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China-Africa co-operation in structural transformation:

Ideas, opportunities, and finances

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Abstract: This paper examines China and Africa co-operation from the angle of structural transformation as a major driver of growth and job creation. Being a bit ahead in the structural transformation process, China can provide ideas, tacit knowledge, opportunities as well as development finances in Africa's transformation. We review critical parts of China's transformation to see if these ideas are relevant for Africa. We use empirical evidence from China-Africa co-operation and find that China-financed infrastructure projects do address Africa's infrastructure bottlenecks and hence contribute to structural transformation. In addition, China's industrial upgrading and outward investments provide opportunities for light manufacturing development in low-income developing countries. Building cluster-based industrial zones has the potential to seize the opportunities for job creation in the labour-intensive light-manufacturing sectors. Further, expanding the definition of international aid could induce more development financing from various sources.

Keywords: structural transformation, development co-operation, development finance, China, Africa

JELs: L5, O1, O4, E2

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1 Introduction

When China started its transition from a planned economy to a market economy in 1979, it was a poor agrarian economy, with 81 per cent of its population living in rural areas. Its per capita income was US\$154 in 1978, less than one-third of the average in sub-Saharan African (SSA) countries. At that time, China's main export was primary products or processed primary products such as crude oil, coal, animals, and agricultural products. Since 1979, China has achieved a miraculous average annual growth rate of 9.8 per cent. Its per capita income reached 6,100 dollars in 2012, more than four times the average in SSA countries. China has also become the world's factory and the world's number one exporter. According to the World Bank estimate, in 1981, 84 per cent of China's population lived below the international poverty line of US\$1.25 a day. The ratio was reduced to 11.9 per cent in 2009. During this period, 680 million people lifted themselves out of poverty, making the largest contribution to poverty alleviation in the world (Lin, speech at OECD-DAC 2013; Ravallion and Chen 2007).

Why was it possible for China to achieve such a dramatic transformation? Is it possible for the low-income African countries to achieve the same? What is the role of China in Africa's economic transformation? Based on the theoretical foundation of New Structural Economics (NSE) (Lin 2010, 2011, 2012c), this paper examines China's and Africa's development co-operation from the angle of **structural transformation** as a major driver of growth and job creation. The objective is to review past experiences of structural transformation in emerging markets, examine how China has been 'doing what she knows best' using the tacit knowledge to contribute to Africa's economic transformation. The paper also presents the future prospect—how a new type of learning partnership can accelerate the transformation in Africa. We go beyond the discussion of Official Development Aid (ODA) to cover South-South development co-operation (SSDC) with a broader definition, and provide a way of thinking 'out of the box' of 'aid effectiveness'.

We consider that Africa and China are partners in climbing the same mountain of structural transformation. All climbers have the freedom to select their partners. On the one hand, China, being a bit ahead in structural transformation, has been attempting to help build 'bottleneck-releasing' infrastructure and Special Economic Zones (SEZs) in Africa to facilitate structural transformation, which was based on China's own ideas and experiences. As the labour costs are rising rapidly in China, African countries can benefit from seizing the opportunities to attract labour-intensive enterprises relocating outside of China. On the other hand, African countries should also push China to learn to become a better development partner by 'selecting desired partners' and regulating partner behaviours, and thereby forcing partners/companies to abide local laws and regulations as well as international principles for development.

The second section summarizes China's dramatic transformation and the key underlying factors: openness to ideas, trade, and the experimental/incremental approach. The third section examines the relevance of SEZs and cluster development. The fourth section examines the logic or philosophy underlying China's co-operation in Africa, which is largely based on China's own tacit knowledge and intimate experiences in the past 34 years. The Issues, challenges and prospects on development financing are discussed in the last section. Data presented in the Annexes 1 and 2 provide some supporting evidence.

2 China's dramatic structural transformation: ideas

The NSE (Lin 2012c) point out that economic development as a dynamic process entails learning, industrial upgrading, and corresponding improvements in 'hard' (tangible) and 'soft' (intangible) infrastructure, at each level. Such upgrades and improvements require an inherent co-ordination, with large externalities to firms' transaction costs and returns to capital investment. Thus, the information and knowledge to identify a country's existing and latent comparative advantage are considered public goods and services that government should provide. In addition to an effective market mechanism, the government should play an active role in learning and facilitating structural transformation, diversification, and industrial upgrading (Lin 2012c: 14–15).

The NSE postulates that each country at any specific time possesses given factor endowments consisting of land (natural resources), labour, and capital (both human and physical), which represent the total available budget that the country can allocate to primary, secondary, and tertiary industries to produce goods and services. The relative abundance of endowments in a country are given at any given specific time, but changeable over time. In addition, infrastructure is a fourth endowment which is fixed at any given specific time and changeable over time (Lin 2012c: 21).

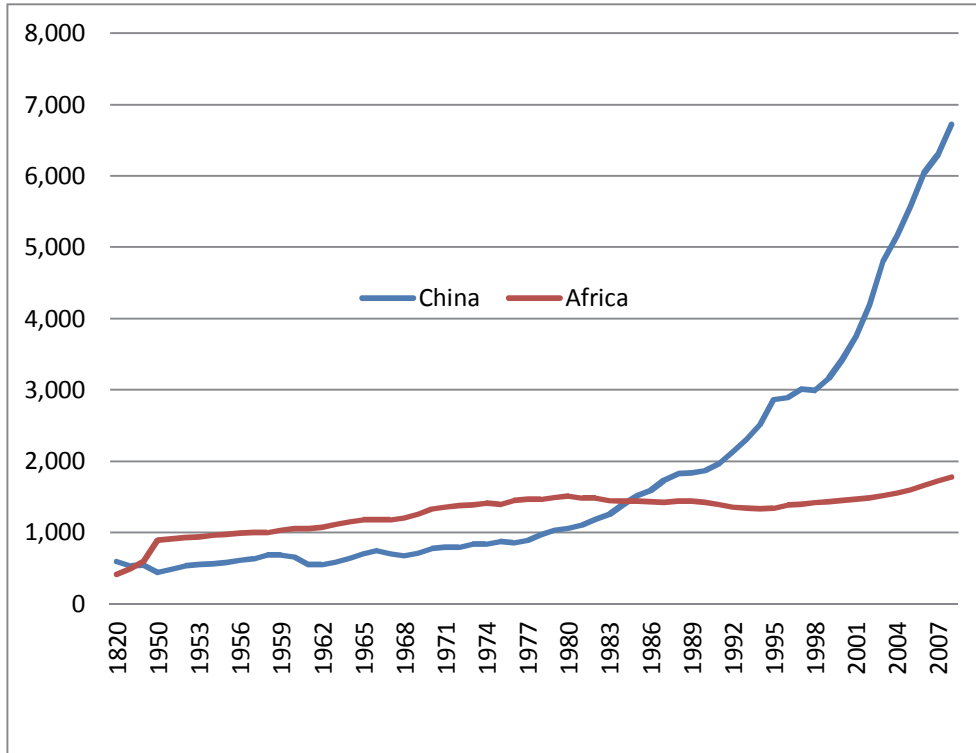
This framework implies that at any given point in time, the structure of a country's factor endowments, that is the relative abundance of factors that the country possesses, determines the relative factor prices and thus the optimal industrial structure. Therefore, the optimal industrial structure in a country, which will make the country most competitive, is endogenously determined by its endowment structure at each point in time. It follows that the import/export structures are also largely determined *endogenously* by their different endowments.

Many countries have in the past succeeded in structural transformation, upgrading from resource based or agrarian economies to manufacturing powerhouses. According to Angus Maddison, it took 1,400 years to double per capita income before the 18th century, but as the industrial revolution spread, it took only 70 years to double per capita income from the 18th century to the mid-19th century. Now it took the developed countries 35 years to double the per capita income (Maddison 2007; World Bank 2008). This process of economic transformation has been accelerated in the case of 13 rapidly growing emerging economies (mostly East Asian economies), notably Korea, Taiwan (China), and other East Asian newly industrialized economies (NIEs), and later, China and others, following a pattern that is well characterized by the 'flying geese model' (Akamatsu 1962).

For Korea, it took only 35 years to grow from a war-torn agrarian economy in 1953 to a manufacturing leader in 1988. The share of manufactures in gross domestic product (GDP) rose from merely nine per cent in 1953 to 30.1 per cent in 1988, while that of agriculture and mining sector shrunk to single digits in the 1990s. Korea's industrial upgrading process between the 1960s and the 1980s can be roughly divided into three phases: (i) the 'take-off' phase (1962–73); (ii) the heavy and chemical industry (HCI) drive phase (1973–79); and (iii) the liberalization phase (1980–). Until the early 1980s, labour-intensive products, primarily wood manufactures and clothing, had a combined share of about 60 per cent and accounted for the majority of total exports. Since 1983, capital-intensive machinery and transport-equipment products have accounted for the majority of exports. After the mid-1990s, their share exceeded half of total exports, which means Korea has graduated from labour-intensive manufacturing (Chandra, Lin, and Wang et al. 2013).

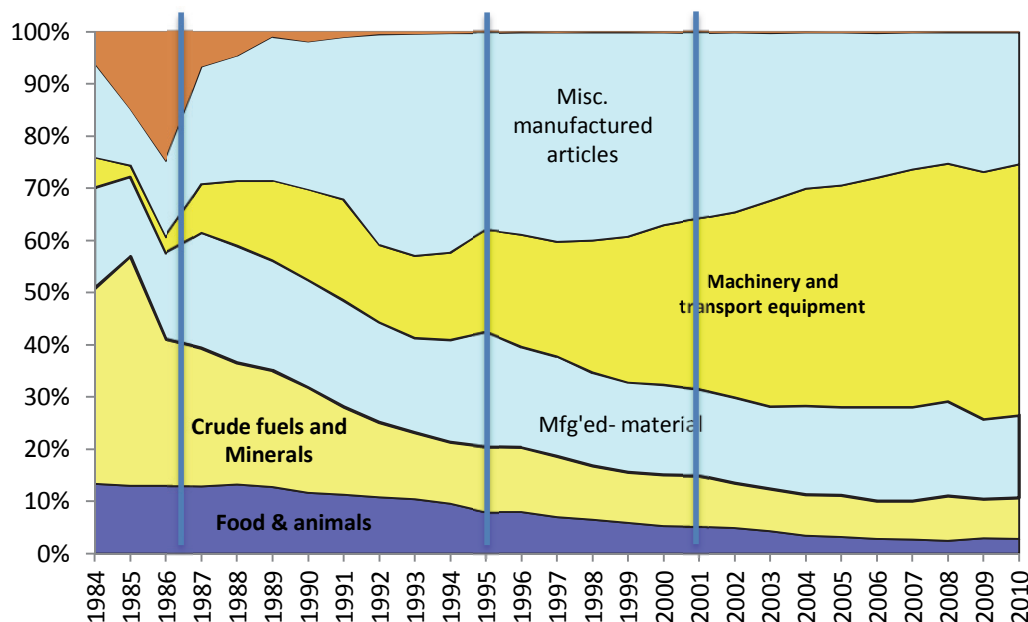
When China started its economic transformation in 1978, it was an agrarian economy with agriculture as its largest sector, accounting for 71 per cent of total employment. Its per capita income was US\$154 in 1978, less than one-third of the average in SSA countries (Figure 1). Like many of them today, China was an exporter of primary product: In as late as 1984, 50 per cent of China's export was concentrated in crude materials including oil, coal, food and animals, and other agricultural products (Figure 2).

