastructure and public buildings). By contrast, in Ethiopia manufacturing sector projects (such as the building of factories) were relatively more important than in Angola, manufacturing being the third most important use (16.3%) of Chinese construction services in Ethiopia for projects documented by the two sources (see ***Table 10***). Well-known examples of Chinese-built industrial infrastructure in Ethiopia include the Eastern Industrial Zone, the Hawassa Industrial Park and the Huajian Ethio-China Light Industry SEZ currently in initial development stage. In line with priority sectors for industrial production defined in the Ethiopian Growth and Transformation Plan (GTP) Chinese construction services were used, for example, in the construction of sugar and cement plants.

Table 10. *Ethiopia: sectoral distribution of Chinese contracted projects 2008-2015*		
Sector	**USD current million**	**% of total**
Public works	3,896.9	49.9%
Manufacturing	1,276.0	16.3%
Energy and water	1,367.0	17.5%
Post and telecommunication	1,036.9	13.3%
n.a.	231.6	3.0%
	7,808.4	**100%**
		Compiled based on CICA and AEI

According to CICA (2014: 33), the main contracts signed in Ethiopia in 2013 were transportation infrastructure related (43.1% of all contracts). The contract signed by CAMC Engineering Company Limited for the Welkait Sugar Mill Project (construction of a 24,000t/d sugar mill, a 4 x 30MW bagasse power station and affiliated irrigation equipment with 36 months project life-span) is worth USD 650 million and is partly financed by the China Exim-Bank (Berhane 2014). China Communications Construction Company Limited has also signed a highway construction project with contract value of USD 500 million. The Ethiopian government has continued to invest in infrastructure construction and the market is expected to expand. But due to the international financial crisis and the reduction in international loans, growth in the contracting market might be limited.

2.2. The socio-economic impact of Chinese construction projects – a brief review

Chinese construction projects filling the infrastructure gap

Given the importance of infrastructure for export diversification (see for instance Hummels 2007) and the well documented infrastructure gap in SSA (see for instance Center for China Studies 2011; Foster et al. 2009), Chinese construction activities can remove important bottlenecks to industrialisation in SSA. China has played a transformative role in SSA's energy sector, building 9GW energy generating capacity in SSA between 2001 and 2010 out of an entire installed capacity of 28GW across the continent (Lin and Wang 2017: 123). Lin and Wang's findings suggest that the overall probability of Chinese-financed infrastructure hitting one of the top three infrastructure bottlenecks in each SSA country was 62% (Lin and Wang 2017: 127).

Importantly, Chinese cost-benefit evaluations follow more dynamic criteria than those of other funding bodies like the World Bank, which makes Chinese funding agencies more prepared to take on projects that the World Bank would not accept. In particular, Chinese authorities and funding bodies consider that infrastructure needs to be built 'ahead of time' in order to avoid unnecessarily high production and transportation costs of infant industries (Lin and Wang 2017). As reckoned by Geda and Meskel (2010a), although Chinese contractors are only taking up projects on the initiative of the host governments, some of the projects could hardly be carried out without the support of the Chinese policy banks and, ultimately, the Chinese government. Various cases, such as Ghana's Bui Dam, suggest that Chinese finance was essential for projects to go ahead (Kirchherr, Disselhoff, and Charles 2016). Similarly, China Exim-Bank finance for the Memve'ele dam project in Cameroon, though not below commercial rates, speedily advanced finance for a project that stalled for over 30 years (Y. Chen and Landry 2016).

By steering the infrastructure boom, China is addressing one of the most pressing issues for African developing countries (Davies 2010: 19ff). Estimations of McKinsey (2016), for instance, suggest that approximately USD 982 billion will be needed across Africa between 2016 and 2030 to satisfy additional infrastructural demands at current average growth rates. This contrasts to just about USD 314 billion in actual spending in the period 2000 to 2015, suggesting both substantial investment needs and serious infrastructure gaps. Chinese lending to SSA, amounting to a total of USD 86.9 billion over the period 2000 to 2014 (Hwang, Brautigam, and Eom 2016), helps to address infrastructure spending needs. Around 50% of Chinese loans to SSA countries financed either transportation (receiving $24.2 billion of loans) or energy ($17.6 billion). Chinese finance for transportation infrastructure focussed on roads and railways (accounting together for 80% of transport related loans). In concrete terms, in the hydropower sector, Hwang, Brautigam, and Wang (2015), for instance, find that a total of 17 large Chinese-financed hydropower projects implemented between 2000 and 2013 added approximately 6,771MW of power generation capacity to SSA. To this add a number of smaller projects below 50MW and Chinese-contracted hydropower projects financed by third funders (Hwang, Brautigam, and Wang 2015). In the transportation infrastructure sector, the largest Chinese-finance project include phase1 of Kenya's Mombasa Nairobi Standard Gauge Railway, funded by $3.6 billion of loans, followed by the Addis Djibouti Railway, funded at $2.5 billion (Eom 2016).

In Angola, through the 2004 and 2007 credit lines a total number of 51 schools,[6] 10 hospitals and nine health centres, as well as around 800km of highways[7] have been constructed. The electricity network in seven cities, the water supply system in nine cities and the telecommunications network in 13 provinces has been restored and expanded. Details on the 40 largest construction projects financed through the 2015 Chinese credit line suggest that this credit line has further expanded water supply networks in nine cities, further extended the national highways (EN100, EN120, EN230, EN280 and EN322) as well as municipal roads and equipped and modernised the airport of Cabinda and ports in Cabinda and Soyo. This fills important gaps, especially when taking into account the pressing lack of infrastructure after the civil war and the relatively low levels of commitments from other donors in this area.

In Ethiopia, large-scale public spending on infrastructure is central to the government's 2011-15 Growth and Transformation Plan. The main focus lies on power generation, with hydropower foremost in the mix. Hydropower generation does play an important role in the current development strategy of the Ethiopian government, particularly in two main aspects: 1) potential foreign exchange contribution since electricity will be exported too; 2) supporting the ambitious industrialization drive and making sure industrial parks run with reliable power. Although Ethiopia's largest dam project (the 6,000MW Grand Ethiopian Renaissance Dam) is largely constructed without Chinese involvement, Chinese contractors have been leading recent large dam projects in Ethiopia such as the Tekeze hydroelectric dam (300MW) and the 90 MW Amerti-Neshe hydropower dam. The road network has been extended from 36,400km in 2004/05 to 60,466km in 2013/14 and the construction of 5,000km of railway lines is underway (see MOFED 2010 and National Planning Commission 2015). These infrastructure projects (especially the power infrastructure) are vital to serving the growing industrial base, including agro-processing, sugar and fertiliser production.

