

China's Slowdown and Rebalancing : Impacts on Sub-Saharan Africa

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Abstract

This paper explores the economic impacts of two related tracks of China's expected transformation, that is, economic slowdown and rebalancing away from investment toward consumption. It estimates the spillovers for the rest of the world with a special focus on Sub-Saharan African countries. By 2030, an average 1 percent annual slowdown of China's GDP is expected to result in 1.1 percent GDP decline in Sub-Saharan Africa and a 0.6 percent global slowdown relative to past trends. However, if China's transformation also entails substantial rebalancing, the negative income effects of the economic slowdown could be offset through higher overall imports by China and positive terms-of-trade effects for its trading partners. Slowdown and rebalancing in China is estimated to increase GDP by 4.7 percent for Sub-Saharan Africa and by

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4.8 percent for the global economy. China's transformation is also estimated to reduce poverty, but the extent depends on country in the Sub-Saharan Africa.

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I. Introduction

This paper is centered on two main pillars. First, it explores the economic impacts of China's slowdown on the rest of the world with a focus on Sub-Saharan Africa. Second, it separately considers the impacts of China's rebalancing by providing an in-depth examination of the driving forces behind the expected benefits and losses and by shedding light on potential areas of policy intervention.

The contributions of this study to the existing literature are multi-fold. First, we not only explore growth spillovers commonly analyzed by other authors, but also separately consider the impacts of China's rebalancing along with the combined aggregate impacts of China's expected transformation. Second, we estimate the impact of China's transformation on poverty and shared prosperity in Africa. Finally, we have updated and extended our modeling tools, so that a similar analysis could be conducted for other parts of the world.

Economic engagement with Africa¹ has been a priority for Chinese policy makers since the 1990s. Through improved economic relations with this continent, China benefits from access to dynamic and growing markets for Chinese goods and services, a reliable source of raw materials and energy, a destination for foreign direct investment that makes use of lower local wages, and finally, political support from African countries in international affairs. Meanwhile, Africa benefits from China's financial and technical assistance in infrastructure investment, transfer of technology and knowledge, and China's relatively strong capacity to implement development and industrialization

¹ The focus of this analysis is Sub-Saharan Africa (SSA). SSA and Africa are hereafter used interchangeably.

projects.

Even so, China's economy is undergoing significant changes. The 12th Five Year Plan recognizes that the annual growth in excess of 10 percent (average over 2003–2010) is unsustainable in the long run and envisages a growth rate of 7 percent a year. Apart from putting the brakes on fast growth, Chinese authorities aim to rebalance the economy toward consumption and away from investment. Indeed, recent data show that investment as a share of GDP had risen to more than 46 percent in 2013, which in turn led to the build-up of excess capacity. The most important measures set out to facilitate China's structural transformation are (1) policies that promote urbanization, which in turn would help fuel domestic consumption; (2) policies that encourage lower domestic savings, leading to lower investment; and (3) policies that improve the efficiency of state-owned enterprises and allow more sectors to be open to non-state investment.

The most important transmission channels of economic spillovers are the income effects on trade and investment. First, China's economic strategy will lower external demand for African exports. As the Chinese economy shifts its target of 7 percent growth per annum toward a projected 4.6 percent by 2030, it could require fewer imports to fuel domestic manufacturing production. A lower demand for imports could in turn disproportionately affect the countries of Sub-Saharan Africa (SSA) that are exporters of commodities, raw materials, and oil. In addition, as Chinese domestic aggregate demand shifts from investment goods to household consumption and services, exporters of consumption goods and services can gain from rebalancing. Second, weaker global demand is expected to translate into falling commodity prices, which will negatively impact terms of trade of net commodity exporters. Third, motivated by increasing labor costs, some Chinese firms might relocate production to the relatively more labor abundant Africa. Although Foreign Direct Investment (FDI) and multinational companies are not explicitly considered in our modeling framework, such effects will be indirectly represented as a result of changing comparative advantages and the specialization of SSA's economies in goods that are relatively labor abundant (Chandra *et al.* 2013, Dollar 2013). Fourth, as economic growth in China slows down, its pool of savings is likely to decline, leading to reduced funding for Chinese investment in Africa, particularly in natural resource sectors and infrastructure.

II. Economic Engagement of Africa and China

A. Trade relations

Trade between China and SSA has been growing at a staggering pace and increased over 100-fold since 1990 (Figure 1). In 2014, exports from China to SSA reached 84 billion US dollars compared to exports worth 63 billion US dollars from SSA to China. China's WTO accession in 2001 made a significant positive difference on trade relations between the two regions. Trade between the two regions grew at an average annual rate of 17 percent during 1990~2000. Since China's WTO accession, it grew by 27 percent over 2001~2014, despite the slump in global trade during the 2008~2009 financial crisis. Consequently, China has become SSA's largest trading partner, having surpassed the US in 2009.

Regarding the region as a whole, China is a destination for 16 percent of SSA's total exports (surpassing even intra-regional exports, which account for 10 percent) and a source of 14.3 percent of the region's total imports. The regional decomposition of these aggregates shown in Figure 2 highlights important regional heterogeneities. South Africa, Zambia, and the rest of SSA export relatively more than the regional average, while Madagascar, Botswana, and Ghana import from China at above the regional average.

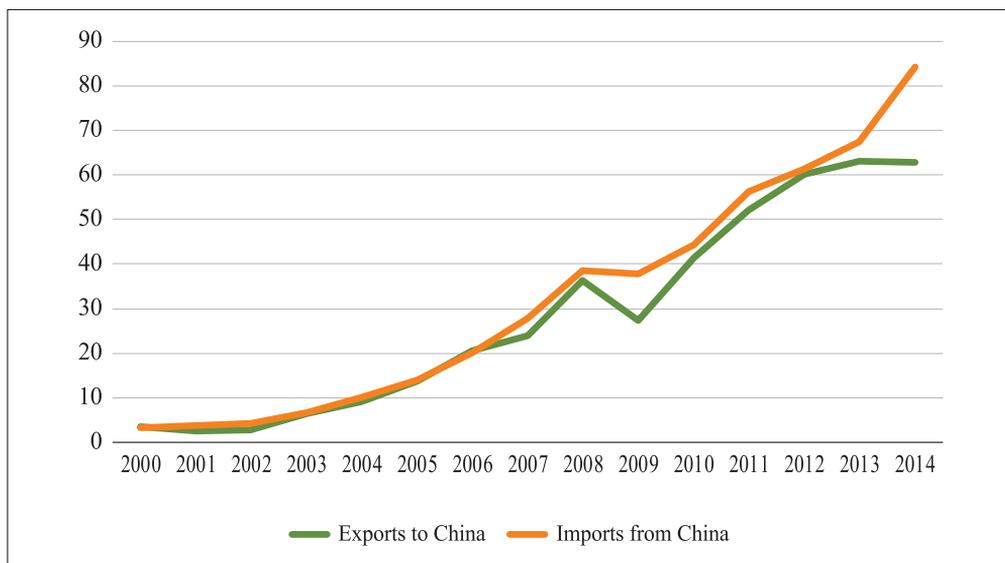
In terms of sectoral composition, SSA exports to China are concentrated in natural resource industries about 78 percent of the total. On the other hand, the majority of SSA's imports are accounted for by high- and low-skill manufactures at 48.6 percent and 37.7 percent, respectively. A concern related to the sectoral composition of trade between the two regions is that China's imports from Africa are mainly focused on low value-added and raw commodities, which may limit opportunities for Africa's industrialization and ability to move up the value chain. Implicitly, the nature of SSA–China trade tends to limit African growth prospects away from sustainable structural upgrades and economic diversification (Ighobor 2013).