Figure 1: Per capita income in China and Africa (in 1990 international dollar)



Source: Data from Maddison (2001) and (2007).

Figure 2: China's export structure: from raw material in the 1980s to labour intensive manufacturing product in the middle 1990s



Source: Lin and Wang (2008) updated by Yan Wang using COMTRAD data.

Note: Mfg'ed materials for manufactured materials.

China's structural transformation and 'moving up' on the value chain took at least three steps as shown below:

- The first industrial upgrade happened in 1986 (the first vertical bar), when exports of textiles and clothing exceeded crude oil. Incentives were provided to foreign direct investments coming to SEZs. This signified China's transition from exporting resource-intensive products to labour-intensive textile and clothing, consistent with China's comparative advantage.
- The second upgrade happened in 1995 (the second bar), when China's export of machineries and electronics exceeded textiles and clothing. This indicated that China started the transition from exporting traditional labour-intensive exports to 'assemble' non-traditional labour-intensive products. Low-end original equipment manufacturer (OEM) was still the dominant approach.
- The third upgrade happened after China's accession to the World Trade Organization (WTO) in 2001, when high and new tech exports grew rapidly, and the level of product sophistication increased. The central and local governments conducted regulatory reforms to improve the investment climate. Some exporters have become integral parts of the global supply chains of multinationals in automobiles, computers, cell phones, and airplane parts. There is, however, a myth about the level of export sophistication (Lin and Wang 2008).

3 Transformation can be achieved through partial reforms via SEZs

During the transition process, China adopted a pragmatic, gradual, dual-track approach. The government first improved the incentives and productivity by allowing the workers in the collective farms and state-owned firms to be residual claimants and to set the prices for selling at the market after delivering the quota obligations to the state at fixed prices (Lin 1992). At the same time, the government continued to provide necessary protections to nonviable firms in the priority sectors to avoid their collapse and simultaneously liberalized the entry of private enterprises, joint ventures, and foreign direct investment (FDI) in labour-intensive sectors in which China had a comparative advantage but that were repressed before the transition to promote dynamic growth.

With the liberalization of entry to the new sectors, the Chinese government recognized the needs to help firms to overcome all kinds of inherent hurdles in the transition process: The business environment was poor,¹ the infrastructure was very bad, and the investment environment was harsh.² The advice based on the Washington Consensus was to improve everything for the whole nation simultaneously without the attempt to pick/focus on specific sectors and regions. Many of those ‘undesirable’ distortions in the business and investment environment, such as the control of import and restriction on foreign ownership, in fact were necessary for protecting the nonviable firms in the old priority sectors. If China removed all those distortions/regulations, many of the nonviable firms might have bankrupted, causing the collapse of the economy as what happened in many Eastern European and former Soviet Union countries during their transition process. Moreover, even if China adopted that approach, it might have taken China decades or generations, due to the government’s limited implementation capacity and availability of resources, to achieve the desirable business environment and infrastructure. Instead the Chinese government mobilized its limited resources and capability to build up SEZs and industrial parks (Zeng 2010, 2011). Within the zones and parks, the infrastructure and business environment were made very competitive, but outside the zones and parks, they were improved only gradually. The labour costs were low due to large surplus labour in rural area when China started the transition. But China lacked the knowledge about how to turn that advantage to produce labour-intensive goods with quality acceptable by the international market and international buyers did not have confidence that Chinese firms would be able to deliver the goods in timely manner either. To overcome those difficulties, the Chinese governments at all levels and regions proactively approached prospect foreign investors, especially those manufacturers in developing Asia who were about to relocate their labour-intensive processing to other low-wage economies, and incentivized them to make investments in the SEZs and industrial parks (Wei and Liu 2001). With that approach, China developed labour-intensive light manufacturing and became the world factory quickly.

This experimental transition strategy allowed China to both maintain stability by avoiding the collapse of old priority industries and achieve dynamic growth by simultaneously pursuing its comparative advantage and tapping the advantage of backwardness in the industrial upgrading process. In addition, the dynamic growth in the newly liberalized sectors created the conditions for reforming the old priority sectors. Through this gradual, dual-track approach China achieved

¹ In 2013, after more than three decades of market-oriented reform, China still ranked 91 in the world (<http://www.doingbusiness.org/rankings>).

² In the World Bank’s Investing Across Borders 2010, China’s investment environment was ranked the worst among the 87 economies covered in the study. See <http://iab.worldbank.org/~media/FDPKM/IAB/Documents/IAB-report.pdf>

‘reform without losers’ (Lau et al. 2000; Naughton 1995; Lin 2012a) and moved gradually but steadily to a well-functioning market economy.

In sum, China’s structural transformation had started before its infrastructure bottlenecks had been relieved, and before business environment and investment climate had been improved. Through experimenting via SEZs and industrial parks, the country and people had been learning, imitating, investing, acquiring tacit knowledge, accumulating factor endowments such as human and physical capital, and expanding its comparative advantages. Now China is utilizing its own ideas and experiences in providing (SSDC), following the thousand-year tradition of not only ‘offering fish’ but also ‘teaching how to fish’.

4 China and Africa co-operation for structural transformation: opportunities and finances

China–Africa relationship has been the subject of many heated debates, which has escalated in the recent years. Many of the critics seem to have forgotten that China is big but not yet rich—it was a low-income country when it started providing development co-operation to African countries in the 1960s. The past 50 some years have witnessed a joint learning process for economic transformation in China and Africa.

The past literature on aid or aid effectiveness has largely focused on donors’ behaviours—who provides aid, for what objective/motivation, and their effects. There is an extensive literature on aid effectiveness, for example, Burnside and Dollar (2000); Easterly (2003); Easterly et al. (2003); Collier and Hoeffler (2004); Rajan and Subramanian (2008); Roodman (2007), Arndt et al. (2010); among others. Only a limited number of authors have focused on the institutional economics of aid (Martens et al. 2002³), and recently on the sectoral allocation of foreign aid and growth and employment (Akramov 2012,⁴ and Van der Hoeven 2012⁵). The issues of imperfect information and agency problem in ‘aid with conditionality’ are under-researched. From the angle of joint learning and co-transformation, we address the issues of principal-agent, imperfect information and a ‘broken feedback loop’ in aid effectiveness. Therefore, we suggest to think ‘out of the box’ using a model of joint learning and co-transformation (Lin and Wang forthcoming).

What are the unique features of China’s SSDC? As one of the poorest developing countries in the 1980s, China has been utilizing its comparative advantage, working together with African countries to enhance the capacity in self-development. China’s approach in SSDC differs from

³ Based on agency theory and four case studies, Martens et al. (2002) pointed out the ‘principal-agent’ problems in the donor-recipient relationship, and found that ‘the nature of foreign aid—with a broken information feedback loop— ... put a number of inherent constraints on the performance of foreign aid programmes. All these constraints are due to imperfect information flows in the aid delivery process.’ (p. 30).

⁴ Akramov (2012), in particular, found that economic aid, including aid to productive sectors and economic infrastructure, contributes to economic growth by increasing domestic investment. Aid to social sectors, however, does not appear to have a significant impact on human capital and economic growth.

⁵ Van der Hoeven (2012) took note of China’s approach of focusing on economic infrastructure, pointed to the neglect of concern for employment and inequality in Millennium Development Goals (MDGs) in 2000. He called for the ‘refocusing of development efforts’, ‘combining a greater share of development aid for employment and productivity enhancing activities with a change in national and international economic and financial policies, so as to make employment creation (together with poverty reduction) an overarching goal.’ (p. 24).

the international aid literature of established donors, focusing on utilizing ‘what China owns and knows best’ by combining trade, investment, and development co-operation. In official language, China follows the principles of equality and mutual respect, reciprocity, mutual benefit, and noninterference of domestic affairs. Aside from adherence to the ‘One China’ principle, no political strings are attached to China’s co-operation (State Council Information Office 2011). This is not to say that China’s aid or development co-operative activities are ‘altruistic’, they are not. The government ‘never regards such aid as a kind of unilateral alms but as something mutual.’ This ‘mutual (economic) benefit’ is based on the simple idea of ‘exchanging what I have with what you have’ (*butong youwu*, or 互通有无) from which both can gain, as we learned from Adam Smith.

Based on the structure of trade, some criticized China ‘practicing neocolonialism’ (importing resources and exporting manufactures). However the analysis has often ignored two basic factors: First, the import-export patterns of countries are largely *endogenously determined* by their own natural and factor endowment structures. China-Africa trade pattern is not a result of ‘deliberate’ foreign policy. What China has been doing is following its comparative advantages, and there is nothing wrong with African countries following their own comparative advantages in each step of their own transformation. As Paul Krugman said:

Comparative advantage still explains much, perhaps most of world trade.

However, both traditional location theory and recent work in economic geography generally **assume away** inherent differences between locations, and instead explain regional specialization in terms of some kind of external economies. (Krugman 1995).

As acknowledged by Krugman, trade between countries with different endowment structures due to different stages of development can be better explained by the Heckscher-Ohlin model. As African countries continue to accumulate factor endowment such as human, physical, and financial capital, their export structures will transform and upgrade.