[6] Of which 16 are high schools, 18 are vocational schools, six are agricultural schools, and 11 are centres of administration and management

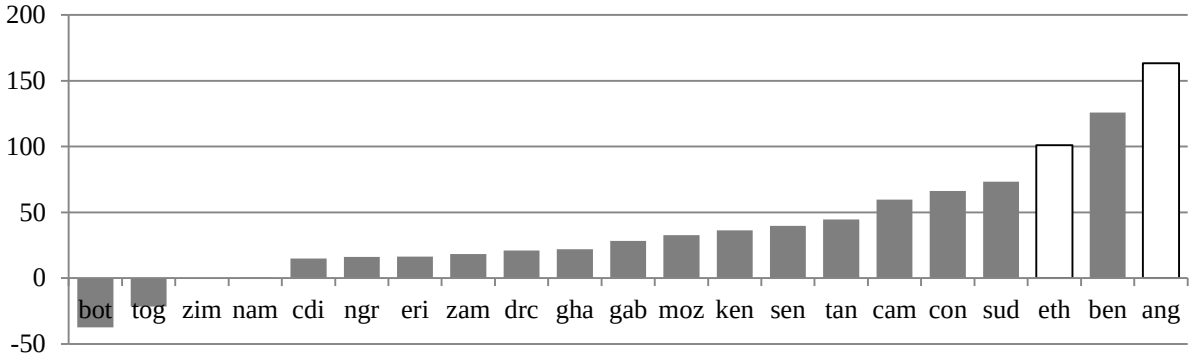
[7] The Caxito-N'zeto highway (around 216km, completed in June 2014), the Quifangondo-Caxito-Uige-Negage highway (around 355km) and the Nzeto-Tomboco-Mbanza highway (around 222km)

The Ethiopian Prime Minister Hailemariam Desalegn said that the major projects carried out by Chinese companies such as mobile telephone expansion, the Addis Ababa Light Railway, the Adama Wind Farm and the Addis-Adama Expressway are crucial for Ethiopia to meet the GTP targets (Embassy of Ethiopia 2014). In particular, the recently rehabilitated Addis Ababa-Djibouti railway line and the Mojo dry port renovation should play a major role in reducing the logistics costs for export and imports for existing and new industrial investors.

Other than railways, the construction of industrial parks is of particular relevance for industrial diversification in Ethiopia and Chinese contractors have dominated key development projects in recent years. The Mekelle, Kombolcha, Dire Dawa, Hawassa and Adama Industrial parks, figure among the latest Chinese-built industrial parks, all inaugurated in summer 2017 and contributing towards fulfilling Ethiopia's ambition of becoming a textile hub in Africa (China Daily 2017).

Supply-side effects are not easily quantifiable given lack of data, but the fact that both countries have the highest growth rates of electricity production in sub-Saharan African countries for which data are available, is illustrative of the importance and success of physical infrastructure construction in Angola and Ethiopia (see ***Figure 5***).

Figure 5. Electricity (production of kwh) - % increase period 2000-04 to 2007-2010



Source: World Bank - African Development Indicators

Quality of infrastructure construction

Some anecdotal, mainly news media-led evidence (e.g. The Economist 2011), has suggested quality issues with Chinese contracted infrastructure. This does, however, not withstand the test of quantitative scrutiny. A systematic review of the World Bank's impact assessments for Chinese-contracted, World Bank-financed infrastructure projects reveals no statistically significant difference in quality between Chinese-contracted and OECD-contracted projects financed by the World Bank in SSA, both scoring on average between moderately satisfactory and satisfactory. Chinese-contracted projects did however have more variation in their outcome scores. The negative reputation of Chinese firms might be explained by news media disproportionately picking up on very low scoring projects (Farrell 2016).

Zhao and Shen (2008) find that Chinese contractors even have technological advantages vis-à-vis Western contractors. Due to the rapid expansion of the construction market in China itself which involved increasingly technologically complex projects, Chinese construction firms have developed world-class, advanced construction technologies in highways and railway bridge construction, tunnels and underground work, structures for deep foundation pits, super high rise buildings, blasting technology, large structure and equipment hoisting, pre-stressed concrete and mass-concrete pouring. Therefore, Chinese firms are now more capable of undertaking technically complex projects and have, according to survey results

from Zhao and Shen (2008), built a reputation for cost saving and quality performance including in the African market. Moreover, it should also be noted that in some cases the main reason for quality problems lies in poor project design, which is not always the remit of the contractor that builds or rehabilitates the infrastructure.

Environmental and labour issues

Case study findings from Ghana and Cameroon suggest that environmental and social mitigation plans of Chinese contracted construction projects, specifically those in the hydro-power sector, were carried out by Western consultancies in collaboration with the domestic governments and as such in line international standards and domestic regulations. However, the degree of compliance and enforcement varied. Comparing two Chinese-constructed hydro-power projects in Cameroon, one financed by China Exim-Bank, the other by the World Bank, Y. Chen and Landry (2016) find similarities in Chinese contractors' adherence with national environmental standards but differences in the rigor of ensuring compliance with these standards and in the involvement of financiers. In particular, both projects were accompanied by action plans addressing various social and environmental impacts but the Chinese-financed project, was, for instance, not halted when the resettlement plan fell through. It should be noted, however, that the Chinese-financed project was much less environmentally risky from the outset (Y. Chen and Landry 2016). In the case of Ghana's Bui Dam, the Chinese contractor Sinohydro monitored the implementation of the economic and social impact plan, which was carried out by a British consultancy in cooperation with Ghana's Bui Dam authority (Kirchherr, Disselhoff, and Charles 2016).

One key area of concern highlighted in Kirchherr, Disselhoff, and Charles' (2016) case study of Ghana's Bui Dam concerns the need for better management of labour conditions. Although there is scattered evidence of poor labour practices (Wissenbach and Wang 2016, Bah and Jauch 2009), there is not enough comparative evidence, which is needed given that labour practices are generally poor in many African countries and particularly in construction, and, where there is, evidence does not suggest Chinese contractors are systematically worse (see Sautman and Yan 2016; Rounds and Huang 2017). Another paper in this project is devoted to a comprehensive analysis of labour practices by Chinese companies in Africa.

3. ECONOMIC IMPACT OF CHINESE CONSTRUCTION PROJECTS IN ANGOLA AND ETHIOPIA: THE CONSTRUCTION-INDUSTRY NEXUS

3.1. DEMAND-CHAIN FORMATION: THE EMERGENCE OF THE BUILDING MATERIALS SECTOR IN ANGOLA AND ETHIOPIA

C. Chen, Goldstein, and Orr (2009) find that Chinese firms source large amounts of supplies and equipment through imports from China given the lack of (almost any) supply in the African host countries. Yet, this situation is beginning to change. Case study findings from the SGR project in Kenya suggest that all cement is purchased from Kenyan industries. Railway cars are produced in Kenya, while construction machines, railway engines and steel rails were imported from China. Local markets further benefitted from the influx of workers and follow-up maintenance services (Wissenbach and Wang 2016). It appears that an important determinant of variation in the extent to which contractors source inputs locally is domestic policy and agency from the government and local suppliers. The following section seeks to further substantiate these effects on domestic markets at the example of building materials manufacturing in Angola and Ethiopia.

Interestingly, outward FDI in building materials production are actively encouraged by the Chinese state. The "Guiding Opinions on Promoting International Production and Equipment Manufacturing Cooperation" (*关于推进国际产能和装备制造合作的指导意见*) released by the State Council in 2015encourage enterprises to invest in cement, glass, and other production lines linked to the construction industry of the host country (China State Council 2015).

Investigating the links between construction activities and manufacturing is critical, not least because building materials make up for a significant share in both Angola's and Ethiopia's import bill, though with important variations over time. Drawing on commodity trade data based the HS (Rev. 2002) classification at the 6-digit level, 71 product groups were identified as building materials imports (see ***Annex 2*** for details). Building materials imports increased substantially and unsurprisingly in both countries over the latter half of the 2000s, averaging 10.7% (8.1%) of total commodity imports in the period 2007-2011 in Angola (Ethiopia), up from 7.2% (4.8%) in the period 2002-2006. Though still a very substantial part of the import bill, building materials imports have decreased slightly relative to total imports over the last five years (***Table 11***).

The high shares of building materials in total imports are particularly striking when comparing them to building materials imports made by the major OECD and BRICS contractors. Building materials imports in the comparator group composed of the major OECD and BRICS contractors range from around 1% of total commodity imports in China to slightly more than 2% in France, the rest falling somewhere in between 1% and 2% (***Table 11***).