These concerns are, however, often controversial in the empirical literature. Previous studies have found that African countries with a concentration in primary-product exports experienced broader growth benefits than more diversified exporters and that countries may recover from a global financial crisis faster if their exports contribute to China's production chain or consumption chain (Maswana 2010). Contrary to the common view that increasing imports from China would have a negative effect on

Figure 1. Increasing importance of China for SSA

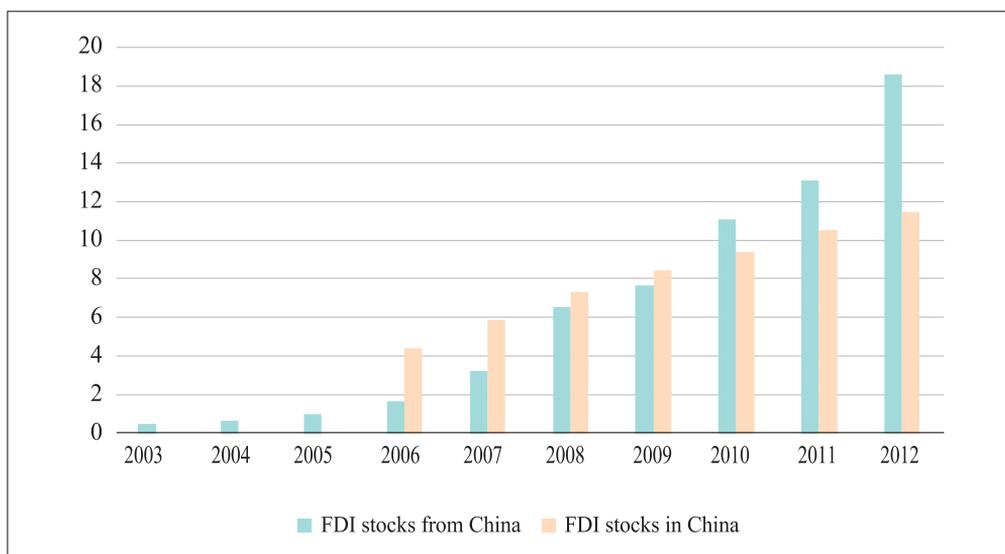
Panel A. Trade linkages

(Billion US dollars)



Panel B. Investment linkages

(Billion US dollars)



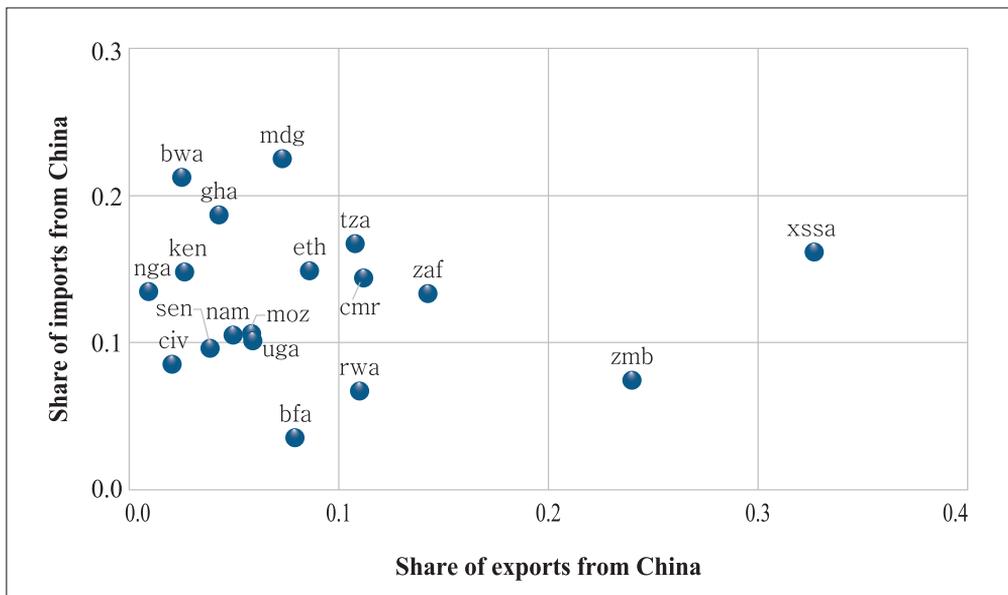
(Source) Direction of Trade Statistics (IMF) and UNCTAD bilateral FDI statistics

growth, empirical evidence shows that China’s share in a country’s total imports has a robust positive effect on growth (Balioumoune-Lutz 2011).

In terms of trade preferences, currently, no free trade agreements exist between China and any SSA countries or regions. Average tariff barriers faced by Chinese exporters to SSA markets are significantly higher (10.1 percent) than barriers faced by SSA’s exporters to Chinese markets (5.2 percent). Sectoral protection patterns reveal significant variations. In terms of Chinese exports to SSA markets, low-skill manufactures and agriculture are the most protected, with average tariffs of 19.2 percent and 16.5 percent, respectively, compared to a much lower 5.8 percent in high-skill manufactures. On the other hand, the most protected Chinese sectors for SSA exporters are agriculture and high-skill manufactures with 7.3 percent and 7.6 percent tariff rates. We also note that imports of natural resource products (coal, oil, gas, and their products) have duty-free access to Chinese markets.

Like other developed countries, China started offering duty-free market access to SSA’s Least Developed Countries (LDCs) shortly after its accession to the WTO in

Figure 2. China : Main trading partner for most SSA countries

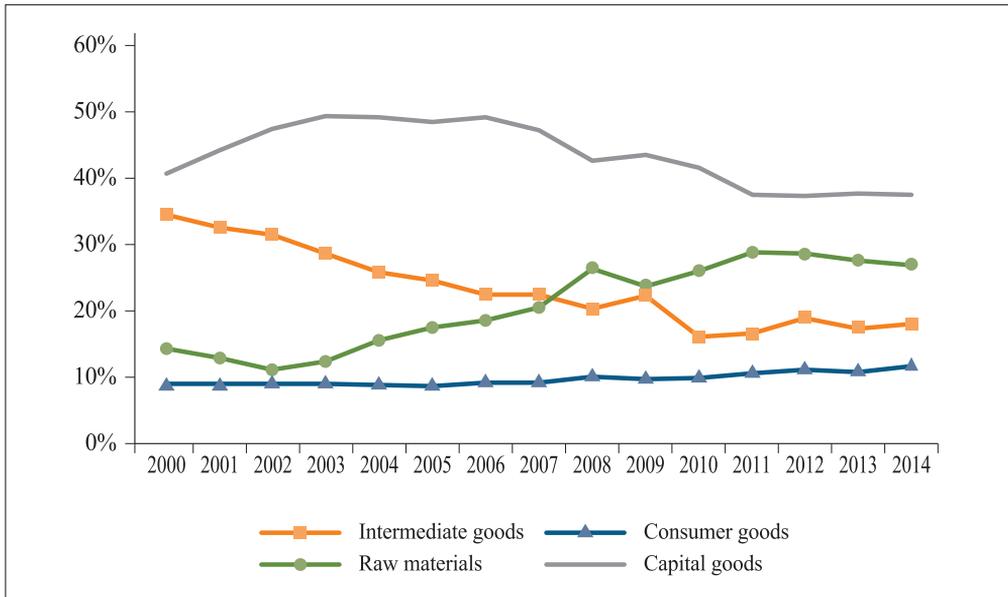


(Note) **bwa** for Botswana, **gha** for Ghana, **mdg** for Madagascar, **nga** for Nigeria, **ken** for Kenya, **eth** for Ethiopia, **tza** for Tanzania, **sen** for Senegal, **civ** for Cote d’Ivoire, **nam** for Namibia, **moz** for Mozambique, **uga** for Uganda, **bfa** for Burkina Faso, **rwa** for Rwanda, **zaf** for south Africa, **zmb** for Zambia, **xssa** for Rest of SSA.