Second, the size of China’s aid and South-South co-operation is small and commensurate with its per capita income level. Many analysts have tried to compare the amount of ODA between China and established donors such as the United States (US) without considering the huge differences in income per capita, which is rather misleading.⁶ When China started to provide development assistance to African countries 50 years ago, it was poorer than most of the SSA countries. Even now, China’s per capita income, at US\$6,091 dollars in 2012, is only one-fourth or one-eighth of that for the established Organisation for Economic Co-operation and Development (OECD) donor countries. (See Figure 3 in Box 1).

China’s definition of aid differs from that of the OECD–Development Assistance Committee (DAC),⁷ and therefore, direct comparison does not make sense. According to the State Council Information Office White Paper on ‘China’s Foreign Aid’ (2011), China provides grants, interest-free loans, and concessional loans, with eight types of foreign aid: ‘complete (turn-key) projects,’⁸

⁶ Studies include, for example, Wolf et al. (2013) and Strange et al. (2013) from Center for Global Development.

⁷ According to the OECD definition, ODA includes grants or loans which are a) undertaken by the official sector; b) with promotion of economic development and welfare as the main objective; and c) ‘is concessional in character and conveys a grant element of at least 25 per cent (calculated at a rate of discount of 10 per cent)’. See <http://www.oecd.org/dac/stats/officialdevelopmentassistance/definitionandcoverage.htm>

⁸ Turn-key projects and in-kind assistance were developed in the 1960s and 1970s, when China itself was in shortage of foreign exchange. These types of projects allowed poor countries to help each other without using US\$ or other foreign exchange. The TAZARA railway was completed in 1975 by Chinese and African workers working together using labour-intensive technology. This is also a unique way of avoiding issues of misuse of funds of both partners.

goods and materials, technical co-operation, human resource development co-operation, medical teams sent abroad, emergency humanitarian aid, volunteer programmes in foreign countries and debt relief.’ (p. 8). See Table 1 for a classification of China’s foreign aid. There are other official flows (OOF) and OOF-like loans and investments, which are not included in the official definition of foreign aid. See Bräutigam (2011) for a discussion of these definitions.

Table 1. China's foreign aid and its composition

Dimensions	Categories
Financial Resources for Foreign Aid	Grant
	Interest-free loans
	Concessional loans
Forms of Foreign Aid	Complete projects
	Goods and Materials
	Technical Cooperation
	Human Resource Development Cooperation
	Chinese Medical Teams Working Abroad
	Emergency Humanitarian Aid
	Overseas Volunteer Programs
	Debt Relief
Distribution of Foreign Aid	Agriculture
	Industry
	Economic Infrastructure
	Public Facilities
	Education
	Medicine and Public Health
	Clean Energy and Coping with Climate Change

Source: State Council Information Office (2011).

Based on strong demand from African countries, new types of SSDC have been added in the recent years, including for example, OOFs (large but less concessional loans and export credit provided by the Eximbank of China); resource for infrastructure (RfI) packages;⁹ equity investment by China-Africa Development (CAD) fund; infrastructure investment by China Development Bank (CDB) and other commercial banks (which are OOF-like loans and investments with the intention for development, but non-concessional, and suitable for long-term infrastructure investment). (See Figure 3 in Box 1).

⁹ The World Bank is working on a research paper on RfI packages, on which we have provided comments. This issue will not be covered in this paper due to space limit.

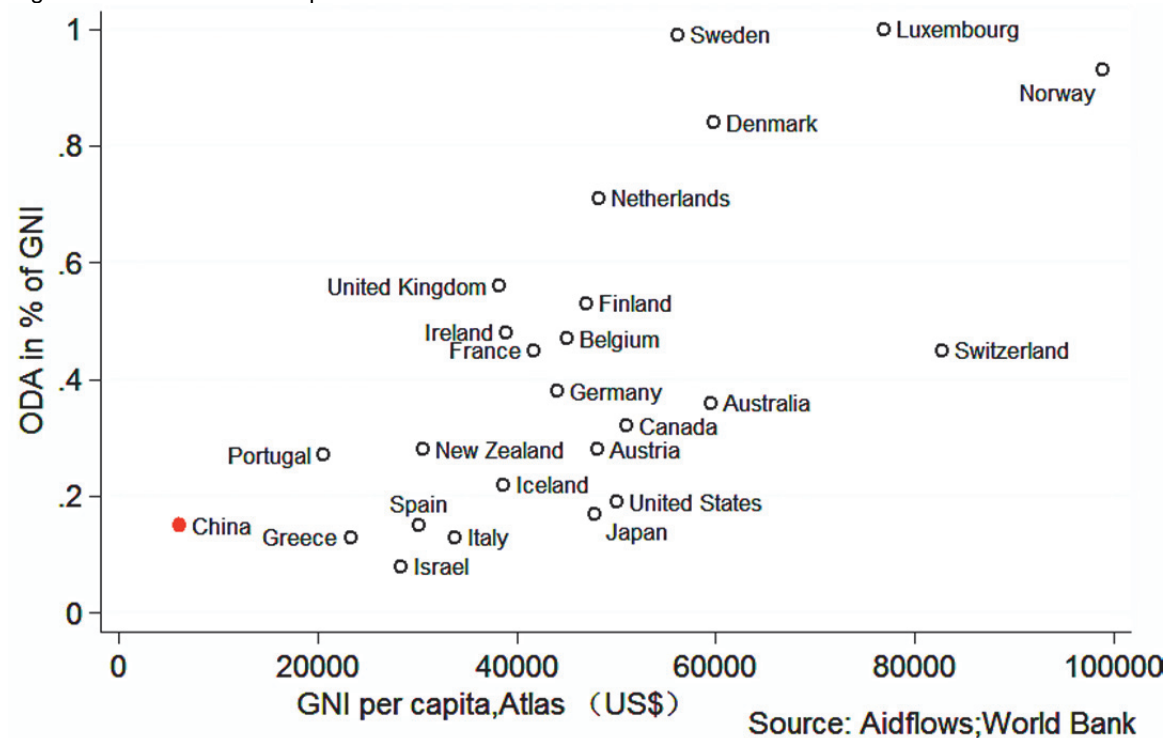
Box 1: China's development co-operation with Africa

China's foreign aid to Africa counts for nearly half (45.7 per cent) of the country's total foreign aid, according to the White Paper on 'China's Foreign Aid' (State Council Information Office 2011). Using the official definition of ODA, China's aid to Africa, consisting of Ministry of Finance's aid budget, concessional loans from the EXIM Bank of China, and debt relief, was **US\$2.4 billion** in 2009 (Bräutigam 2009). Its magnitude is not as huge as some databases based on media reports have indicated.¹⁰ However, if OOFs are included, 'China has grown to become a partner of roughly the same importance as established donors like the United States and Germany' (Bräutigam 2009: 183). On infrastructure, however, China is by far the largest development financier in Africa in the period of 2000–10 (Chen 2013).

Here, we take into consideration of different stages of development, and compare China's total ODA as a per cent of gross national income (GNI), to those of the OECD countries. We found that China's aid to developing countries started from a relatively low per capita income level. Using a conservative estimate of **US\$12.8 billion as the total ODA** in 2012, China's ODA accounted for 0.15 per cent of GNI, which is lower than most of the OECD Countries. However, if one draws a linear regression line on this scatter chart, China is located well above the regression line, indicating China is contributing a relatively significant proportion of its GNI to development co-operation as compared to its per capita income level of US\$6,091 in 2012. In other words, China, at its current stage of development, is more generous in providing aid than some of the rich countries. If OOFs and OOF-like loans are included and compared across, the picture would show favourably for China.

¹⁰ For instance, one estimate puts China's assistance to Africa at US\$12 billion in 2011 (Wolf et al. 2013: 30). Based on media based data, Strange et al. (2013) estimates that: 'Over the entire decade (2000–11) China committed US\$13 billion in ODA to Africa, which is about 3 per cent of the total OECD-DAC ODA flows and more than 14 per cent those of the US' (p. 29). However, these studies have not used the strict definition of ODA and suffered from mixing 'apples and oranges'—ODA versus OOF, 'pledges' versus 'delivered', 'annual' (flows) versus 'cumulative' (stock).

Figure 3. China's ODA: comparison with OECD on two dimensions



Source: Wang (2011: 22). Update based on the World Bank's AidFlow database. For detailed definitions and composition see Wang (2011, Chapter 1).

Our proposition 1 is that, **a partner who is successful in transformation can utilize its comparative advantage in development co-operation to help diffusing ‘tacit’ knowledge on the ‘how to’ issues of development.** China has thousands of years of history on ‘learning from friends from afar’, and believed in ‘teaching it only if you know it well’. Many Chinese officials have said, when interviewed, that ‘China is successful because she is a good student’. It is just natural that a good student, who is fast in learning and industrial upgrading, can help other classmates in the same class in transforming ‘what they have’ to ‘what they can potentially do well’. For example:

- China is financing the construction of 24 agricultural technical demonstration centers in Africa—thereby transferring suitable agricultural and aquatic technologies to Africa. One of the earlier agricultural-technological centers has been development into a sugarcane farm and a Sukala Sugar Refinery in Segou, Mali, operating for over 17 years since 1996.
- For 50 years, China has been sending medical teams, teachers, and agricultural experts to African countries, providing scholarships for African students, thereby provide hand-in-hand transmission of ‘tacit knowledge’ and experiences. The feedbacks from Africa on Chinese medical teams are overwhelmingly positive and appreciative.