Table 11. Building materials imports in Angola and Ethiopia compared to major contractors

	2002-2006	**2007-2011**	**2012-2016**
Brazil	1.5%	1.8%	1.9%
China	1.1%	0.9%	0.8%
France	2.4%	2.4%	2.3%
Germany	2.0%	2.0%	2.1%
Italy	1.7%	1.8%	1.6%
United Kingdom	1.6%	1.7%	1.7%
USA	2.0%	1.8%	1.8%
Angola	7.2%	10.7%	8.2%
Ethiopia	4.8%	8.1%	8.2%

Source: UN Comtrade (HS, rev. 2002)

While imports are substantial, the increase in demand for building materials has also spurred domestic production and investment in both countries. To get a sense of Angolan and Ethiopian building materials production since the turn of the century, the following section triangulates between official output and investment data as well as sector level reports and evidence from qualitative research.

The most detailed time series on Ethiopian manufacturing is provided by UNIDO's INDSTAT database at the four digit level using the ISIC Rev.3 classification. This allows drawing some conclusions about the sectoral composition of Ethiopia's manufacturing output but filtering out building materials specifically faces various challenges and is much less accurate than for the NACE Rev.2 classification used for Germany and the UK above. In particular, the product codes counted as 'Building materials + associated' below undoubtedly

include a number of other glass-, plastic-, and ceramic related consumer products as well as wood and steel products serving as inputs for other industries.[8] So this regrouping relies on a very wide definition and provides only a rough indication (see ***Annex 3*** for details). However, some interesting trends emerge when comparing building materials very widely defined to other manufacturing activities that are clearly distinct from it. Building materials and associated industries grew at a faster rate than the 'Food and Beverages' industries as well as the 'Textiles and Apparel' industries (counting both inputs and final consumer goods) both in terms of output and employment. In 2013, 'Building materials and associated' industries account for about 30% of total manufacturing output compared to 35% of 'Food and Beverages' and 16% of 'Textiles and apparel (***Table 12***).

Table 12. Ethiopia manufacturing output by sub-sector (in % of total manufacturing), selected years

	2002	**2006**	**2010**	**2013**
Food and Beverages	41.7%	38.7%	41.0%	35.2%
Textiles and Apparel	19.1%	13.4%	10.9%	16.1%
Building materials + associated	20.0%	29.3%	30.1%	30.5%
Other	19.2%	18.6%	17.9%	18.2%
Total manufacturing	100%	100%	100%	100%

Source: calculations based on UNIDO INDSTAT4 (ISIC Rev.3)

In terms of employment, the 'Building materials and associated' industries employ about 42% of Ethiopia's manufacturing workforce in 2013, compared to 22% for 'Textiles and Apparel' and 19% for 'Food and Beverages'. These shares are likely to shift in recent years given the rapid growth of the textile and apparel industry since 2014. Note that, out of 116,344 workers employed in 'Building materials and associated', more than half (63,126 workers) worked in rubber and plastics production (codes 2519 and 2520) –which includes a myriad products beyond building materials inputs strictly defined. The production of cement and concrete articles (codes 2694 and 2695) employed 28,437 in 2013 and iron, steel, structural and fabricated metal products (codes 2710, 2732, 2811, 2899) employed 16,857 and builders' carpentry and veneer sheets employed 5,577 workers in 2013. Together, these cement-related, steel-related and wood-related production activities, which capture almost exclusively building materials, employ 50,871 workers in 2013, making them the third largest sources of manufacturing employment after 'Textile and Apparel' (60,810) and 'Food and Beverages' (52,872) (***Table 13***). Indeed, many Chinese investors in Ethiopia and Angola indicated in interviews with SOAS research team that domestic demand for building materials at a time of fast construction growth was a major driver of their investments. Both the availability of finance for construction and the rise in imports of building materials indicated substantial business opportunities in these sectors

[8] Some of the four digit-groups are quite clearly identifiable as building materials, including 2022 Builders' carpentry and joinery; 2694 cement, lime and plaster; 2695 articles of concrete, cement and plaster; 2696 cutting, shaping and finishing of stone. Other groups contain a significant amount of building materials alongside other intermediate inputs, e.g. 2021 veneer sheets, plywood and particle boards; 2811 structural metal products and 2899 other fabricated metal products. Finally, some product groups contain building materials alongside a various consumer goods, e.g. 2691 non-structural non-refractory ceramic ware (containing sanitary fixtures and insulating fittings but also tableware and porcelain); 2520 plastics products (a very large plastic tubes and fitting alongside all other plastic products) or 2610 glass and glass products (including both flat glass articles likely to be used in construction and hollow glass more likely to be used for bottles and decorative items).

Table 13. Ethiopia manufacturing employment by sub-sector, selected years				
	2002	**2006**	**2010**	**2013**
Food and Beverages	29,652	36,415	61,096	52,872
Textiles and Apparel	32,794	34,113	41,431	60,810
Building materials + associated	14,692	22,424	44,246	116,344
Other	20,998	25,516	38,313	46,828
Total manufacturing	98,136	118,468	185,086	276,854

Source: calculations based on UNIDO INDSTAT4 (ISIC Rev.3)

This is partly confirmed by data on private investments in Angola. ISIC output data are not available for Angola, though investment projects recorded by ANIP (Angola's former investment promotion agency) point to a similar pattern of substantial investment in building materials manufacturing. Investment projects in intermediate goods production are the second most important sector of investment after beverages, in the projects recorded by ANIP (Wolf 2017). The 4-digit disaggregation of investments in the production of intermediate goods reveals that, in the years 2011 and 2012, the largest volume of investments went to the production of cement, lime and plaster, followed by iron and steel as well as plastic products (see ***Table 14***).

Table 14. Manufacturing Sector Investments – Intermediate Goods, 2011 and 2012 (constant 2005 USD, thousands)

Code	**Description**	**Angolan**	**Foreign**	**Σ IM***	**Σ Manf.****	**Σ IM/ Σ Manf.*****
2520	Plastics products	102,699	10,813	113,512		12.58%
2691	Non-structural non-refractory ceramic ware	5,555	0	5,555		0.62%
2694	Cement, lime and plaster	255,190	0	255,190		28.28%
2811	Structural metal products	1,102	4,221	5,323		0.59%
2692	Refractory ceramic products	24,692	2,434	27,125		3.01%
2695	Articles of concrete, cement and plaster	3,063	0	3,063		0.34%
2710	Basic iron and steel	218,029	0	218,029		24.16%
3210	Electronic valves and tubes and other electronic components	1,988	600	2,588		0.29%
21	Pulp, paper and paperboard	0	735	735		0.08%
2422	Paints, varnishes and similar coatings, printing ink and mastics	0	326	326		0.04%
2610	Glass and glass products	0	288	288		0.03%
2693	Structural non-refractory clay and ceramic products	0	202	202		0.02%
		612,318	**19,619**	**631,937**	**902,279**	**70%**