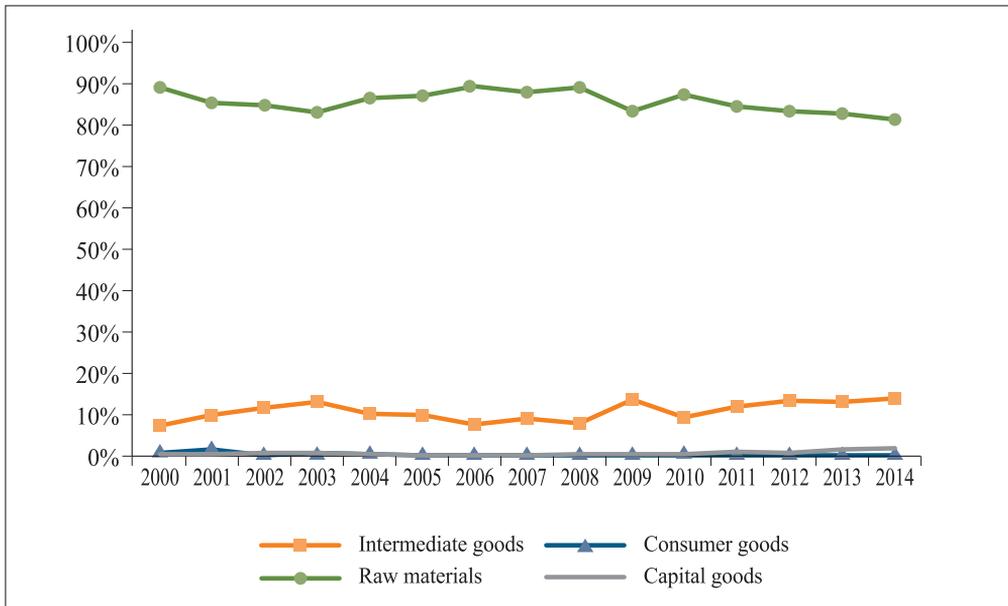
(Source) GTAP9 database.

Figure 3. Composition of China's imports

Panel A. China's overall imports



Panel B. China's imports from SSA



(Source) World Integrated Trade Solution

2003, a scheme that covered 190 types of commodities. In 2007, 440 items were exempt. Finally, in 2009 it extended duty-free exemptions to 95 percent of exports from LDCs in Africa. Among LDCs in Africa, Angola, Sudan, Congo, Equatorial Guinea, and DR Congo benefit significantly because they account for 90 percent of LDC exports to China.

China’s rebalancing away from investment-led growth toward consumption-based growth is expected to change the composition of Chinese imports, with a possible shift toward consumer or final goods. As highlighted in Figure 3, given that SSA’s exports

Table 1. Prevalence of final goods in SSA’s exports

(Percent of total, 2004~2014)

	Exports to China			Exports to Japan			Exports to Korea		
	Final goods	Intermediates	Capital goods	Final goods	Intermediates	Capital goods	Final goods	Intermediates	Capital goods
<i>Burkina Faso</i>	0.0	100.0	0.0	0.3	99.7	0.0	0.2	98.9	1.0
<i>Botswana</i>	0.0	100.0	0.0	0.0	100.0	0.0	0.0	100.0	0.0
<i>Cote d’Ivoire</i>	0.2	99.8	0.0	1.5	98.5	0.0	3.3	96.4	0.3
<i>Cameroon</i>	0.0	100.0	0.0	3.2	88.3	8.3	0.2	99.5	0.3
<i>Ethiopia</i>	0.4	99.6	0.0	4.4	95.6	0.0	0.2	99.7	0.0
<i>Ghana</i>	0.2	99.8	0.0	2.5	97.2	0.0	5.2	94.2	0.5
<i>Kenya</i>	16.0	83.9	0.0	69.0	30.4	0.5	2.7	94.3	3.0
<i>Madagascar</i>	7.5	92.3	0.1	51.7	48.2	0.1	10.0	89.8	0.2
<i>Mozambique</i>	0.2	99.5	0.0	16.8	83.2	0.0	0.8	99.2	0.0
<i>Namibia</i>	0.7	99.2	0.0	24.2	75.7	0.0	1.3	98.6	0.0
<i>Nigeria</i>	0.0	99.9	0.0	0.0	99.7	0.0	0.0	99.6	0.4
<i>Rwanda</i>	0.0	100.0	0.0	19.9	80.0	0.1	3.2	95.9	0.9
<i>Senegal</i>	23.6	76.3	0.1	91.7	7.4	0.9	91.4	8.2	0.3
<i>Tanzania</i>	0.5	99.4	0.0	6.5	93.5	0.0	1.2	98.6	0.1
<i>Uganda</i>	0.3	99.5	0.0	28.5	71.3	0.2	1.0	98.7	0.2
<i>South Africa</i>	1.4	98.1	0.5	11.0	88.2	0.6	1.6	97.7	0.6
<i>Zambia</i>	0.0	100.0	0.0	0.6	99.3	0.0	0.0	100.0	0.0

(Source) Authors’ calculations based on UN COMTRADE

to China are less intensive in consumer goods than that of the rest of the world, such a compositional change will provide a new source of trade expansion if supply in SSA could respond positively to the shifting opportunities.

As shown in Table 1, certain SSA countries have untapped potential to export final goods to Chinese markets compared to the structure of their exports to other similar markets. For example, although consumer goods represent only 16 percent of Kenya's exports to China, exports to Japan are dominated by flowers, tea, and coffee products. Senegal's exports of fish and crustacean products to Japanese and Korean markets accounts for more than 90 percent of their total exports, but only 24 percent of exports to China. In the case of Madagascar, major export products such as vanilla and cloves, which account for the majority of final goods exports to Japan, are underrepresented in exports to China.

B. Investment relations

Although not as remarkably as trade, investment between China and SSA has been growing significantly (limited data availability complicates the assessment of the true extent of Chinese engagement in Africa). By 2012, accumulated Chinese FDI stocks in SSA amounted to 18.5 billion US dollars compared to only 0.46 billion US dollars in 2003 (Figure 1). On the other hand, SSA's FDI stocks in China are reportedly 11.5 billion US dollars (UNCTAD 2014). The majority of China's investment in Africa is concentrated in resource-rich countries such as Angola, Nigeria, and South Africa, DRC, Sudan, and Zambia (Ighobor 2013). The top industries for China's investment are mining (30.6 percent) and finance (19.5 percent) (MOFCOM 2013).