Our proposition 2 is that **learning can happen only by taking tiny steps, ‘one step at a time’, which is commensurate to a country’s natural endowment or accumulated factor endowment.** Since China has conducted partial reforms via experimental approach, it can help

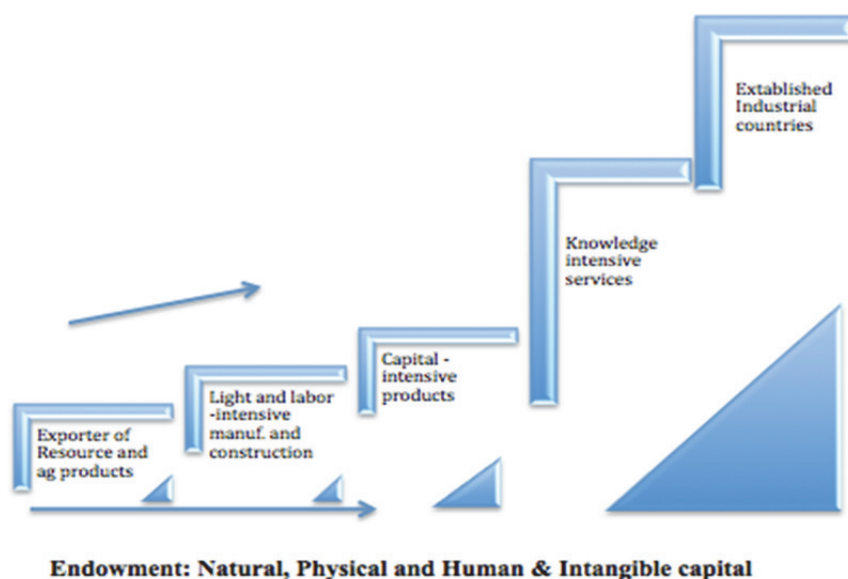
others with partial reforms through SEZs and experimentation. A country can change its endowment structure through saving, investment, and learning to accumulate natural, physical, human and institutional capital. It is impossible for a capital-scarce country to ‘defy comparative advantages’ and become a capital-intensive manufacturer. For example,

- Many of Chinese firms relocating to Africa are producing labour-intensive light manufacturing products. See for example, Shen (2013); World Bank (2013), including the case of Huajian Shoe company (see box 3).
- Chinese technology has been considered inexpensive and more appropriate to low-income countries. One example is the hand-held water pumps, another is the herb medicine for malaria (artemisinin, also called Qinghaosu).

In other words, China is able to help low-income African countries because they have similar level of human, physical, and institutional capital. China cannot help others to ‘leapfrog’ because of its own limitations and constraints. For instance, if China itself is not a knowledge economy, it cannot help others to become a knowledge-intensive or service-oriented economy. What Chinese companies know best is labour-intensive light manufacturing, not capital-intensive sector or knowledge-intensive services. As China itself is struggling with challenges of implementing own labour and environmental standards (with domestic problems), and Chinese firms are still to be educated and trained in those aspects, these firms’ overseas projects would bound to have such issues with the labour and environmental standards. Here comes the need for mutual learning.

An analogy is that China and Africa are like teammates in climbing the same mountain of structural transformation (as shown below). And a good climber can help a teammate by pulling them up a step, but the good climber themselves may also need to be ‘pushed up’ in case of need. African people, the media, and non-governmental organizations (NGOs), can help to ‘pull’ or ‘push’ the partners and to be selective and induce the desired partner behaviour: to abide by local laws and regulations, and follow international labour and environmental standards. See Illustration 1.

Illustration 1: Learning can happen by taking 'one step at a time' and building on the comparative advantage determined by a country's endowment



Source: Authors.

China's development co-operation follows the logic of NSE by helping Africans to **take tiny steps** in agriculture, infrastructure, and labour-intensive light manufacturing sectors. Partial reforms through SEZs can also help in structural transformation, as shown by China's experiences (Zeng 2011). Partner countries need to have more recent intimate 'tacit' knowledge and experiences in order to be able to help in such an experimental approach because of similar endowment, similar institutional constraints, and similar human capital structure. One example is the complex challenge of 'unlocking the value of land' for urban infrastructure, including for SEZs.

- On the one hand, land-based financing offers powerful tools that can help pay for urban infrastructure investment.¹¹ And these options have been explored during China's experimentation on SEZs and the infrastructure around these zones (Wang 2011). China is applying this knowledge in the zone development in Africa.
- On the other hand, as the land tenure system in China is not clearly defined and land market not well developed, laws and regulations are not sufficient to guide land transfers and price determination. Farmers are not sufficiently compensated and the risk of corruption is high. This is an area where African countries need to be cautious, as good governance and transparency is critical for development (Wang 2011: 77–8).

In what follows, we present two kinds of evidence to support these arguments:

1. China has been helping to build 'bottleneck releasing' infrastructures in Africa.
2. China has been helping to develop industrial clusters through industrial zones.

¹¹ For legal and typical land-asset based infrastructure financing, see policy note by Peterson (2008).

4.1 China's development co-operation helps to address Africa's bottlenecks

Non-traditional bi-lateral development financiers such as China, India, the Arab countries, and Brazil have emerged as major financiers of infrastructure projects in Africa. Overall, infrastructure resources committed to Africa by these countries jumped from US\$1 billion per year in the early 2000s to over US\$10 billion in 2010. China held a portfolio of some US\$20 billion in active infrastructure projects in more than 40 African countries. Chinese financing for African infrastructure structure projects is estimated to have reached a record level of roughly US\$5.1 billion in 2009, though it fell to around US\$2.3 billion in 2010. A new study found that China alone accounts for 34 per cent of all aid to infrastructure in SSA, higher than other multi- and bi-lateral donors (Chen 2013).

In particular, China has been working in bottleneck-releasing sectors, such as power generation and transmission. While 'Donors have neglected power since the 1990s' (Foster and Briceño-Garmendia 2010: 25), 50 per cent of China's commitment on infrastructure was allocated to Electricity (Box 2). A recent study found that China has contributed, and is contributing, to a total of **9.024 gigawatt** of electricity generating capacity, including completed, on-going and committed power projects.¹² The impact of this investment is likely to be transformative when one considers that the entire installed capacity of the 47 SSA countries excluding South Africa countries is 28 gigawatt.

Box 2: Southern partners are leading financiers of infrastructure in SSA

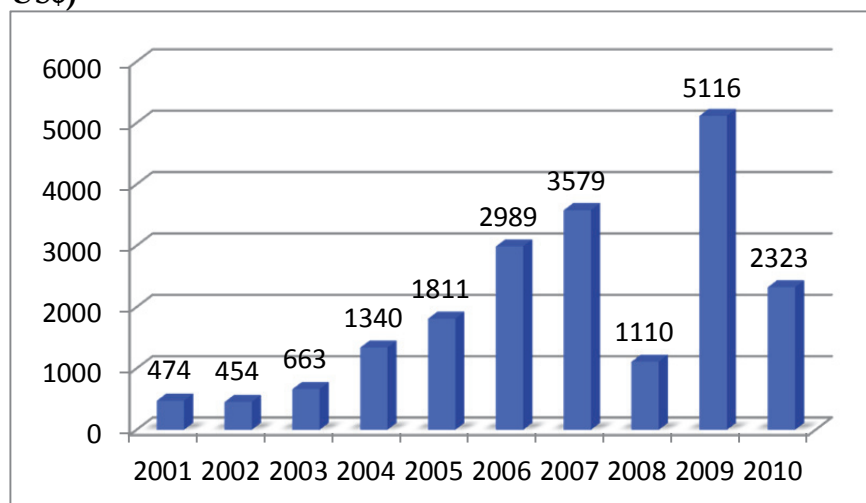
A new study ranks the donors/providers of infrastructure in SSA for the period 2001–08. China is shown to be the largest infrastructure financier followed by three multi-lateral organizations International Development Association (IDA), European Commission (EC), and African Development Fund (AfDF). In total, there are three Southern providers in the top ten **China, India, and Islamic Development Bank (IsDB)** (Chen 2013).

China alone accounts for 34 per cent of the total official financing amount on infrastructure in SSA, higher than any Northern partner. But China accounts for only three per cent of the number of aid projects, indicating that the size of Chinese funded projects is larger. The US is the second largest bi-lateral infrastructure contributor, but its total aid volume during the period is far less than that of China. Northern donors together contribute to 28 per cent of the total aid amount in infrastructure, but they account for 76 per cent of the number of aid projects, indicating the small scale of these projects (Chen 2013).

It is estimated that as of December 2010, China held a portfolio of some US\$20 billion in active infrastructure projects in more than 40 African countries. The amount was estimated at US\$5.1 billion in 2009 and US\$2.3 billion in 2010 (Chen 2013). Given that the annual number of projects fluctuates during the past four years, the average size of Chinese financing commitment per project has been skyrocketing indicating Chinese financiers' interest and capacity in financing large projects. See Figure 4.

¹² The Hoover Dam in Colorado, by comparison, is a two gigawatt facility, producing on average electricity for about 390,000 US homes. See Chen (2013).

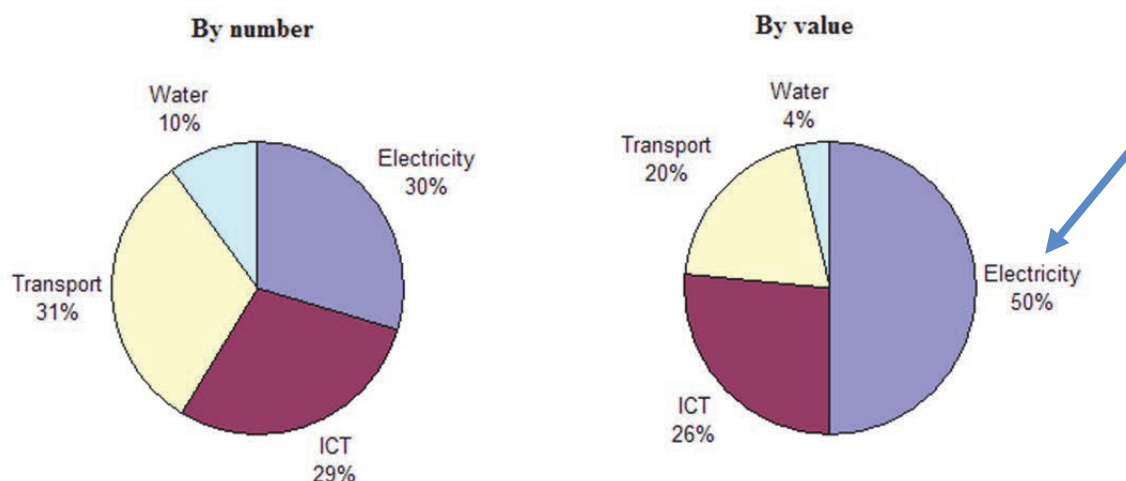
Figure 4: Chinese financing commitment in African infrastructure, 2001-2010 (million US\$)



Source: Chen (2013), update based on Foster et al. (2009) and World Bank-PPIAF Chinese projects database.