Source: Agência Nacional para o Investimento Privado

* Total investment in intermediate inputs recorded by ANIP 2011 and 2012

** Total manufacturing investment recorded by ANIP in 2011 and 2012

***Investment intermediate inputs as share of manufacturing investment recorded by ANIP 2011 and 2012

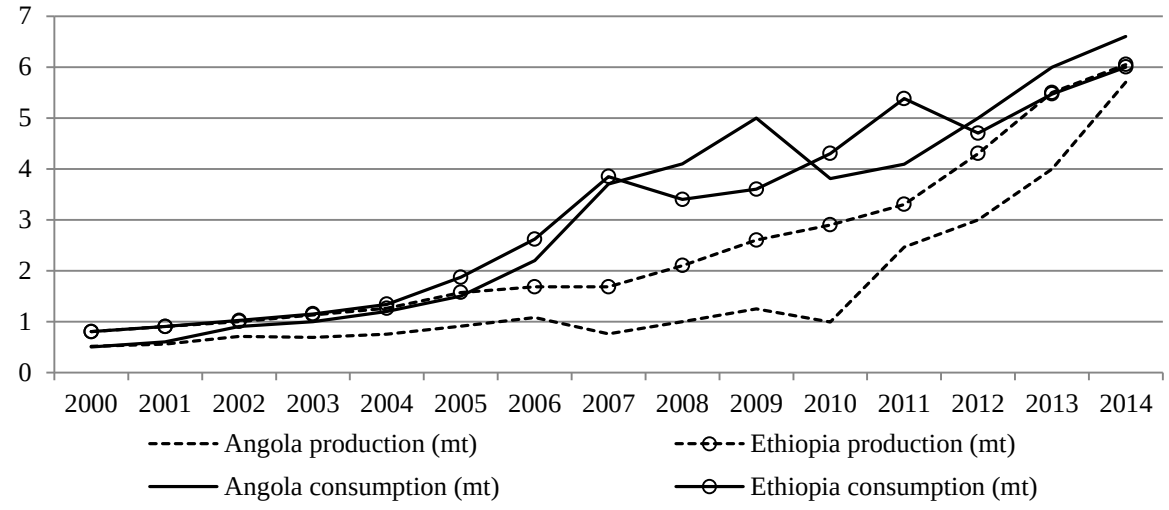
Emerging building materials production: the cement sector in Angola and Ethiopia

Both in Angola and Ethiopia, one of the most noticeable increases in building materials manufacturing is cement production. Cement consumption in Angola and Ethiopia has

followed similar patterns, with demand accelerating in both countries in the mid-2000s, outstripping domestic production by a large margin (see ***Figure 6***). This caused cement imports in both countries to increase dramatically: Angolan cement imports increased at an average annual rate of 56% between 2002 and 2009 (from USD 10.5 million in 2002 to USD 193 million in 2010). In Ethiopia, cement imports increased from USD 36.6 thousand in 2002 to USD 11 million in 2012, which is approximately equivalent to the revenues generated by Ethiopian footwear exports at that time.

But both countries gradually developed a cement supply base causing both imports and prices of cement to fall. In Angola, cement imports decreased at an average annual rate of 30% between 2010 and 2014 (to USD 77 million in 2014). An average of 51.5% of all cement imports between 2002 and 2014 was sourced from China, with a peak of 77.6% in 2011. In Angola, investments by various companies have redressed this balance, with production levels reaching 5.7 million tons in 2014 (against 6.6 million tons consumption) (see ***Figure 6***). In terms of installed capacity, Angola was self-sufficient in 2014, with installed capacity surpassing 8.5mta across five producers). Given the slowdown of the construction sector in Angola post 2015, as a result of the sharp decline in oil revenues, demand for building materials declined and companies started considering exports to the region, according to field interviews. Meanwhile, Ethiopian imports of cement dropped to just USD 535 thousand in 2014 as a result of substantial expansion in domestic production. To this add USD 865 thousand in concrete products. In Ethiopia, a total of 20 plants have an installed capacity of 12.6 Mta producing 6.05 million tons in 2014 (***Figure 6***).

Figure 6. Cement consumption and production (Mt) Angola and Ethiopia 2000-2014



Source: Global Cement report 11th edition

World cement production and production in African countries is dominated by European multinationals. The nominal capacity of the two biggest and recently merged producers, Holcim (Switzerland) and Lafarge (France), stands at 423.6 Mta. They are followed by Heidelberg Cement (Germany), Cemex (Mexico) and Italcementi (Italy) with an installed capacity of 133.4 Mta, 93.7 Mta and 60.6Mta respectively. Lafarge and Heidelberg Cement are major players in almost all of the cement producing countries in sub-Saharan Africa whose production capacity exceeds 4Mta. In Ghana, Heidelberg Cement accounts for 67% of installed capacity, Lafarge accounts for 44% in Cameroon, 26% in Kenya, 23% in Nigeria, 17% in South Africa and 7% in Tanzania.

Noticeable exceptions are Senegal, Angola and Ethiopia, where production is dominated by domestic firms and MNCs from emerging countries, including China. In Angola, the largest producer is CIF Luanda, a joint venture between Angolan capital and the Hong-Kong based China International Fund which operates a plant with an installed capacity of 3.6Mta at Bom Jesus in the outskirts of Luanda. The remaining plants are by now all in local hands and include Nova Cimangola (formerly owned by Heidelberg Cement), Fabrica de Cimento do Kwanza Sul, Cimenfort industrial Lda and Secil Lobito (see ***Table 15***).

Table 15. Angolan Cement production base in 2014		
Company	**Capacity (Mta)**	**No. of Plants**
CIF Luanda	3.60	1
Nova Cimangola	1.80	1
Fabrica de Cimento do Kwuanza Sul	1.46	1
Cimenfort industrial Lda (Genea Angola)	1.40	1
Secil Lobito	0.35	1
Source: Global Cement Report 11th edition		

In Ethiopia, ownership structures are more diverse than in Angola, the three largest plants with an installed capacity of 2.5 Mta each are Nigerian (Dangote Ethiopia), Saudi Arabian (Derba Midroc Cement) and an Ethiopian SOE (Mugher Cement) (see ***Table 16***). Ethiopian production was led by the Ethiopian SOEs Mugher and the EFFORT company[9] Messebo, and only later followed investments by the Dangote Group and Derba Midroc (Oqubay 2015). Chinese contractors and investments have played an important role in the development of the Ethiopian production base. The Dangote and Derba plants were constructed by Chinese contractors, Sinoma and the China National Building Materials and Equipment Import and Export Corporation respectively. The Messebo cement factory added a second production line in 2012, which was supplied by China's Hefei Cement Research and Design Institute. Finally, one of the smaller plants in Ethiopia is Chinese owned: Huang Shan Cement is a subsidiary of Guangdong Chaun Hui Technology Development Group Co. Ltd and commenced production in 2010 (Armstrong et al. 2015).

Table 16. Ethiopian cement production base (main producers)		
Company	**Capacity (Mta)**	**No. of Plants**
Dangote (Ethiopia)	2.50	1
Derba Midroc Cement plc	2.50	1
Mugher Cement	2.20	1
National Cement Share Co (NCSC)	1.40	2
Messebo Cement Factory plc	2.10	1
Huang Shan Cement	0.66	1
East Cement SC	0.75	1
Tura Dire Dawa	0.50	1
Source: Global Cement Report, 11th edition		

Both in Angola and Ethiopia, cement production is associated with forward linkages. In Angola, production of concrete bricks and other concrete structures has grown at similar rates

[9] Endowment Fund for the Rehabilitation of Tigray

as domestic clinker production (MIND 2014a).[10] Furthermore, a plaster factory, Super Gesso, operates in Kwanza Sul (AllAfrica 2009) and the processing of natural stone (tiles etc.) is actually one of the few sectors, in which Angola has successfully developed an export capacity (MIND 2014b).