China's investment policy toward Africa is complicated and non-transparent (Johnston and Yuan 2015). The institutional framework that regulates investment relations is mainly based on the Forum on China and Africa Cooperation, under which 45 Economic and Technical Cooperation agreements have been signed. In addition, 32 Bilateral Investment Treaties and 9 Double Taxation Treaties add to the complexity of existing regulations.

An important mechanism for China's direct investment in African manufacturing is industrial parks or Special Economic Zones (SEZs). Of the 19 zones approved by the Chinese government as of 2011, five are in Sub-Saharan African countries, namely, Ethiopia, Mauritius, Nigeria (2), and Zambia. The Chinese government stopped holding

more tenders after 2007, but private enterprises continued to establish, expand, or propose new industrial parks or free-trade zones in Africa on their own in Nigeria, Sierra Leone, Uganda, Botswana, and South Africa.

It is interesting to note that only one economic zone concentrates on mining. The industrial focus of SEZs varies across zones, spanning a range of industries, including copper mining, garment, food, appliances, machinery, and construction materials. The following table describes the sectoral focus of the zones.

Table 2. Special economic zones by country and sector

Country	Special Economic Zones	Sector
<i>Zambia</i>	Chambishi	copper and cobalt mining
	Lusaka	garments, food, appliances, tobacco, electronics
<i>Nigeria</i>	Lekki	transportation equipment, textile, light industries, home appliances, telecommunications
	Ogun	construction materials and ceramics, furniture, wood processing, medicine, computers, lighting
<i>Mauritius</i>		manufacturing and services
<i>Ethiopia</i>	Oriental	electric machinery, steel, construction materials

(Source) Brautigam *et al.* (2011)

Chinese SEZ projects in Africa may succeed for several reasons (Brautigam *et al.* 2010 and 2011). First, China has a successful experience with its own SEZs. Second, these efforts are part of an important government initiative with both political and economic aims. The political support may help with the implementation of these projects. Third, the Chinese government promotes these initiatives by offering generous financial and nonfinancial support. Finally, the zones are profit-driven initiatives led by private-sector consortia, although many lead firms are state-owned enterprises.

At the other extreme, there are significant political, economic, and social challenges to making SEZs in SSA successful. Most notably, insufficient local learning and participation may affect SEZs' ability to facilitate SSA's industrialization. Furthermore, challenges such as cross-cultural communication barriers, governance issues, disputes with local communities, lack of transparency, and insufficient implementation capacity of African governments could potentially limit the success of SEZs. SEZs will only be successful if they attract sufficient local and foreign investment, create local jobs,

promote exports, and boost local industrial competitiveness. If the zones fail to become integrated, transfer knowledge and technology, or generate local employment, they may not be viable.

C. Chinese development aid

Empirical evidence shows that China's Official Development Aid (ODA) in Africa is distributed relatively evenly across the continent, both in LDCs and developing countries (Brautigam 2011a and 2011b). Grants and zero-interest loans were China's main instruments for foreign aid until 1995. Over time, unlike OECD countries, China has deviated from traditional aid instruments to implement a combination of official development aid and other official financing via export buyers' credits, official loans at market rates, and strategic lines of credit provided to Chinese enterprises in Africa. Most development funds come from China's policy banks. As of 2009, about half (47 percent) of China's foreign aid was committed to Africa.

Several interesting findings emerged from the study by Brautigam (2011a). First, not surprisingly, countries did not receive official development aid from China if they had had diplomatic ties with Taiwan. Second, contrary to the general perception, aid was not given in larger amounts to resource-rich countries such as Nigeria and Democratic Republic of the Congo (DRC). Grants and interest-free loans were distributed evenly while concessional loans were correlated with a country's ability to pay. For example, market-rate official loans may be provided to middle-income countries such as Mauritius, Namibia, Botswana, or countries that are financing an income-generating project. Indeed, Lin and Wang (2014) also point out that as of 2009, only 8.9 percent of China's concessional loans to Africa were used in the extraction of natural resources. In contrast, the study highlights the fact that 61 percent of concessional loans were used to finance infrastructure construction and 16 percent to finance industrial development.

D. Integration into global and Chinese value chains

In a world dominated by international production networks and global value chains, looking at trade data in gross terms might not provide a clear enough picture of a country's comparative advantage. Surprisingly, as pointed out in the 2014 African

Economic Outlook (African Development Bank 2014), Africa's integration into global value chains is greater than one might have expected. It is the third most GVC(China Value Chain)-integrated region after North America and South East Asia. Expected medium- and long-run structural changes in China might further benefit Africa's increasing participation in global value chains. The expected halt in the growth of China's working-age population coupled with rising wages implies that China's attractiveness as a manufacturing hub is likely to decline (African Development Bank 2014). As suggested by Chandra *et al.* (2013), China might soon have 85 million light manufacturing jobs to export, and with the right policies in place, Africa might benefit from these opportunities.

III. Literature Review

The IMF's yearly Economic Spillover Reports initiated in 2011 contributed significantly to providing a continuous and reliable quantitative analysis of economic spillovers between countries, if any few studies have explored the impact of potential changes in China's domestic policies on the rest of the world in general, or on Africa in particular.

A. China's slowdown

As shown by the IMF (2014), China's economic slowdown is expected to have a larger impact on advanced economies than on emerging markets outside of Asia. On average, a 1 percentage-point slowdown in China can lead to a 0.15 percent slowdown in growth in advanced economies (most significantly, around 0.2 percent in Japan), but the overall impact on other emerging markets is expected to be smaller. Nevertheless, commodity-exporting emerging economies may be more significantly affected by terms-of-trade effects. These estimates are consistent with those reported in the literature. Among others, Duval *et al.* (2014)² also provide quantitative evidence that changes in China's

² Departing from previous studies, Duval *et al.* (2014) use value-added trade data to capture the extent of international spillovers, noting that gross trade data often misrepresent trade linkages between countries in the context of the increasing importance of global value chains.

growth patterns have sizeable international spillovers. They estimate that an increase of 1 percentage point in China's growth could increase GDP growth in the median Asian economy by about 0.3 percentage points after a year compared with 0.1 percentage points for the median non-Asian economy. Arora and Vamvakidis (2010) also estimate that a 1 percentage-point increase in China's growth is associated with an average 0.5 percentage-point increase in other countries' growth.

Using a structural Vector Autoregression (VAR) model for South Africa with data from 2000Q2~2014Q2, the World Bank (2015) estimate that 1 percentage-point reduction in China's growth would result in a 0.37 percentage-point decrease in output growth in South Africa in the short run. As pointed out by the authors, their results are consistent with those reported by Houssa *et al.* (2015).

In the same vein, Anderson *et al.* (2015) use a dynamic general equilibrium macroeconomic model (AFRMOD) to explore various impacts of China's transformation on SSA. Their results show that a cumulative real GDP loss of 2.6 percentage points in China could result in the decline of sub-Saharan African real GDP by about 0.2 percentage points compared to the past trends scenario. The authors also highlight the fact that regional aggregates conceal a wide range of country heterogeneity. More specifically, the real GDP of SSA commodity exporters (excluding Nigeria and South Africa) is found to fall by nearly 0.8 percent relative to the past trends scenario compared to only 0.01 percent for non-commodity exporters.