Sectoral composition: During the period 2001–10, most of the Chinese financing commitment went to the electricity, information and communications technology (ICT), and transport sectors in Africa. Electricity alone accounts for **50 per cent** of the Chinese commitment by value, but 30 per cent by number, indicating the large size of these power projects. See Figure 5.

Figure 5: Confirmed Chinese infrastructure finance commitments in SSA by sector 2001–10



Source: Chen (2013), update based on Foster et al. (2009) and World Bank-PPIAF Chinese projects database.

Note: For more details, see Annex 1.

In Annex 1, we provide additional evidence to show that to a significant extent, China financed infrastructure projects in 2001-2010 have, to a significant extent, targeted and addressed African countries bottlenecks in five sectors: water; electricity; road and rail; air transport; and telecom

(based on World Bank-PPIAF Chinese projects database). The total number of projects in the dataset is 168 allocated in the five sectors, and the probability of these China-funded projects ‘hitting the bottlenecks’ is 62.5 per cent in the period of 2001–10 (see Annex 1). There is, however, much room for better targeting and improvement, especially in the water sector.

From 2010 to May 2012, China approved concessional loans worth a total of US\$11.3 billion for 92 African projects. For example, the Addis Ababa-Adama Expressway of Ethiopia and the Kribi Deep-water Port of Cameroon were both funded by concessional loans from China. Some of China’s main commercial banks have also started buyer’s credit businesses in Africa, supporting the power grid in Ghana, hydropower stations in Ethiopia, a west-east expressway in Algeria, and other projects (MOFCOM 2013).

4.2 China has been helping to develop clusters-based industrial parks

The idea that industrial clusters can promote structural transformation is not new. Economists have emphasized that clusters take advantage of economies of scale, reduce transactions- and search- and learning-costs (Greenwald and Stiglitz 1986; Stiglitz 1996; Lin and Monga 2011). Agglomeration helps firms to benefit from knowledge spillovers, create a market for specialized skills, and backward and forward linkages (good access to large input suppliers, logistics, privileged network with customers, etc.). These agglomeration benefits reduce the individual firm’s transaction costs, and increase the competitiveness of a nation’s industry, compared with the same industry in other countries at a similar level of development. (Lin 2012c).

Deng Xiaoping, once said ‘the SEZ is a window, a window of technology, a window of management skill, a window of knowledge. ... from SEZs we can bring in technology, acquire knowledge and learn management skill’ (*People’s Daily* 2009). The role of SEZs or industrial parks has been proven by the successful experiences of emerging markets. In particular, investing in SEZs can 1) provide a bundling of public services in a geographically concentrated area; 2) improve the efficiency of limited government funding/budget for infrastructure; 3) facilitate cluster development, or agglomeration of certain industries; 4) propel urban development and conglomeration of services; and thus 5) they are conducive to growth, job creation, and income generation (Lin and Wang 2013: 14).

In particular, China has been supporting several SEZs in Africa aimed to improve investment climate and encourage outward investment into these low-income developing countries if there is a need. According to detailed studies by Bräutigam and Tang (2012), in total China has jointly established six industrial zones in Africa. Over 80 companies have signed agreements and settled in these industrial zones, creating over 11,000 jobs for African workers (Table A2.1, Annex 2).

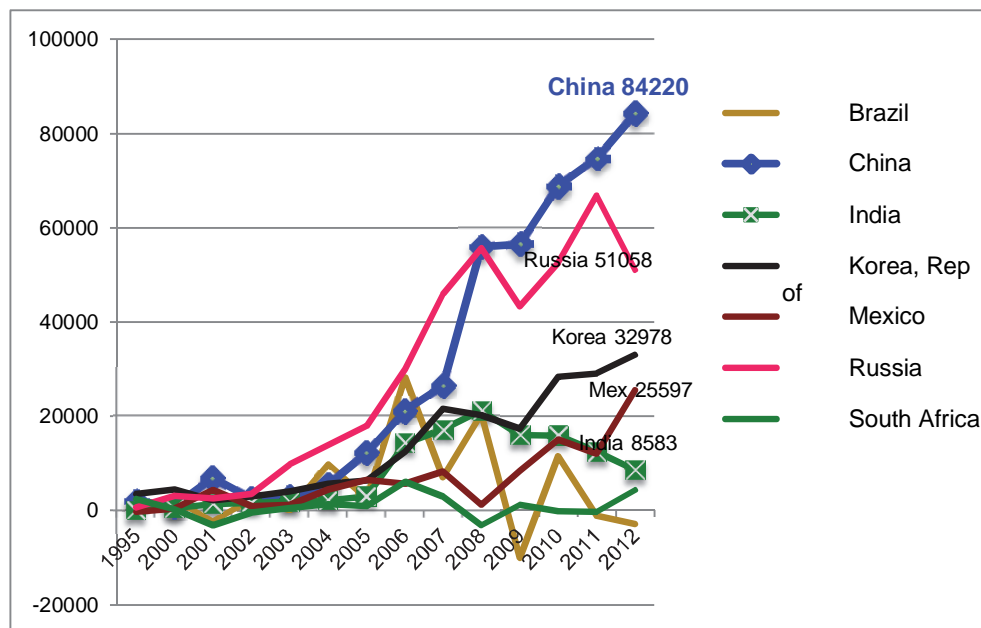
China’s labour cost was rising rapidly from US\$150 per month in 2005, to US\$500 in 2012, and was over US\$600 in coastal regions in 2013 (growing at the rate of 15 per cent annually plus currency appreciation of nearly three per cent). More Chinese enterprises facing the pressure of seeking low-cost locations are moving inland or ‘going global’. China has an estimated 85 million workers in manufacturing, most of them in labour-intensive sectors, as compared to 9.7 million in Japan in 1960 and 2.3 million in Korea in 1980. The re-allocation of China’s manufacturing to more sophisticated, higher value-added products and tasks will open great opportunities for labour abundant, lower-income countries to produce the labour-intensive light-manufacturing goods that China leaves behind. As a result, China will not be a *goose* in the traditional flying geese model but a leading *dragon*, which opens up a huge opportunity for numerous lower-

income countries to step into the vacuum left by its industrial upgrading (Lin 2012d; Chandra, Lin, and Wang 2013).

African countries can benefit from seizing the opportunities to attract labour-intensive enterprises relocating out of China. While there is widespread suspicion on China’s motivations and criticisms of its record of following international standards, some studies have shown that the investment has generated employment opportunities.¹³

In particular, in SSA, the scarcity of local entrepreneurial skills and investment capital are invariably the top two constraints for a competitive manufacturing sector. Evidently, availability of outward FDI enables them to overcome these constraints and take advantage of enterprises relocating from China and other emerging markets. Figure 6 shows that China is taking the lead amongst the Brazil, Russia, India, China, Korea, and South Africa (BRICKS) countries in outward FDI, with the amount rising from a few million to over US\$84 billion in 2012, with Russia, Korea, India, and Brazil following (UNCTAD 2013). Roughly 60 per cent of outward FDI from developing countries went into other developing countries, mostly in the form of greenfield investments that can typically open the door for South-South relocation of various industries from China and other emerging economies.

Figure 6: Outward FDI from China and other BRICKS countries, 2000–12 (US\$ millions)



Source: Authors based on UNCTAD data, accessed on October 25, 2013.

According to Chinese MOFCOM statistics, ‘in January–November 2013, Chinese investors made direct investment overseas in 4,522 enterprises in 156 countries and regions. Direct investment overseas amounted to US\$80.24 billion, up by 28.3 per cent year-on-year. As of the end of November, China’s non-financial direct investment overseas totaled US\$515.7 billion’ (2013). A small but increasing share of China’s outward FDI is flowing to Africa, ‘From 2009 to 2012,

¹³ A few studies have found that China’s outward FDI has contributed to employment generation in both developing and industrial nations, see for example, Shen (2013); Weisbrod and Whalley (2011); Mlachila and Takebe (2011); Rosen and Hanemann (2011); Scissors (2012), and World Bank (2012) on ‘China’s FDI in Ethiopia’.

China's direct investment in Africa increased from US\$1.44 billion to US\$2.52 billion, with an annual growth rate of 20.5 per cent.' Ministry of Commerce (2013). 'The cumulative direct investment in Africa increased from US\$9.33 billion in 2009 to US\$21.23 billion in 2012, 2.3 times the amount in 2009. Currently, over 2,000 Chinese enterprises are investing and developing in more than 50 African countries' (MOFCOM 2013).

Manufacturing is China's key investment field in Africa. From 2009 to 2012, Chinese enterprises' direct investment volume in Africa's manufacturing sector totaled US\$1.33 billion. By the end of 2012, China's investment in Africa's manufacturing industry had reached US\$3.43 billion. Mali, Ethiopia, and other resource-poor countries have also attracted a large amount of Chinese investment (MOFCOM 2013).

But these statistics may be an underestimation. A recent study (Shen 2013) found that:

- The government statistics have underestimated the size of outward FDI.
- The government plays a lesser role in outward FDI: the private sector—usually small to midsized, closed held firms—is responsible for 55 per cent of Chinese FDI in Africa.
- Manufacturing accounts for the bulk of private Chinese investment.
- Chinese investment produces jobs, which African leaders appreciate, while expressing concerns about 'technology transfer' and 'language and cultural barriers'.
- Chinese firms come to Africa because their domestic market is saturated and African labour costs less than Chinese labour.
- Operating in Africa is expensive due to infrastructure gaps and security issues.
- Private Chinese investors do what all international business people do: pursue new markets beyond their home countries for economic gain. (Xiaofang Shen 2013).