Other building materials production

Furthermore, linkage formation to the construction is not limited to the cement and concrete sector. In Angola, steel production is taking off with the expansion of Canadian firm Fabrimetal, the arrival of Chinese firm San Yuan, as well as of *Companhia Siderúrgica do Cuchi* (CSC), a factory producing pig-iron (Macauhub 2015) and another steel mill, *Aceria de Angola* (ADA), which stated production in late 2015 (Winsor 2016). ADA produces 250,000 tons of steel annually and employs 600 people (Moggridge 2016). The company is owned by K2L, an Angolan holding company operating in steel, real estate and construction. K2L began as a real estate development business in 2003 importing all inputs from Brazil and Western markets. It later expanded into the distribution of steel, controlling 70% of Angola's imported steel market. Since 2012, the company pursued active efforts to move into into steel production and since December 2015, the ADA factory is operational (Zarya 2015).

In Ethiopia, the Toussa steel mill, a joint venture between Ethiopia's MIDROC and an Italian investor, was established. The company has an installed capacity of 1.3 million tons and produces reinforcement bars, billets, hollow sections and railway tracks (The Africa Report 2012). A glass factory and ten steel factories were built between 2004 and 2012. In addition, the construction boom has stimulated the emergence of domestic producer-related services such as architects and engineering consultants (Oqubay 2015).

As for the case of cement, the increase in steel production and processing is an Africa-wide trend. The upsurge for infrastructure development has driven the demand for steel in the form of wires, roofing sheets, nails or reinforcement bars all over Africa and more and more steel mills are established and upgraded, for instance in Nigeria, Kenya and Uganda where not just the establishment of mills but also vertical integration into iron ore mining are supported by the governments (CR 2013).

3.2. UNDERSTANDING THE ROLE OF INDUSTRIAL POLICY

While infrastructure is often identified as a key bottleneck to industrialisation in SSA (e.g. Nijinkeu, Lohi, and Djiofack 2013; Lin and Wang 2017) and China's role in filling these gaps is positively acknowledged, the question of China's impact on structural change in SSA economies is approached through other channels, namely productivity enhancing effects of Chinese outward investment (Tang 2014; Seyoum, Wu, and Yang 2015; Amighini and Sanfilippo 2014; Y. Chen et al. 2016; Tang 2016) and of Chinese capital goods imports (Hanlin and Kaplinsky 2016; Atta-Ankomah 2016; Agyei-Holmes 2016) or China's impact on global export markets. Chinese products have been shown to displace African manufactured goods in export-oriented light industries such as textiles and footwear (Geda and Meskel 2010b; Villoria 2009; Giovannetti and Sanfilippo 2009; Kamau, McCormick, and Pinaud 2009; Kamau 2013), which makes it more difficult for African countries to get their feet on the ladder of export-led industrialization (Kaplinsky and Morris 2008). However, a countervailing factor might be that, due to rising labour costs in China, some of these

[10] Clinker is a by-product of cement production, which is used in the form of stones or powder as the binder in many cement products.

industries might eventually be relocated to African countries (Lin 2012; Lin 2017), a process which can already be observed in some African countries such as Ethiopia, Nigeria and Tanzania (Tang 2014). Empirical evidence suggests that Chinese firms in SSA are attracted by a combination of (a) large and largely untapped domestic consumer markets and (b) potential platforms for exports to Europe and USA due to preferential access of African countries (e.g. AGOA), rather than because of labour cost advantages in export-oriented light manufacturing. 93% of the sales realised by the firms interviewed by McKinsey (2017) came from local or regional sales and firms indicate they are drawn to Africa's high margins for a range of manufacturing goods (see Shen 2015; Gu 2011; Warmerdam and van Dijk 2013; Huang and Ren 2013 for similar conclusions). Even in Ethiopia, often presented as a model case for flying-geese type relocations of Chinese labour intensive industries (Geiger and Goh 2012), survey data of the Ethiopian Central Statistical Agency (CSA) suggest that about 84% of Chinese manufacturing firms in Ethiopia are local market-seekers (Seyoum, Wu, and Yang 2015).

Domestic-market seeking FDI generates different dynamics than relocations, yet emerging policy paradigms do not sit comfortably with the empirical reality. The question of how domestic policy can support the growth of domestic markets and purchasing power through Keynesian-type income redistribution, taxation and labour market policies has not taken a prominent role in policy debates, even though emphasis on jobs and consumption linkages seems on the rise. Two new industrial policy paradigms for African economies have emerged corresponding closely to the different accounts of what China's rise in the world economy and in Africa might mean for structural change in SSA economies. On the one hand, the "flying-geese" paradigm (FG) predicts the relocation of labour-intensive industries from China and stipulates wage moderation and labour market deregulation (Ceglowski, Golub, and Mbaye 2015; Monga 2013) to attract this "flock of geese" to Africa. On the other hand, the resource-based diversification paradigm (RBD) maintains that, in the face of saturated global demand for various consumer goods, late-industrialisers need to focus on adding value in rapidly expanding export markets such as processed mineral and energy commodities (UNECA 2013) while supporting the production of domestically consumed 'bottom-of-the billion products' (Kaplinsky 2013). These two approaches are of course not mutually exclusive but are seldom discussed as a potential combination.

Apart from the support of domestic purchasing power, another largely under-researched policy area concerns active support for building materials industries as a form of domestic demand-induced industrialisation. As described in the previous section, China is playing a critical role in the economic diversification of SSA economies through its construction activities. Yet, infrastructure projects alone do not ensure dynamic industrial development without a bold and long-term coherent industrial strategy/ policy. This is simply because construction booms can easily feed from imports in a liberalised trade environment and given structural capacity constraints to develop local industry. In Ethiopia, we observe active institutional support for different building materials industries following Ethiopia's longer-term strategic vision for growth and transformation. The Ethiopian Chemicals and Construction Input Industries Development Institute, for instance, supports individual firms such as clay tiles producers with market and viability studies (CCIIDI 2015). Ethiopia has also set out a cement industries development strategy (Ministry of Industry 2015), and hosted the 2nd annual East-Africa cement, concrete and energy summit in April 2017, to list just a

few examples.[11] By contrast, support for other building materials is operated more on an *ad hoc* basis on the initiative of private capital (see below).

Supporting building materials manufacturing requires various forms of policy support, some of them very industry specific others applying to the building materials sector as a whole. These include *firstly* maintaining demand for building materials. The prime driver of the building materials sectors in Angola and Ethiopia has been government spending on large-scale housing and infrastructure development, which boosted demand for construction inputs. One specificity of the cement and other building materials industries is the importance of government procurement in total consumption, making the stable growth government spending on construction key for the emergence and expansion of production (Oqubay 2015).

In Ethiopia, the government is the biggest buyer of cement, having purchased more than two thirds of domestic production between 2005 and 2013. The housing programme is the most important use, accounting for about 50% of total domestic cement demand. The scaling down of the national housing development programmes in Ethiopia was a major reason for the slower growth in the Ethiopian cement products industry between 2009 and 2012. This is reflected in firms' capacity utilisation rates: between 2009 and 2012 only four firms reached 80% capacity utilisation, four operated between 60 and 80% and six below 50% capacity utilisation (Oqubay 2015). This shows the extent to which government-spending on construction constrains and accelerates output growth. Oqubay (2015) even argues that the demand-side support through housing and infrastructure development was more important for the emergence of the cement sector in Ethiopia than some of the direct support measures such as subsidies and access to credit.

Similarly, in Angola, investments in steel production are clearly linked to expansionary fiscal spending, especially in the form of infrastructure development. As ADA's Vice President and Chief Marketing Officer explains:

> "Steel is not doing well in the world, but for a country like ours it makes complete sense. Everything that stands has steel in it and we're going to produce that steel." (De Almeida, Chief Marketing Officer and Vice President of ADA quoted in Zarya 2015)

Conversely, contractions in Angolan government spending on building materials production following the drop in oil prices since late 2014 had negative impacts on building materials producers. A Lebanese construction materials producer, for instance, said to branch out of building materials into juice production given the shrinking demand for building materials (McClelland 2014).