B. China's rebalancing

Ahuja and Nabar (2012) consider the impacts of rebalancing China's growth from investment to consumption. The authors emphasize the fact that due to the low import intensity of consumption in China, rebalancing away from investment toward consumption results in negligible spillover effects on trading partners. Accordingly, their results show that a 1 percentage-point decrease in investment in China could potentially lead to a reduction in global growth of just under 0.1 percentage point.

The results reported by Drummond and Liu (2015) are comparable for Sub-Saharan African countries. The authors use a fixed effects dynamic panel regression model and find that a 1 percentage-point increase in China's domestic investment growth is associated with an average 0.6 percentage-point increase in Sub-Saharan African countries' exports. This impact could be larger for resource-rich countries. Bandara

(2012) finds that SSA's exports to China and FDI from China have an impact on African countries' economic growth, however, this impact became smaller in their more recent sample period.

Busse *et al.* (2016) use a Solow-type growth model with panel data to consider the impact of Chinese trade, FDI, and aid on African countries and find that exporters of natural resources have benefited from positive terms-of-trade effects. However, they find no evidence that Chinese foreign investment and aid in Africa have an impact on growth.

In a scenario that captures China's economic reforms aiming to rebalance the sources of growth toward domestic demand from external demand, Anderson *et al.* (2015) find that 15 years after the reforms, commodity exporters (excluding South Africa and Nigeria) registered real consumption gains of about 6.5 percent over the baseline, driven by higher commodity wealth, higher domestic demand, and greater investment. Gains for commodity importers are expectedly lower, around 0.4 percent over the baseline³.

It is thus evident from the econometric literature that the economic ties between the two regions have important implications for Africa's growth prospects. The results reported by different studies are, however, highly sensitive to the data and methodology used in the estimation. VAR models are the most widespread specifications in the literature for estimating growth spillovers. Several studies use structural regression, while few use general equilibrium techniques. Their results are highly sensitive to the time period, data issues, and econometric specification. Moreover, one would expect general equilibrium model estimates that take into consideration supply and demand and factor market constraints to yield more moderate estimates than specifications that do not control for such factors.

IV. Implications of China's Transformation

Expected changes in China's economy present both challenges and opportunities for Sub-Saharan African countries. The planned rebalancing of growth away from

³ The rebalancing scenario captures different domestic reforms in China: (1) reducing government spending on unproductive investment by 3 percent of GDP; (2) reforms that increase TFP by 1.5 percent by 2024; and (3) the reduction of effective export subsidies by 3 percent of GDP over 6 years.

investment toward domestic consumption, coupled with the shift in Chinese growth away from external to domestic demand, is expected to have important effects on China's main economic partners, including Sub-Saharan African countries. Global general equilibrium models with well-defined economic linkages among different agents, trade, and current account flows are particularly well suited for analyzing economy-wide implications of such policy changes. The next sections describe the modeling framework and results of the simulations.

A. Methodology

The empirical analysis conducted here relies on LINKAGE, a global, multi-sector, multi-factor, dynamic Computable General Equilibrium (CGE) model developed by the World Bank's DEC Prospects Group (van der Mensbrugghe 2011 and 2013). LINKAGE is an ideal tool for analyzing the impact of policy changes that have repercussions on different facets of the domestic or global economy because it can take into consideration interactions between agents (consumers, producers, government, etc.), inter- and intra-industry linkages, domestic and foreign markets, and the interaction between supply, demand, and resource constraints.

CGE models are best thought of as tools for understanding the implications of different scenarios. Their rich structure enables them to capture complex inter-linkages between sectors and long-term developments in demand and supply. However, they cannot track short-term dynamics, and with the focus only on the developments in the real sphere of the economy, they cannot be used as forecasting tools. Furthermore, CGE models cannot be tested for statistical accuracy of forecasts in the same way as econometric models. In short, these are tools for scenario building, but not for forecasting.

The current version of LINKAGE largely relies on release 9 of the GTAP database (Narayanan *et al.* 2015). The database allows for a flexible aggregation of 141 countries/regions and 57 sectors. We cover 17 individual Sub-Saharan African countries and one SSA regional aggregate for the remaining countries. The rest of the world is represented by large countries such as China, India, and the United States as well as EU28 and regional aggregates (rest of high-income countries and rest of the world). Sectors have been aggregated to reflect the most important trade linkages between China and Africa

(at least 5 percent of trade with China) and represent agriculture, natural resources, food, high- and low-skill manufactures, and services (Appendix 1 and 2).

The core specification of the model replicates largely a standard global dynamic CGE model.⁴ Production is specified as a series of nested Constant Elasticity of Substitution (CES) functions for the various inputs; unskilled and skilled labor, capital, land, natural resources (sector-specific), energy, and other material inputs. LINKAGE uses a vintage structure of production that allows for putty, semi-putty capital. In the labor market, we assume constant participation rates and an unchanged unemployment rate. Labor market segmentation allows for rural–urban migration of unskilled workers.

Demand by each domestic agent is specified at the Armington level, i.e., demand for a bundle of domestically produced and imported goods. Armington demand is aggregated across all agents and allocated at the national level between domestic production and imports by the region of origin.

The standard scenario incorporates three closure rules. First, government expenditures are held constant as a share of GDP; the fiscal balance is exogenous, while direct taxes adjust to cover any changes in revenues to keep the fiscal balance at an exogenous level. The second closure rule determines the investment–savings balance. Households save a portion of their income, with the average propensity to save influenced by elderly and youth dependency rates as well as GDP per capita growth rates. The savings function specification follows Loayza *et al.* (2000) with different coefficients for developed and developing countries. Because government and foreign savings are exogenous, investment is savings driven. The last closure determines the external balance. We determine exogenously the foreign savings balance as a share of GDP in line with World Bank and DRC (2014) and therefore the trade balance. For most countries, we assume that foreign savings as a share of GDP decline to more sustainable levels by 2030. Hence, changes in trade flows result in shifts in the real exchange rate, but not in trade balances.

The model characterizes a few key dynamics. Population growth is based on the medium fertility variant of the UN's 2012 population projections. Labor-force growth is equated to the growth of the working-age population, defined here as the demographic cohort aged between 15 and 64 years. Investment is equated to the sum of domestic, government, and foreign savings. Capital accumulation is equated to the previous period's (depreciated) capital stock plus investment. Productivity growth in the past

⁴ Other well-known models in this class include the GTAP model (Hertel 1997) and CEPII's Mirage (Decreux and Valin 2007).

trends scenario is calibrated to achieve a given trend in long-term growth in line with historical and projected growth rates (i.e., up to 2018), and productivity growth remains fixed up to 2030 at the average level of 2011~2018.