Box 3: Results in four months: Huajian in the industrial park in Ethiopia

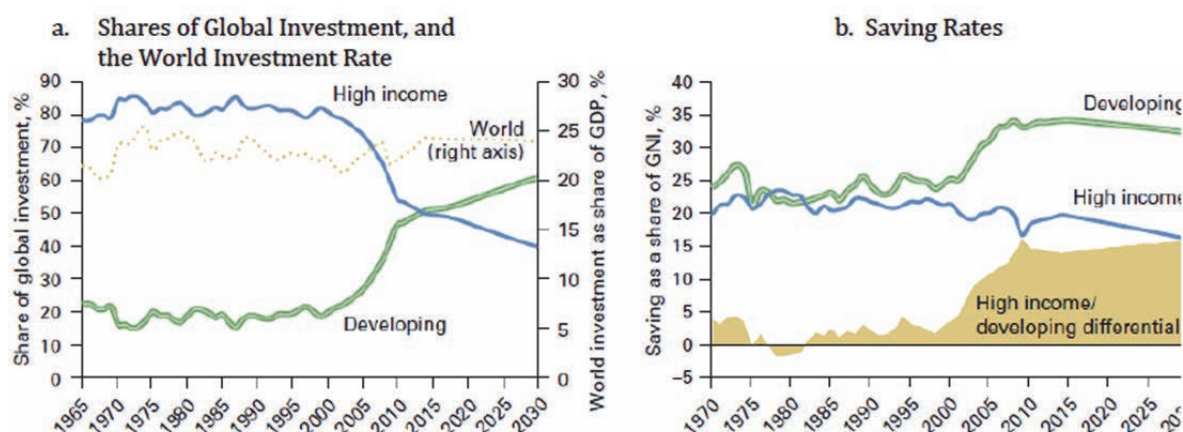
For the development of light manufacturing for which many African countries have comparative advantages, the governments can also develop SEZs/industrial parks and proactively attract foreign firms from other dynamic growing countries, which have the incentives to relocate their productions to take advantages of low wage in Africa (Monga 2013). The quick success of Huajian Shoe Factory in Ethiopia provides a convincing example for the approach. According to a research at the World Bank (Dinh et al. 2012) in 2010, the wage rate of the footwear industry in Ethiopia is one-eighth to one-tenth of that in China, about one and half of that in Vietnam, while its labour productivity is about 70 per cent of that in China, almost the same as Vietnam's, so Ethiopia is highly competitive in the footwear industry. But in 2010, China has about 19 million workers in its footwear industry, and Vietnam has 1.2 million, while Ethiopia has only 8,000 workers. Informed by the research finding and the rising wages and pending relocation of many Chinese shoe factories to other low-income countries, late Prime Minister Meles Zenawi came to Shenzhen to invite Chinese shoe manufacturers to invest in Ethiopia in August 2011. The Chairman of Huajian Group, a designer shoes manufacturer, visited Addis Ababa in October in 2011, convinced by the opportunity and established a shoe factory in the Oriental Industrial Park near Addis Ababa in January 2012, trained local workers and started export to the US market, all within the time span of four months. Now the factory hires 2,500 Ethiopian workers (August 2013) and plans to hire 30,000 by 2016. By the end of 2012, with 57 per cent of market share, Huajian had more than doubled Ethiopia's shoe exports (ACET 2013). Had there been no joint effort to establish the Oriental Industrial Park, could Huajian have achieved so much in four months? It is highly unlikely.

5 Future prospects of development finance

Based on the projections by the World Bank Global Development Horizon 2013, developing and emerging economies will provide two-thirds of the global growth, and one-third of the global capital flows in the next decade. (Figure 7).

As some established donors are constrained by their heavy debt burden and slow growth, development financing will come less from ODA, but more and more from the OOFs, OOF-like loans, and OOF-like investments from development banks in emerging economies. Therefore, the prospect of China-Africa development co-operation is likely to expand, and become more significant in the future. For instance, China will fulfill its commitment to provide US\$20 billion loans to Africa, which will be used for infrastructure construction, as well as the development of agriculture, manufacturing, and small- and medium-sized enterprises (MOFCOM 2013). These loans are not necessarily ODA as defined by OECD-DAC, but more likely to be OOF-like loans due to the nature of infrastructure projects.

Figure 7 Share of global investment—high income countries versus developing countries



Source: World Bank (2013) *Global Development Horizons*.

Table 2: Projected EME Shares of world financial assets GDP

	Financial Assets			GDP		
	2010	2030	2030 \$trn	2010	2030	2030 \$trn
Rapid Growth	22%	39%	\$223.9	37%	45%	\$58.8
Gradual Growth	22%	28%	\$156.4	37%	36%	\$45.6

Source: Sheng (2013: 25).

We propose to start a discussion to broaden the definitions of ‘development financing’. The OECD-DAC definitions of ODA and OOFs are a good starting point, but they are not sufficient to take into account all forms of finances aimed to support development. In monetary policy instruments we have M0, M1, M2, and M3. In development finance, we can define DF1, DF2, DF3, and DF4 similarly, according to (a) the extent of ‘concessionality’; (b) the source (the extent of ‘official’ or state involvement); (c) the destination countries (low income developing countries); and (d) objectives of the financing (for economic development and welfare). This idea was also eluted in several pervious studies including Bräutigam (2011), Center for Global Development (China-aid database 2013), and other studies. A new set of clearer definitions would facilitate transparency, accountability and selectivity by development partners, encourage Sovereign Wealth Funds (SWFs) to invest in developing countries, as well as facilitate public-private partnerships (PPP) in developing country infrastructure.

In particular, SWFs in the world are managing huge amounts of assets, in excess of US\$6 trillion US dollars (see SWF institute website),¹⁴ and many of them are seeking higher risk-adjusted returns. Some of them have traditionally under-invested in the emerging and developing countries with less than ten per cent of assets allocated to these countries. Norway, for example, with the largest SWF in the world, is having a national debate on how best to re-allocate some of its huge asset to developing countries. Currently, the Norwegian Government Pension Fund (GPF) is now the world’s largest SWF with US\$818 billion asset, which is expected to grow to more than US\$1,100 billion by 2020. But it allocates 90 per cent of assets in ‘liquid’ developed country equities, with a real rate of return of mere 3.17 per cent since 1998, much lower than

¹⁴ See <http://www.swfinstitute.org/fund-rankings/>

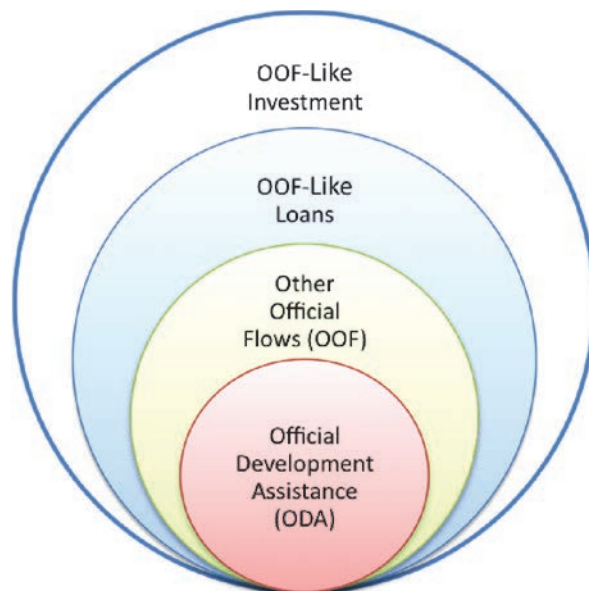
other SWFs with more significant investment in emerging market, in the range of ten per cent or above (Kapoor 2013). On the other hand, a much smaller fund investing in developing countries, the NorFund, has a higher rate of return than the larger GPF. Redefining development finance, as we proposed, would help sway public opinions toward SWFs investing in developing countries, and expand the sources of development finance.

Concretely, we propose to redefine development finance (DF) in the following ways, for instance,

- DF1 = ODA, as defined by OECD-DAC;
- DF2= DF1+ OOFs, as defined by OECD-DAC;
- DF3= DF2+OOF-like loans (loans from state entities for development but at market interest rate);
- DF4=DF3+OOF-like investment (equity investment by SWFs or enterprises/corporations for development with state involvement through guarantees or etc]. For example, PPP for public infrastructure, such as electricity, water, sanitation, transportation, and other pressing infrastructure bottlenecks.

Other categories may include pure private contributions to development without state involvement. Some element of SSDC cannot be monetized, such as number of volunteers and medical doctors, separate categories can be established for those. The Illustration 2 roughly summarizes our ideas.

Illustration 2: Proposal for an expansion of the definition of development financing



Source: Authors.

Notes: The circles correspond to DF1= ODA; DF2=ODA+OOF; DF3=DF2+OOF-like loans; and DF4=DF3+OOF-like investment. Other categories may be added separately for those forms of SSDC that cannot be monetized.

5.1 Global governance matters

The availability of international DFs, however, also depends on the institutional arrangements, the channels of financing and co-ordination, and ultimately, the global environment and the structure of global governance. In other words, it depends on whether the SSDC or DF are welcomed, whether and how much the voice of emerging market partners are being included, and whether they are invited to the table for shaping the global ‘rules of the road’. Two possible trends are emerging:

Multi-lateralism: China and southern partners will potentially move toward more multi- and tri-lateral collaboration with the World Bank and other established regional development banks. This can provide more learning opportunities for emerging partners, enhance triangular knowledge exchange, and hopefully, improve the effectiveness of both the established and emerging donors. For example, recently China Eximbank and CDB have both signed memorandums of understanding (MOUs) with the World Bank (September 2013), to conduct tri-lateral collaboration. Concrete ‘parallel projects’ are being prepared in Africa and moving forward. China has also contributed to the African Development Bank, Development Bank of Southern Africa (DBSA) and Inter-America Development Bank (IDB). In addition, China has long been co-operating with United Nation’s Food and Agriculture Organization (UNFAO) on tri-lateral co-operation. There are however obstacles on this path, for instance, the issues related to enhancing the voice of Southern partners in the International Monetary Fund (IMF) and the World Bank have not been resolved.

New groupings: In response to this gridlock in reforming the global governance structure,¹⁵ new groupings have, and will continue to, emerge outside the ‘established’ international development financial organizations. For example, Trans-Pacific Partnership (TPP) negotiations and ASEAN plus 6 negotiations are moving in parallel. BRICS countries have proposed to establish a BRICS Bank, with the concrete steps being taken after the summit meetings of the BRICS leaders. In addition, Chinese leader Xi Jinping has proposed to establish two new banks: The Shanghai Co-operative Organization Bank, and the Asian Infrastructural Investment Bank. Premier Li Keqiang has signed some agreements with Eastern European countries to jointly develop High-Speed Rails (HSR) and the New Silk Road Economic Corridor. According to China Development Bank, negotiations with 17 countries on HSR are being conducted. There is also an additional proposal to establish a Global Structural Transformation Fund (GST Fund), which will help funding the transformation process in Africa (Lin and Wang May 2013 for the United Nations ‘Post 2015 High Level Panel’).