> "We are in the construction materials business but we see it decreasing every year and taxes have gone up." (Ali Tarraf, president of Lebanon-based TAHS Industria Lda. Cited in McClelland 2014)

Going forward, the question is whether high levels of government spending can be kept up in light of dwindling government revenues, especially in Angola. The 2014 shock in oil prices not least showed the vulnerability of government-led demand. The average price for Angolan crude oil fell from $108 per barrel in 2013 to $97 in 2014 and $50 in 2015. Total revenues from oil and gas fell from a height of $69.7 billion in 2013 to $57 billion in 2014 further

[11] In terms of strategy, this signals a combination of export-oriented light manufacturing in textiles and garments, leather products etc. with capacity building in strategic domestic markets dominated by imports such as building materials and other manufactured goods. Given the foreign-exchanged constrained nature of the Ethiopian economy the import-substituting industries are designed to save on foreign exchange while the other industries are expected to generate growing volumes of foreign exchange.

reducing to $31.9 billion in 2015. This had important negative follow on effects on the exchange rate, consumer and producer price inflation, and government spending (IMF 2016).

Although the economy started to diversify and non-oil tax revenues increased between 2010 and 2014 (IMF 2015), this was not enough to compensate for the reduction in oil revenues. Oil exports accounted for 98% of total Angolan exports and 67% of government revenues in 2014. Total government expenditure as % of GDP dropped from 41.9% in 2014 to 30.6% of GDP in 2015. The level of government spending fell by 30.5% between 2013 and 2015 reducing from Akz 4,849 billion to Akz 3,367 billion. The fall in government revenues slowed down the execution of key infrastructure projects (IMF 2016). The most recent estimates predict the average price of oil to jump to USD 57 in 2017 and USD 60 in 2018, with Angolan revenues increasing and the fiscal deficit narrowing accordingly (Proshare 2017).

Secondly, and this is specific to steel production, is the emergence of conflicting demands from traders and domestic producers. The examples of many other SSA countries show that attractive export prices for scrap metal means that these find their way out of the country or forces steel mills to pay higher prices. Though the steel processing interests are gaining the upper hand in in several SSA countries, including Ghana, Nigeria, the Ivory Coast, Kenya, Cameroon and Zimbabwe where legislations were passed to ban the export of scrap metals (Construction Review 2015).

This is less of a problem for cement production. Given the low-value/high-volume nature of cement output and the global abundance of necessary raw materials, cement is effectively a non-traded good with less than 10% of global output being traded. This explains why domestic production was set up comparatively quickly in the face of a construction boom.

Thirdly, in terms of financing and tariff protection, the establishment of the Angolan plants has been supported by subsidies and subsidised credit. For instance, the *Fábrica de Cimento do Kwanza Sul* (FCKS) received subsidised loans from Sonangol and the *Banco Angolano de Investimentos* (BAI) (Marques De Morais 2015) and in 2014 the Angolan government granted Nova Cimangola USD 116 million to raise the plant's capacity (Armstrong et al. 2015). As noted above, these forms of support emerged on an *ad hoc* basis rather than strategic government support for the whole industry or building materials sector, and may have also been the outcome of pressures from leading business-political elites, with established interests in both cement companies. The Angolan government also gradually increased tariffs on cement imports and in early 2015 the government banned the import of cement, barring exceptions operated through a quota system to protect domestic production (WTO 2015). This occurred partly as a result of intense pressure from domestic industrial lobbies exemplified by the *Associação Industrial de Angola* (AIA). In Ethiopia investments were financed through subsidised credit from the Development Bank of Ethiopia and the Commercial Bank of Ethiopia (Oqubay 2015).

Fourthly, the scarcity of skilled labour constitutes a substantial challenge for building materials producers, especially in the steel sector. A 2016 study by the Ethiopian Policy Study and Research Centre (EPSRC) revealed that Ethiopian steel industries were, on average, operating on 38% of installed capacity, a problem that mainly stemmed from shortages of skilled labour (Belete 2016).

Fifthly, supply-side support in terms of water, road and power-infrastructure development is also important to keep these industries viable. In Ethiopia, the government supplies heavy fuels, coal, pet-coke and electricity to all firms at subsidised rates (Oqubay 2015). Almost all of the Ethiopian plants have switched from burning fuel oil to local and imported coal. Use of

alternative fuels is low, but the Messebo plant has begun to replace coal by sesame straw which will entail savings. However the supply of biofuels is seasonal and varies subject to harvested volumes (Armstrong et al. 2015). Other than energy and electricity, the extension of the transport network, along with government provision of trucks for cement transport has been essential.

In Angola, the case of Angola's ADA steel mill, illustrates again the extent to which support for building materials producers is operated much more on an *ad hoc* basis and on the initiative of the investors rather than strategic government policy. ADA's Vice President and CMO reported to have persuaded the government to support the company's operation with stable access to electricity, which was eventually achieved with the installation of a new high voltage line 52km from the plant (Zarya 2015).

In the cement sector, CIF's production lines use diesel, while the Nova Cimangola and FCKS plants rely on (domestically refined) light and heavy fuel. In exchange for loans from Sonangol and the *Banco Angolano de Investimentos*, FCKS buys fuel from Sonangol, which raises production costs vis-à-vis the diesel-operated CIF plant. However, the reduction in government revenues and the subsequent reduction in fuel subsidies are now driving up production costs to a level at which economic viability is at risk (Marques De Morais 2015). In autumn 2017 both FCKS and CIF Luanda had to halt production for several months due a lack of fuel to produce clinker. Both factories could only resume production in November 2017 after lobbying the government to be being directly supplied with fuel from the Luanda refinery (Macauhub 2017).

Last but not least, the example of Germany and the UK revealed that diversified building materials sectors rely to a large extent on the activities of small and medium sized firms in sectors such as tiles or doorframe production. Support for the building materials sector would have to include therefore not just large-scale, capital-intensive building materials production like cement and steel but also sectors dominated by small and medium sized firms. In particular in the case of Angola, whether such support would or could be implemented is doubtful, especially when considering that government support for the productive sector in the past has not been tied to development objectives as such but rather served clientelistic rent redistribution around elite networks (Corkin 2013; Croese 2017; Pitcher 2017; Wolf 2017)

CONCLUSIONS

This paper's point of departure was the observation that growth rates of the construction sector in SSA have exceeded those of GDP by large margins since the turn of the century. While high construction sector growth rates are, in fact, a common pattern across all developing regions since the turn of the century, the trend was more pronounced in SSA. Hence understanding the economic, social and political significance of this sector is a key piece in tracing development trajectories of the region. Investigating the examples of Angola and Ethiopia, this paper has focussed in particular on the nature and dynamics of Chinese contracted construction projects and the wider economic effects of the construction boom in both countries. This paper has argued that the construction boom in SSA has gained increasing influence in the economic dynamics of many African countries and is likely to continue to be important for economic growth and emerging business interests (domestic and foreign). It has also contributed to production capacity and induced investment demand in backwardly linked building materials manufacturing, thereby generating some opportunities for much-desired economic diversification.