B. Past trends scenario

The dynamic nature of the model allows us to determine the long-term impacts of the policies considered here. To examine the impact of slowdown and rebalancing separately, we need to create a hypothetical, unrealistic scenario where neither slowdown nor rebalancing take place. We refer to it as the past trends scenario. It initially tracks historical changes in macroeconomic variables such as real GDP growth, current account balance, and the share of investment in the total GDP from 2011 to 2015; then it assumes the growth rate to remain fixed at 7 percent up to 2030 and the share of investment and consumption in GDP to remain at the level in 2015. We view our slowdown and rebalancing scenario as the realistic one. It also tracks the historical GDP, investment, and current account developments up to 2015 and then follows the evolution of these up to 2018 based on projections reported in the latest version of the Global Economic Prospects (World Bank 2015b). Finally, for 2019~2030, we rely on the scenario from World Bank–DRC (2014) and refine further the slowdown and rebalancing scenario in China by defining the growth rates, the evolution of Chinese investment, consumption, and sectoral composition of value added up to 2030.

This hypothetical past trends scenario is aimed to reflect past growth trends of the Chinese economy. First, it is assumed that China will continue to grow at an average annual growth rate of 7 percent until 2030. Second, the share of investment in total GDP remains constant at its 2015 level at 46.7 percent until 2030. Finally, we impose no explicit structural shift in the Chinese economy to boost the share of the services sector as a share of the total value added. It is important to note that, while it is a convenient benchmark, this scenario assumes a continuation of the unsustainable, investment-based growth model in China and, therefore, the true benefits of the transition may be underestimated.

Figure 4 indicates that with a constant 7 percent growth rate, the Chinese economy is expected to reach 27.9 trillion US dollars by 2030, accounting for about 21 percent of the global GDP (measured in 2011 constant prices). In line with past trends, the share of

different GDP components is not expected to change significantly over time: household consumption and investment are assumed to account for around 34 percent and 46 percent of the total GDP, respectively.

The economy growth of the Sub-Saharan African region is anticipated to grow more than double from 1.7 trillion US dollars to 4.1 trillion US dollars by 2030 with an underlying average annual real GDP growth rate of 6 percent and GDP per capita growth of 3.7 percent.⁵ As a result, SSA's share of the global economy will increase from the current 2 percent to 3 percent by 2030. The share of investment in the total GDP is expected to increase slightly to the detriment of private consumption.

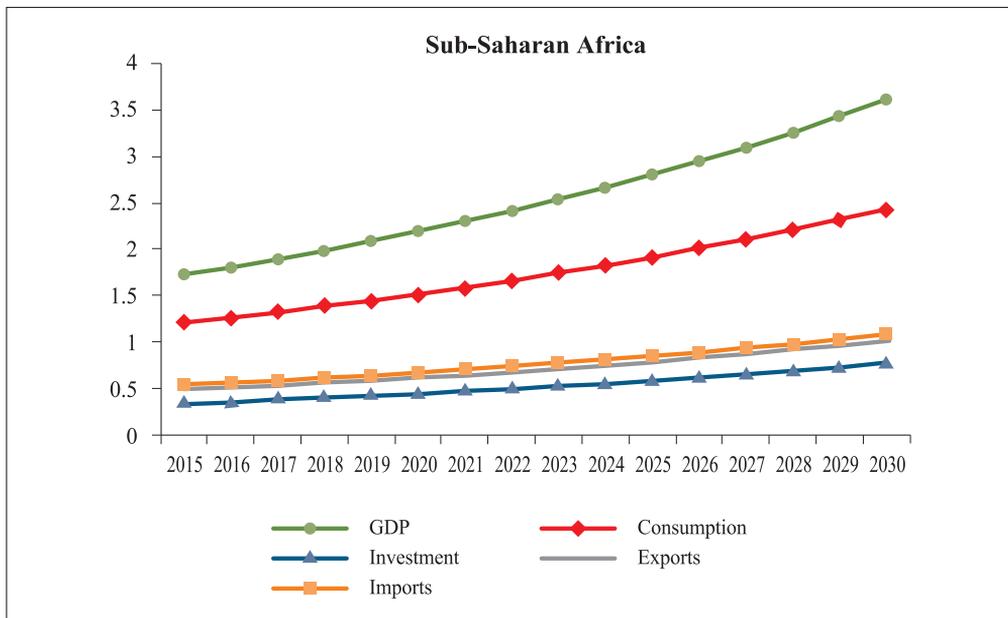
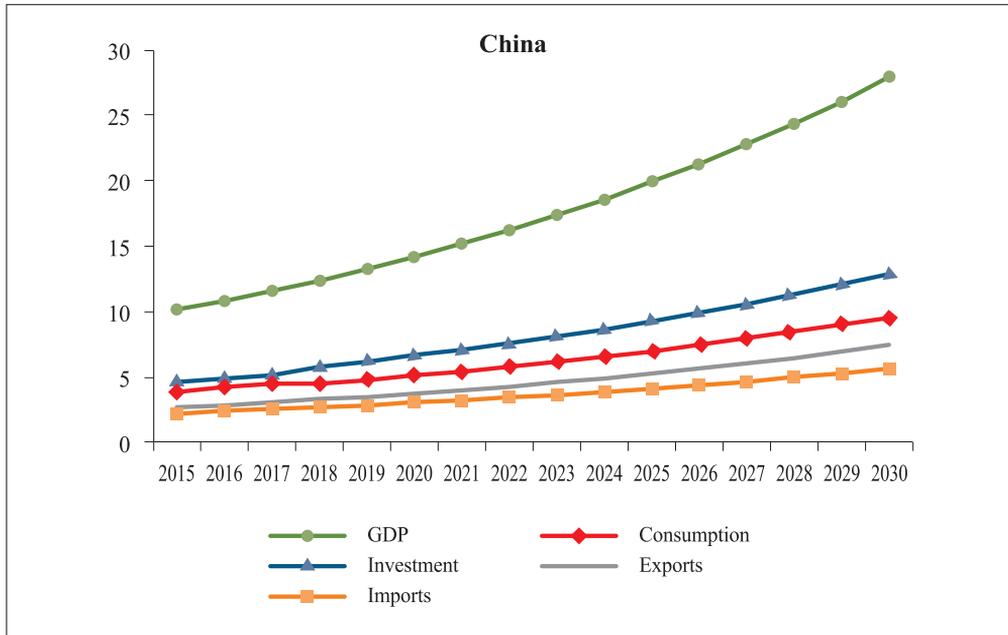
The fastest growing regions are expected to be Mozambique, Cote d'Ivoire, and Kenya with average yearly GDP per capita growth of 5.7, 5.4, and 5.4 percent, respectively. At the other extreme, Madagascar and Namibia will grow slower than the regional average, with projected annual growth of GDP per capita of 1.8 percent and 2.5 percent, respectively, during 2015~2030. Over the same time horizon, the two biggest economies in the region will grow at different pace, thus altering the composition of SSA's regional GDP; as highlighted in Figure 4, Nigeria is expected to gain more intra-regional market share by growing from 29 percent to 38 percent of SSA's GDP, just as South Africa's economy shrinks from 25 percent to 17 percent.

To shed light on the different transmission channels of China's expected structural transformation on SSA, we consider the following separate scenarios and compare the results with those reported in the past trends scenario: (1) slowdown and (2) rebalancing in China.

⁵ The past trends scenario is based on high historical growth rates in SSA; however, the main findings of this analysis would have been unchanged if a lower growth rate had been applied.