Issues and challenges in China’s SSDC

The first challenge is the lack of transparency in China’s SSDC—official data at the project level is not readily available, especially related to large RfI deals, or, the Angola model. The publication of the White Paper on ‘China’s Foreign Aid’ (State Council Information Office 2011) and *China Africa Economic and Trade Co-operation 2013* (MOFCOM 2013), is a progress in the right direction. The government needs to be more open and pro-active in providing more accurate data, making

¹⁵ The shares of emerging market economies in the IMF have not been increased, after many years of discussing.

laws and regulations clear on development co-operation. This would be favourable to increased accountability to tax payers in China, as well as to the international development community.¹⁶

The second concern is about ‘tied aid’ and inadequate technological diffusion and spillover effect. Most of Chinese aid is tied, a practice the members of OECD-DAC agreed to move away from progressively since 1995, since tied aid may increase the cost and reduce efficiency. However, China’s own experience indicates that tied aid had some advantage of facilitating ‘learning by doing’ and learning by implementing projects. According to Hausmann, ‘the tricks of the trade are acquired from experienced senior workers’ (Hausmann 2013; Bahar et al 2013). There is an academic literature on aid and trade, which found mixed results (Wagner 2003; Lloyd et al. 2000; and Morrisay and White 1996). The value of implementing actual projects in learning and development seems to be under-appreciated by economists and the donor community. In the 1980s and 1990s, most donor financed projects located in China were tied aid, and Chinese workers and project managers have learned and benefited from them (Wang 2011). Actually, ‘learning from aid projects’ is one of the reasons why Chinese companies are so competitive in implementing construction projects.

The third concern is that Chinese aid projects seem to have generated few local employment opportunities. Many African officials are concerned that Chinese workers are displacing local workers. Although data and evidence need to be discussed on a case by case basis, clearly, the indirect employment generation from China-financed economic infrastructure has been under-researched. The IMF (2013) finds that: ‘In recent years, China has become the largest single trading partner for Africa and a key investor and provider of aid.’ And ‘a 1 per cent point increase in China’s real domestic fixed asset investment growth has tended to increase SSA’s export growth rate on average by 0.6 per centage point’ (IMF 2013: 5). Better education and training should be provided to Chinese companies to abide by laws and regulations regard labour, social, and the environmental standards. In addition, better training and capacity development programmes should be provided to African workers and managers, in order to fulfill the requirement of timely completion of projects showing tangible results.

No two countries are the same in their economic transformation. China has made some mistakes and paid ‘high tuition’ in the process: for instance, China’s strong drive for rapid growth and industrialization is associated with widening rural-urban income disparities and a degrading environment. In March 2007, the former Chinese Premier Wen Jiabao pointed out that **China’s growth was ‘imbalanced, inequitable and unsustainable’**. Since then there has been tremendous effort to ‘rebalance’ the economy—reducing its reliance on export, investment and paying more attention to the quality and efficiency of growth. However, making deep transformations and upgrading industries is proven extremely difficult, as reforms often go against the vested interest groups. In this sense African countries need to be selective, to avoid these mistakes China has made. African governments, NGOs and civil societies can play important roles in providing pressure to ‘push’ or ‘pull’ development partners including China and Chinese companies to the right directions.

6 Conclusion

The next 50 years will witness a significant structural transformation in most of the African continent, with China and other emerging market economies playing an important role, working

¹⁶ China does not have a legal framework governing foreign aid, nor does it have an independent aid agency. So it is difficult for international bodies and governments to seek collaboration on international development or financing issues.

together with African partners in providing ideas, tacit knowledge, intimate experiences, financing, as well as investing in the infrastructural, human and other productive assets.

Just as China and Vietnam have learned from the faster—growing East Asian NIEs and maintained rapid GDP growth of nearly ten per cent a year in the past decades, African countries can also achieve the same—to reach eight per cent growth rates or higher in the coming decades. In particular, they can seize the opportunities of labour intensive industrial relocating from China and other emerging markets (Lin 2012c; Chandra, Lin, and Wang 2013).

We examine China and Africa co-operation as a co-transformation process – not a donor-client relationship. China, being a bit ahead in transformation, can provide ideas, experiences, tacit knowledge, opportunities, as well as finances in Africa’s transformation. We also present preliminary evidence on whether, and to what extent, Chinese infrastructural projects have matched Africa’s bottlenecks; and whether China’s experience in SEZs can be useful to Africa’s transformation. We argue that in a sense, China and African countries are teammates climbing the same mountain of structural transformation (in Illustration 1), hand in hand, and helping each other in every step of the way. They are each utilizing their own comparative advantages, exchanging tools from time to time, and complementing each other, while each facing own constraints. Working together, they can learn and progress faster.

China needs to continue to learn to become a better development partner, by listening to the voices from Africans and interacting with the partner governments, NGOs, and civil societies. China needs to be more open and transparent in providing accurate data on international development financing and activities. It is our view that ‘any deals made in the dark are more likely to be revoked or renegotiated by the next government of the client country in the future’ (Lin and Wang, forthcoming). The political economy dynamics must be taken into consideration when discussing with the current government of the client country. The established donors among OECD countries also need to see if China’s approach provides useful lessons to improve the effectiveness of the conventional North-South aid. A recent study by the World Bank has also reviewed the approach of RfI deals, finding this approach to be more effective in advancing the developmental impact ‘many years ahead of’ the conventional North-South approaches. Many African leaders find China’s approach (in RfI) more desirable as it has led to ‘inexpensive and tangible results’ within the time span of three to four years, coinciding with the political cycle in a democracy.

The world needs a more active China in the international development arena, not merely a defensive one. China needs to describe its approaches based on solid economic foundation, and takes a leadership role in global development. For example, using the NSE as the theoretical foundation, China could develop its own development co-operation theory and draft a law for international aid and co-operation. China could take a lead in co-ordinating and setting up a few infrastructural investment banks, and a Global Structural Transformation (GST) fund as proposed by Lin and Wang (2013) for the United Nations Post-2015 High Level Panel. Many SWFs are seeking higher risk-adjusted returns in a low-yield environment, and it is not unrealistic to predict that many SWFs will join this effort.

In the next decades, development financing will come less from ODA, but more and more from the OOFs, OOF-like loans, and OOF-like investment from development banks, SWFs, in emerging economies. Therefore, we propose to expand the definitions of development financing to include them, which could induce more contributions from SWFs and other public or private entities. In a multipolar world, the prospect of South-South and China-Africa development co-operation is likely to expand. However, established development partners need to be more

inclusive to enhance the voice of emerging partners, and provide a place ‘at the table’ for these emerging partners. Otherwise, we may see a world with a more disintegrated and fragmented development financing architecture, with new groupings and regional investment banks emerging and competing with each other. As development professionals who are passionate about global development and poverty reduction, this is NOT what we would like to see.

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Annex 1

Have China-financed infrastructural projects helped address Africa's bottlenecks? If so, to what extent?¹⁷

It is well accepted that certain types of infrastructure are public goods/services and semi public goods/services, and addressing bottlenecks in them could have large positive externalities, and hence, significant developmental impact.¹⁸ In this Annex, we attempt to use a three-step method to address the question that whether, and to what extent, do China financed infrastructural projects match African's bottlenecks? A short answer is that they seem to have matched in 63 per cent of the 168 infrastructure projects in 2001–10.

Step 1, five indicators from the World Bank database are used to define Africa countries' bottlenecks, including water, electricity, roads and rail, air transportation, and telecommunication. The year before the global financial crisis 2007 is selected because the investment decisions were made five or more years before the project implementation. These indicators include:

Sector 1 = Improved water source (percentage of population with access), 2007;

Sector 2 = Electric power consumption (kilowatt hour (kWh) per capita), 2007;

Sector 3 = Road sector energy consumption per capita (kilograms (kg) of oil equivalent), 2007

Sector 4 = Air transport, registered carrier departures worldwide, 2007

Sector 5 = Mobile cellular subscriptions (per 100 people), 2007

These 5 sectors are selected since water (sector 1) is largely a public good/service with large externalities for the health of the population, whereas telecom is a private service, and the sectors 2 to 4 are largely semi-public goods/services.¹⁹

1. First, we rank each of the 5 sectors from low to high and figure out the ranking number of the African country, i , in sector j , denoting the ranking number as $R_{i,j}$
2. Second, we compare the ranking numbers for sectors 1 to 5 for the country, i , and select the lowest ranking sector to be the bottleneck 1 for country i ; and then exclude the selected sector j^* , select the next lowest ranking sector as bottleneck 2, and continue to follow this process for bottleneck 3.

17 This Annex is attributable to Murong Xin and Wenxia Tang, two research assistants under Yan Wang's guidance. The authors would like to thank Chuan Chen for providing the World Bank-PPIAF Chinese projects database and for his constructive comments.

18 There is an extensive literature on the positive externalities of infrastructure, see for example, Aschauer (1989); Canning and Bennathan (2000); Estache et al. (2002), Estashe (2003); and Calderon and Serven (2008).

19 In economics, a public good is a good that is both non-rival and non-excludable. Non-rivalry means that 'each individual's consumption of such a good leads to no subtractions from any other individual's consumption of that good.' (Samuelson 1954). Non-excludability means that it is impossible to exclude any individual from consuming the good. There are, however, debates on what constitute 'pure' public good or services, and semi-public goods and services, and the appropriate roles of governments in providing, or in the case of semi-public goods, regulating them.

This process can be expressed as,

Bottleneck 1 for country $i = \min(R_{i,j}), \text{ where } j = 1, \dots 5.$

Bottleneck 2 for country $i = \min(R_{i, -j}) \text{ where } j = 1, \dots 5.$*

3. Considering there are some missing data, we only use the countries with value in the sectors and take the average and standard deviation of each indicator. Then the bottleneck sectors are mostly below the average for that indicator j across countries.
4. For some countries bottleneck cannot be identified since (a) the country is ranked high in all five sectors (such as South Africa), or (b) they are small countries, too small to have enough data values such as roads, rail and air transport.