China has played a central role in the African construction boom both as a contractor and a financier. Chinese contractors' share in the African construction market rose from 15% in 2004 to 49% in 2014 and out of the top five international contractors in Africa, four are Chinese owned. In terms of aggregate volumes, Chinese construction services in SSA are more important than Chinese FDI flows and stocks in the region with USD 40.6 billion in construction contracts completed in the year 2013 against USD 3.1 billion in Chinese FDI flows that year and some USD 20 billion in Chinese FDI stocks. It should be noted though construction services and FDI are, in many instances, closely linked, Chinese firms entering the market as contractors and eventually investing directly in either the construction sector or other sectors of the economy. In absolute terms (the total value of contracts completed in the year 2013), Angola and Ethiopia are the largest market of Chinese contractors in SSA. Completed Chinese construction services are equivalent to 7.7% of GDP in Ethiopia and 6.1% in Angola in 2013. In 2014, Angola and Ethiopia were the first and third most important markets for Chinese construction in sub-Saharan Africa, and China was the most important (international) contractor in both countries, with 49% and 64% of construction companies in Angola and Ethiopia, respectively, coming from China. Though very comparable in terms of relative size to the economy, the sectoral composition of Chinese construction services varies in the two countries, Chinese construction activities being dominated by housing, road infrastructure and water and electricity in Angola while industrial infrastructure occupies a more prominent place in Ethiopia. The former was partly driven by the emerging interests of powerful elite factions willing to tap into the rents distributed from the oil sector into the booming construction business.

Chinese construction services fill important infrastructure gaps and therefore supply-side bottlenecks. China has, in particular, played a formative role in developing energy generating capacity on the continent. Evidence suggests that Chinese funding bodies were financing critical infrastructure that other funding bodies were reluctant to finance. This is explained by Chinese funding bodies' different approach to cost-benefit analysis, which follows a logic of 'building ahead of time' rather than building to demand subject to cost constraints.

Over and beyond addressing supply-side bottlenecks, this paper has investigated demand-chain formation between the construction and the manufacturing sector in Angola and Ethiopia. The Chinese dominated construction boom in both countries had a very strong effect on the composition of demand, building materials accounting for something in between 8 and 11% of total commodity imports since 2007 in both countries, thus constituting a substantial drain on net exports. In both countries, the increase in demand for building materials reflected in the import structures has been met with a domestic supply response. Building materials manufacturing in both countries started with capital-intensive building materials subject to high transportation costs, in particular cement and steel. The most important sub-sector in building materials manufacturing is cement production which increased rapidly in both Angola and Ethiopia. The case of cement illustrates the intertwined nature of Chinese construction services and FDI. The construction boom was critical in the formation of a market for cement and Chinese investments in the cement sector (CIF in Angola and Huang Shan Cement in Ethiopia) contributed to the expansion of the cement industry. In addition, Chinese construction firms have built and equipped cement producers in both countries.

More widely, this suggests *firstly*, that in analogy to theories on inter-sectoral dynamics between agriculture and industry, continuous output growth of the construction sector can play an important role in the process of economic diversification. This was already recognised by Hirschman in 1958 and also becomes evident when looking at output

structures of highly industrialised countries where building materials constitute one among other significant branches in manufacturing industries, especially in the SME sector.

Secondly, this reveals an important dimension in China's impact on structural transformation in SSA economies, the analysis of which has so far largely focussed on the expansion/relocation of China's labour intensive industries to Africa and productivity enhancing effects of Chinese investment and capital goods. Yet, infrastructure projects alone are not sufficient condition for the dynamic development of building materials industries, which also needs to be supported by domestic policy. Such institutional support is, in particular relevant to tap the potential for small- to medium-sized domestically oriented building materials production, such as tiles, door/ window frames, roofing etc. In Ethiopia, we observe institutional support for various building materials industries following Ethiopia's wider development vision, while institutional support in Angola is operated more on an *ad hoc* basis and largely limited to capital intensive large-scale building materials, often in connection with specific interests among leading elite factions. The comparison of challenges facing building materials producers in Angola and Ethiopia showed that their building materials sectors face a number of specific challenges including the maintenance of expansionary fiscal spending, the emergence of conflicting interests between traders and producers, access to finance, tariff protection, shortages of skilled labour and the stable supply of electricity.

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Annex 1. Building materials in NACE Rev.2	
NACE Rev. 2	description SIC4 English
1610	Sawmilling and planning of wood
1621	Manufacture of veneer sheets and wood-based panels
1622	Manufacture of assembled parquet floors
1623	Manufacture of other builders' carpentry and joinery
2012	Manufacture of dyes and pigments
2030	Manufacture of paints varnishes and similar coatings printing ink and mastics
2221	Manufacture of plastic plates sheets tubes and profiles
2223	Manufacture of builders' ware of plastic
2311	Manufacture of flat glass
2312	Shaping and processing of flat glass
2320	Manufacture of refractory products
2331	Manufacture of ceramic tiles and flags
2332	Manufacture of bricks tiles and construction products in baked clay
2342	Manufacture of ceramic sanitary fixtures
2343	Manufacture of ceramic insulators and insulating fittings
2351	Manufacture of cement
2352	Manufacture of lime and plaster
2361	Manufacture of concrete products for construction purposes
2362	Manufacture of plaster products for construction purposes
2363	Manufacture of ready mixed concrete
2364	Manufacture of mortars
2365	Manufacture of fibre cement
2370	Cutting shaping and finishing of stone
2420	Manufacture of tubes pipes hollow profiles and related fittings of steel
2451	Casting of iron
2452	Casting of steel
2453	Casting of light metals
2454	Casting of other non-ferrous metals
2511	Manufacture of metal structures and parts of structures
2512	Manufacture of doors and windows of metal
2521	Manufacture of central heating radiators and boilers
2594	Manufacture of fasteners and screw machine products

Annex 2. Building materials in HS Rev.2002	
HScode	description
7610	Aluminium; structures (excluding prefabricated buildings of heading no. 9406) and parts (eg bridges and sections, towers, lattice masts, etc) plates, rods, profiles and tubes for structures
2517	Pebbles, gravel, crushed stone for concrete aggregates for road or railway ballast, shingle or flint; macadam of slag, dross etc tarred granules, chippings, powder of stones of heading no. 2515 and 2516
2521	Limestone flux; limestone and other calcareous stone, of a kind used for the manufacture of lime or cement
2522	Quicklime, slaked lime and hydraulic lime; other than calcium oxide and hydroxide of heading no. 2825
2524	Asbestos
252310	Cement clinkers (whether or not coloured)
252321	Cement; portland, white, whether or not artificially coloured
252329	Cement; portland, other than white, whether or not artificially coloured