Figure 4. Past trends scenario for China and Sub-Saharan Africa

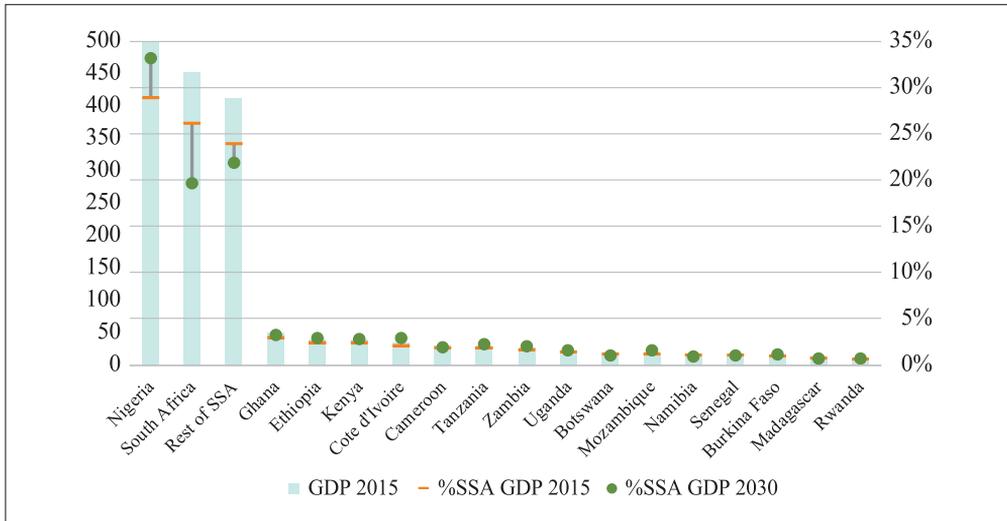
(Constant trillions US dollars, 2011)



(Source) LINKAGE simulations

Figure 5. Past trends scenario: Structure of SSA's GDP

(Million US dollars, 2015 and 2030)



(Source) LINKAGE simulations

C. Impacts of China's slowdown

The slowdown scenario aims to explore endogenous growth spillovers between China and Sub-Saharan African countries in the context of China's anticipated growth changes. China's growth is assumed to gradually slow down from the current 7 percent to 4.6 percent by 2030 (as in World Bank 2014 past trends scenario), resulting in a cumulative real GDP loss of 13.5 percent over a 15-year time horizon. This setting is equivalent to a still relatively high 6 percent average annual growth rate over 2015~2030.

Results show that the spillovers from China's slowdown onto the rest of the world are relatively small, resulting in a GDP loss of 0.6 percent relative to the past trends scenario by 2030 (645 billion US dollars). The impact on the SSA region is found to be more pronounced and is expected to result in GDP that is 1.1 percent or about 43 billion US dollars lower than in the past trends scenario by 2030 (Figure 6).⁶

⁶ It is important to emphasize that because of the nature of the modeling framework used here, we only capture real effects of China's transformation, i.e., those associated with real linkages between the two regions through trade. Financial markets and their impact on these economies are not explicitly modeled. Furthermore, the impact of investment linkages lacks a bilateral dimensions and is limited by assumptions about fixed current accounts.

As depicted in Figure 7, slower growth in China also significantly impacts demand for foreign goods, resulting in a decrease of 12.3 percent (667 billion US dollars) of worldwide exports to China compared to 10.9 percent for Sub-Saharan African countries (25 billion US dollars).

China's slowdown is expected to further contribute to the downward pressure on the world price of commodities; the world price of agricultural, food, and natural resource commodities are estimated to fall by 2.9 percent, 1 percent, and 0.3 percent by 2030 relative to the past trends scenario. As world prices decline, terms of trade for net agricultural, food, and natural resource commodity exporters' deteriorate (Figure 8). While these effects are as expected in terms of the direction of changes, they could be considered as lower-bound estimates. These commodity price declines are in line with the stream of literature represented, among others, by Villoria (2009) and Roache (2012), who find that China's growth does not necessarily translate into significant pressures on world commodity prices. Villoria (2009) explores the possibility of China affecting SSA's agricultural exports through higher world agricultural prices and finds that although China has moderately increased agricultural prices in an aggregated sense, SSA's exports do not seem to have benefited from these price increases.

In this modeling framework, trade is the most significant channel of transmission of economic spillovers; therefore, we proceed with further decomposing aggregate impacts by sectors and regions to gain a better understanding of why certain Sub-Saharan African regions are more affected than others.

As highlighted in Figure 9, a slowdown in China leads to the decline in the world price of agricultural products by 2.9 percent relative to the past trends scenario by 2030, followed by that of food products by 1 percent. As world prices decline, terms of trade of net agricultural, food, and natural resource commodity exporters' decrease. Depending on a country's aggregate and sectoral share of trade with China, country-level results can vary significantly. As highlighted in Figure 6, countries that have most to lose from China's slowdown are Madagascar, Cameroon, and Ethiopia with expected GDP losses of 2.4 percent, 2.2 percent, and 1.7 percent compared to the past trends scenario in 2030. A closer look at the sectoral export shares of these countries reveals the importance of agricultural and natural resource commodities as a share of their total exports to China. Cameroon's main exports to China in 2011 were petroleum crude oil, wood, and cotton products accounting for about 80 percent of total exports. In the case of Ethiopia, the diversification of products exported to China is even lower. Sesame seeds were the main export product, comprising approximately 76 percent of total exports. Finally, for

Madagascar, the data reveal that natural resource products such as zirconium, chromium, and titanium ores constitute 71 percent of their exports to China. Given this low export diversification, as world prices for their main exports decline, these countries face the most significant terms of trade losses of 2.3 percent, 3.4 percent, and 1.9 percent relative to the past trends scenario by 2030 (Figure 8), which in turn translates into GDP losses. In contrast, Sub-Saharan African regions not expected to be significantly affected by China's slowdown are Botswana, Uganda, and Cote d'Ivoire. For all of these, the lower than average spillovers can be explained by the low share of their exports sent to Chinese markets (Figure 2), i.e., an estimated 2 percent, 6 percent, and 2 percent of total exports, respectively.

Our earlier work based on a similar methodology (World Bank 2015a) found that a persistent slowdown in the BRICs (with an average GDP rate about three percentage points lower than that in the past trends scenario), would reduce Sub-Saharan African countries' GDP by 4 percent by 2025. These results are higher than those presented here, mainly because the magnitude of the slowdown was higher; the slowdown took place in all BRICS economies, including South Africa, which is the second biggest economy in SSA with strong ties to the region, and finally, these estimates did not include the impact of rebalancing.

Estimates of growth spillovers reported here are broadly consistent with those found in the empirical literature. We estimate that a 1 percentage-point slowdown in China can lead to 0.12 percent slowdown in SSA. IMF (2014) estimate that on average, a 1 percentage-point slowdown in China can lead to a 0.15 percent slowdown in the growth of advanced economies (most significantly, around 0.2 percent in Japan), while the overall impact on other emerging markets is expected to be smaller. Duval *et al.* (2014) show that a 1 percentage-point increase in China's growth could increase the GDP growth in the median Asian economy by about 0.3 percentage points after a year, compared with 0.1 percentage points for the median non-Asian economy. Results from Arora and Vamvakidis (2010) are on the higher end, estimating that a 1 percentage-point increase in China's growth is associated with an average 0.5 percentage-point increase in the growth of other countries.