Step 2, World Bank-PPIAF Chinese projects database is used to find the location and number of infrastructure projects financed by China in each sector during the period of 2001–10. There are 168 projects allocated in 4 sectors. Here we first divide the transport sector into two sectors, with rail and roads as sector 3, and air transport as sector 4. After re-defining this way, the 5 sectors are identical with the sectors in the dataset on bottlenecks.

The above two steps are conducted independently by two research assistants.

Step 3, the two datasets are merged by country code, and see if the locations of the Chinese financed projects match the bottlenecks, which is shown in Figure A1.3. We have also calculated some probabilities of projects 'hitting' the bottlenecks.

- Probability of (hitting one of the 3 bottlenecks) = (number of matches)/total projects
- Probability of (hitting the bottleneck 1) = (number of hitting B1)/total
- Probability of (hitting the bottleneck 2) = (number of hitting B2)/total
- Probability of (hitting the bottleneck 3) = (number of hitting B3)/total

Results are:

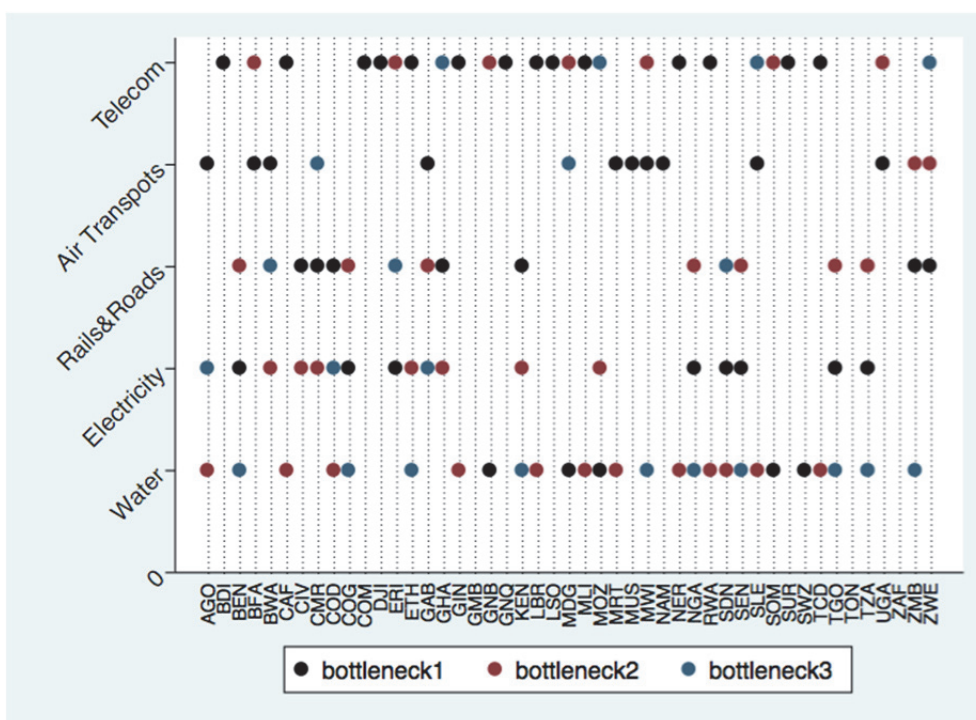
- Probability of (hitting one of the 3 bottlenecks) = $105/168 = 0.625$
- Probability of (hitting the bottleneck 1) = $39/168 = 0.232$
- Probability of (hitting the bottleneck 2) = $31/168 = 0.185$
- Probability of (hitting the bottleneck 3) = $35/168 = 0.208$

Conclusion:

The total probability of China financed infrastructure projects hitting the bottlenecks is 0.625, although the cross-sectoral variation is large. Based on this result, therefore, we conclude that China’s infrastructural investments in SSA countries match these countries’ bottlenecks relatively well, albeit there remains a large cross-sectoral variation. In other words, China has contributed to releasing some of SSA’s bottlenecks by meeting the ‘unmet’ demand.

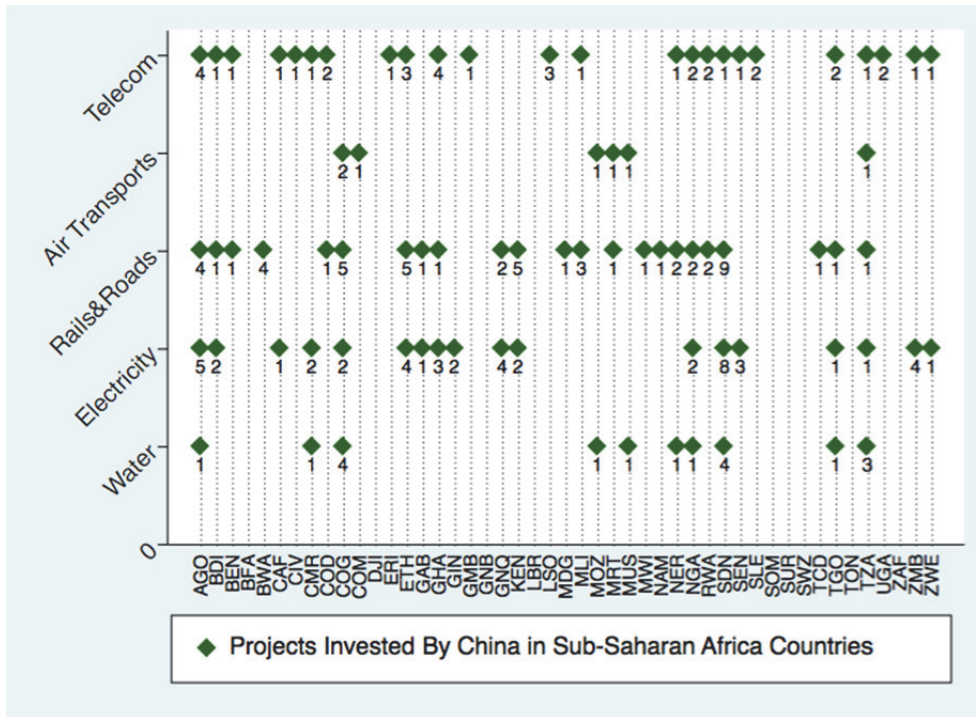
There is however still plenty of room to improve the ‘relevance’, or the matching of supply with the specific demand on the ground, especially in the water sector where the investment is still very low as compared to demand. For details see Figures A1.1, A1.2, and A1.3.

Figure A1.1: Africa: Infrastructure bottlenecks by sector (Step 1)



Source: Authors.

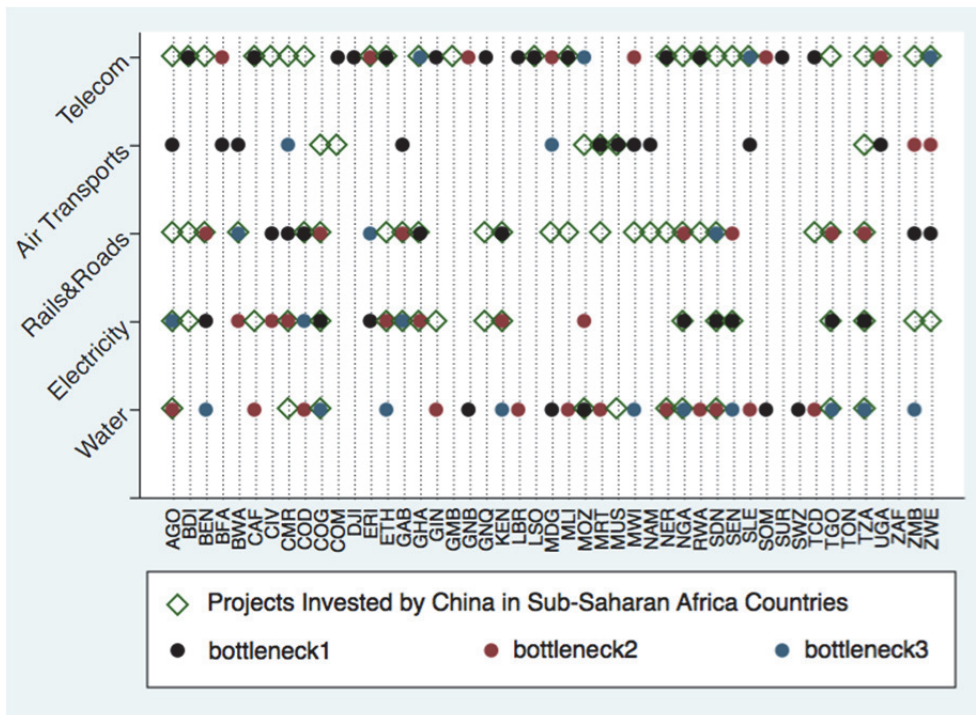
Figure A1.2: Number of China-financed projects in each sector, 2001–10 (Step 2)



Source: Authors based on World Bank-PPIAF Chinese projects database.

Notes: Numbers in the chart are the number of China-financed infrastructure projects in that particular sector *j* and country *i*. The total number of projects is 168. Sectors are identical to those in Figure A1.1.

Figure A1.3: Are China-financed projects matched with bottlenecks in SSA? (Step 3)



Source: Authors, by merging the 2 steps using country code.

Note: Probabilities of China-financed projects hitting the bottlenecks are calculated.

Annex 2

Table A2.1: Investment in China's trade and co-operation zones, circa July 2013.

	Constr. start date	Phase 1 size (ha)	Est. constr. investment (US\$ mil)	Actual constr. investment (US\$ mil)	No. of tenant companies (signed)	No. of tenant companies (in operation)	Tenant company commitments to invest (US\$ mil)	Tenant company actual investment (US\$ mil)	Tenants: approx. no. of Chinese workers	Tenants: approx. no. of African workers
Egypt TEDA ^a	2000	134	200–280	49.4	49	38	524	358	n/a	1000
Zambia Chambishi ^b	2004	1158	200	150.0	36	26	1000	322	1372	7973
Nigeria Lekki ^c	2007	109	392	82.5	26	6	700	76	n/a	n/a
Mauritius Jinfei ^d	2009	70	220	15.0	n/a	0	n/a	n/a	n/a	n/a
Nigeria Ogun ^e	2009	250	220	23.7	34	7	150	58	177	1619
Ethiopia Eastern ^f	2010	200	101	22.0	12	6	129.5	n/a	300	1600

Source: Bräutigam and Tang 2013.