Annex 2. Building materials in HS Rev.2002	
HScode	description
252330	Cement; aluminous (ciment fondu), whether or not coloured or in the form of clinkers
252390	Cement; hydraulic kinds n.e.s. in heading no. 2523
381600	Refractory cements, mortars, concretes and similar compositions; other than products of heading no. 3801
382440	Cements, mortars or concretes; their prepared additives
382450	Mortars and concretes; non-refractory
681110	Asbestos-cement, cellulose fibre-cement articles or the like; corrugated sheets
681120	Asbestos-cement, cellulose fibre-cement articles or the like; sheets, panels, tiles and similar articles, other than corrugated sheets
681130	Asbestos-cement, cellulose fibre-cement articles or the like; tubes, pipes and tube or pipe fittings
681190	Asbestos-cement, cellulose fibre-cement articles or the like; articles n.e.s. in heading no. 6811
6902	Refractory bricks, blocks, tiles and similar refractory ceramic constructional goods; other than those of siliceous fossil meals or similar siliceous earths
6903	Ceramic goods; (eg retorts, crucibles, muffles, nozzles, plugs, supports cupels, tubes, pipes, sheaths, rods) excluding those of siliceous fossil meals or of similar siliceous earths
6904	Ceramic building bricks, floor blocks, support or filler tiles and the like
6905	Roofing tiles, chimney-pots, cowls, chimney liners, architectural ornaments and other ceramic constructional goods
6906	Ceramic pipes, conduits, guttering and pipe fittings
6907	Ceramic flags and paving, hearth or wall tiles, unglazed; unglazed ceramic mosaic cubes and the like, whether or not on a backing
6908	Ceramic flags and paving, hearth or wall tiles, glazed; glazed ceramic mosaic cubes and the like, whether or not on a backing
6910	Ceramic sinks, wash basins, wash basin pedestals, baths, bidets, water closet pans, flushing cisterns, urinals and similar sanitary fixtures
690100	Bricks, blocks, tiles and other ceramic goods of siliceous fossil meals (eg kieselguhr, tripolite or diatomite) or of similar siliceous earths
7001	Glass; cullet and other waste and scrap of glass, glass in the mass
7003	Glass; cast glass and rolled glass in sheets or profiles, whether or not having an absorbent, reflecting or non-reflecting layer, but not otherwise worked
7004	Glass; drawn glass and blown glass, in sheets, whether or not having an absorbent, reflecting or non-reflecting layer, but not otherwise worked
7005	Glass; float glass and surface ground or polished glass, in sheets, whether or not having an absorbent, reflecting or non-reflecting layer, but not otherwise worked
7006	Glass of heading no. 7003, 7004 or 7005, bent, edge-worked, engraved, drilled, enamelled or otherwise worked, not framed or fitted with other materials
7016	Glass; paving blocks, slabs, bricks, tiles etc, of pressed, moulded glass, whether or not wired, glass smallwares for decorative purposes leaded lights and the like; multicellular or foam glass
680210	Tiles, cubes and similar articles; whether or not rectangular (including square), largest surface area of which is capable of being enclosed in square, side less than 7cm, coloured granules, chippings, powder
680221	Marble, travertine and alabaster; simply cut or sawn, with a flat or even surface
680222	Stone; calcareous (excluding marble, travertine, alabaster), articles thereof, simply cut or sawn, with a flat or even surface
680223	Granite; articles thereof, simply cut or sawn, with a flat or even surface
680229	Stone; monumental or building stone, n.e.s. in item no. 6802.2, articles thereof, simply cut or sawn, with a flat or even surface
680291	Marble, travertine and alabaster; articles thereof, (other than simply cut or sawn, with a flat or even surface)
680292	Stone; calcareous (excluding marble, travertine, alabaster) articles thereof, (other than simply cut or sawn, with a flat or even surface)
680293	Granite; articles thereof, (other than simply cut or sawn, with a flat or even surface)
680299	Stone; natural (excluding marble, travertine, alabaster, other calcareous stone or granite), monumental or building stone, (other than simply cut or sawn, with a flat or even surface)
3208	Paints, varnishes; (enamels and lacquers) based on synthetic polymers or chemically modified natural polymers, dispersed or dissolved in a non-aqueous medium
3209	Paints and varnishes (including enamels and lacquers) based on synthetic or chemically modified

Annex 2. Building materials in HS Rev.2002	
HScode	description
	natural polymers, dispersed or dissolved in an aqueous medium
3210	Paints and varnishes (including enamels, lacquers and distempers), excluding those of heading no. 3209, prepared water pigments of a kind used for finishing leather
321410	Mastics; painters' fillings
3917	Tubes, pipes and hoses and fittings thereof (for example, joints, elbows, flanges), of plastics
3918	Floor coverings of plastics, self-adhesive or not, in rolls or tiles; wall or ceiling coverings of plastics, in rolls of a width not less than 45cm
3925	Plastics; builders' wares n.e.s. or included
9406	Buildings; prefabricated
7213	Iron or non-alloy steel; bars and rods, hot-rolled, in irregularly wound coils
7214	Iron or non-alloy steel; bars and rods, not further worked than forged, hot-rolled, hot drawn or hot-extruded, but including those twisted after rolling
7304	Tubes, pipes and hollow profiles, seamless, of iron (other than cast iron) or steel
7305	Tubes and pipes (eg welded, riveted or similarly closed), internal and external circular cross-sections, external diameter of which exceeds 406.4mm, of iron or steel
7306	Tubes, pipes and hollow profiles (eg open seam or welded, riveted or similarly closed), of iron or steel
7307	Tube or pipe fittings (eg couplings, elbows, sleeves), of iron or steel
7317	Nails, tacks, drawing pins, corrugated nails, staples (not those of heading no. 8305) and the like, of iron or steel, with heads of other material or not, but excluding articles with heads of copper
7318	Screws, bolts, nuts, coach screws, screw hooks, rivets, cotters, cotter-pins, washers (including spring washers) and similar articles, of iron or steel
730210	Iron or steel, railway or tramway track construction material; rails
730230	Iron or steel, railway or tramway track construction material; switch blades, crossing frogs, point rods and other crossing pieces
730240	Iron or steel, railway or tramway track construction material; fish-plates and sole plates
730290	Iron or steel, railway or tramway track construction material; n.e.c. in heading no. 7302
730300	Cast iron; tubes, pipes and hollow profiles
730810	Iron or steel; structures and parts thereof; bridges and bridge-sections
730820	Iron or steel; structures and parts thereof, towers and lattice masts
730830	Iron or steel; structures and parts thereof, doors, windows and their frames and thresholds for doors
730840	Iron or steel; structures and parts thereof, props and similar equipment for scaffolding, shuttering or pit-propping
730890	Iron or steel; structures and parts thereof, n.e.s. in heading no. 7308
4409	Wood (including strips, friezes for parquet flooring, not assembled), continuously shaped (tongued, grooved, v-jointed, beaded or the like) along any edges, ends or faces, whether or not planed, sanded or end-jointed
4418	Builders' joinery and carpentry of wood, including cellular wood panels, assembled parquet panels, shingles and shakes
450410	Cork; blocks, plates, sheets and strip, tiles of any shape, solid cylinders (including discs), of agglomerated cork (with or without a binding substance)
4815	Floor coverings on a base of paper or of paperboard, whether or not cut to size

Annex 3. Building Materials in ISIC Rev.3	
ISIC3	**Description**
2010	2010 Sawmilling and planing of wood
2021	2021 Veneer sheets, plywood, particle board, etc.
2022	2022 Builders' carpentry and joinery
2022	2022 Builders' carpentry and joinery
2422	2422 Paints, varnishes, printing ink and mastics
2519	2519 Other rubber products
2520	2520 Plastic products
2610	2610 Glass and glass products
2610	2610 Glass and glass products
2692	2692 Refractory ceramic products
2691	2691 Pottery, china and earthenware
2693	2693 Struct.non-refractory clay; ceramic products
2691	2691 Pottery, china and earthenware
2691	2691 Pottery, china and earthenware
2694	2694 Cement, lime and plaster
2694	2694 Cement, lime and plaster
2695	2695 Articles of concrete, cement and plaster
2695	2695 Articles of concrete, cement and plaster
2695	2695 Articles of concrete, cement and plaster
2695	2695 Articles of concrete, cement and plaster
2695	2695 Articles of concrete, cement and plaster
2696	2696 Cutting, shaping & finishing of stone
2710	2710 Basic iron and steel
2710	2710 Basic iron and steel
2731	2731 Casting of iron and steel
2732	2732 Casting of non-ferrous metals
2732	2732 Casting of non-ferrous metals
2811	2811 Structural metal products
2811	2811 Structural metal products
2899	2899 Other fabricated metal products n.e.c.

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