D. Impacts of China's rebalancing

The objective of the rebalancing scenario is to decompose further the impacts of China's economic transformation and separate the impacts of a general economic slowdown from the more structural changes expected to occur in the Chinese economy. The rebalancing strategy is implemented through two major channels. First, following the World Bank (2014)'s China Urbanization past trends scenario, we assume that the share of investment in total GDP gradually falls from 46.7 percent to 35.5 percent in 2030, while the difference accrues to household consumption. Second, structural shifts in the Chinese economy allow the importance of the services sector to grow as a share of total value added from 50 percent in 2015 to 61 percent in 2030. In line with this rebalancing strategy, household consumption is anticipated to overtake investment in terms of share of total GDP; a change that our assumptions posit will materialize in the year 2024. China's growth rate is assumed to be the same as in the slowdown scenario, i.e., an average of 6 percent per year over 2015–2030.

Compared to the slowdown scenario that leads to global losses, rebalancing in China is shown to be beneficial for both the rest of the world and SSA, with GDP gains of 5.5 percent and 6 percent relative to the past trends scenario by 2030 (Figure 6). With great simplification, this contrast may be understood from the perspective of a production frontier curve between consumer and investment goods. A slowdown or contraction implies an inward shift of the production transformation curve, resulting in losses in both consumer and investment goods, thereby implying a reduction in overall productivity and potential output. A rebalancing, on the other hand, tilts the production curve toward consumer goods and away from investment goods. It does not necessarily imply a contraction, but rather a reallocation of resources in the favored sector (i.e., the production curve and its expansion path shift). Moreover, it does not preclude an expansion of the new and tilted output curve, albeit at a slower pace because capital in the economy will not be growing as fast as in the past. For the rest of the world to benefit from this shift and resulting relative price changes, global supply must be able to respond by reallocating resources toward the new sources of consumer demand from China. The significant changes that must occur to bring about the positive effects are driven by numerous factors.

Rebalancing in China boosts private consumption and thus implicitly increases demand for imported products because consumption demand is more import-intensive

than investment.⁷ This change benefits the rest of the world through higher demand for their exports. In particular, the rebalancing scenario sees Chinese consumers demanding significantly more services, both domestic and imported, leading to expansion of imports of services by China. At the same time, with Chinese production shifting toward services, domestic production of agricultural, natural resource, and manufacturing goods is replaced to some extent by increased imports of these products in order to satisfy domestic demand. Furthermore, higher consumer demand biased toward services will drive up the prices of non-tradable goods relative to tradable goods, which will lead to real exchange rate appreciation of 15 percent by 2030. All these mechanisms contribute to a significant increase of imports into China.

Our results indicate that rebalancing away from investment toward consumption is expected to have significant positive effects on China's external demand. World exports to China are expected to increase 7.9 percent (425 billion US dollars) at a rate faster than that in the past trends scenario, whereas SSA's exports to China are found to increase 13.2 percent (30.6 billion US dollars) at a rate faster than that in the past trends scenario by 2030 (Figure 7). For the same period, SSA's imports from China are estimated to be 11 percent (25.8 billion US dollars) higher than in the past trends scenario (Figure 7).

As in the case of the estimated impact of China's slowdown, country-level estimates vary. SSA countries that are expected to benefit the most from China's rebalancing are Kenya, Madagascar, and Nigeria, which will enjoy additional GDP gain of 7.5 percent, 6.9 percent, and 6.5 percent compared to the past trends scenario by 2030, respectively (Figure 6). In the case of Madagascar and Nigeria, the higher-than-average gains can be traced back to the prevalence of agricultural and natural resource products as a share of their exports to China (see discussion above for the slowdown scenario). Given that rebalancing in China leads to an increase in the world price of agricultural and natural resource products by 5.4 percent and 4.4 percent relative to the past trends scenario by 2030 (Figure 9), terms of trade for Madagascar and Nigeria improve by 2.9 percent and 1.7 percent, respectively, leading to above-average GDP gains. In the case of Kenya, the prevalence of the services sector in their total exports to China (40 percent) explains the gains. They are driven by the increased demand for services by China; the price of services products expands by 5.8 percent relative to the past trends scenario and thus

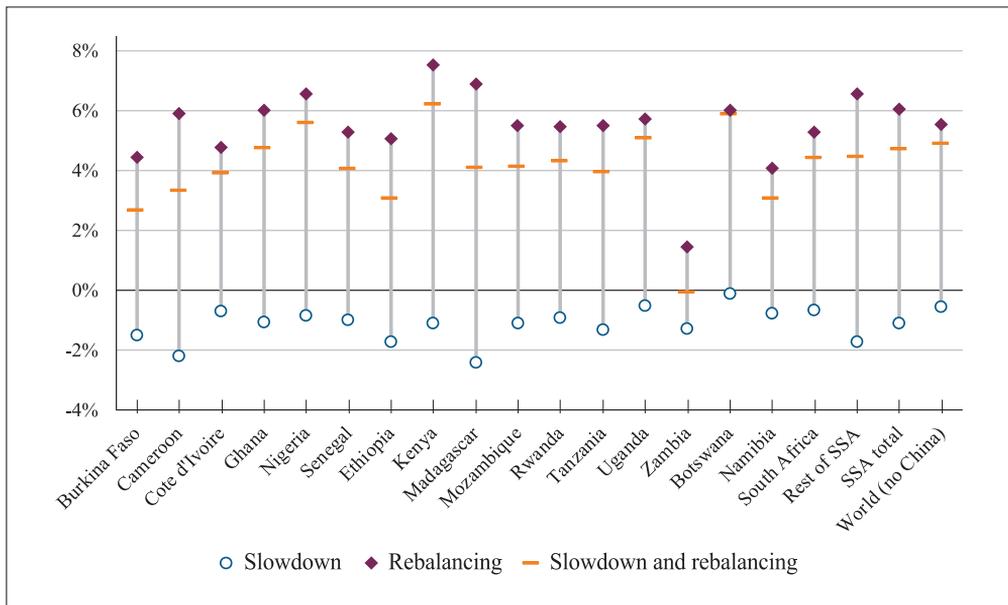
⁷ GTAP v. 9 data indicates that in 2011, private consumption in China was relatively more intensive in imported commodities than the formation of gross fixed capital. The biggest component of the formation of capital goods in China are construction services (54 percent), which are not much traded. These data are consistent with the WIOD database, where the share of imports in final consumption (5 percent) is only slightly lower than the share of imports in gross fixed capital investment (6 percent).

improves Kenya's terms of trade and GDP.

Previous empirical estimates of spillover impacts resulting from China's domestic rebalancing are less numerous and paint a picture of contradictory results. Contrary to measuring growth spillovers, the exact implications of China's rebalancing is still open for interpretation, and given the lack of an existing natural experiment, the effects are much harder to capture. Out of the studies discussed in the literature review section, our results are very much in line with the most recent analysis by Anderson *et al.* (2015), who find real GDP gains of 1 percent and real consumption gains of about 6.5 percent over the baseline for commodity exporters (excluding South Africa and Nigeria), driven by higher commodity wealth, higher domestic demand, and greater investment. The real GDP of commodity importers is barely affected.

Figure 6. GDP

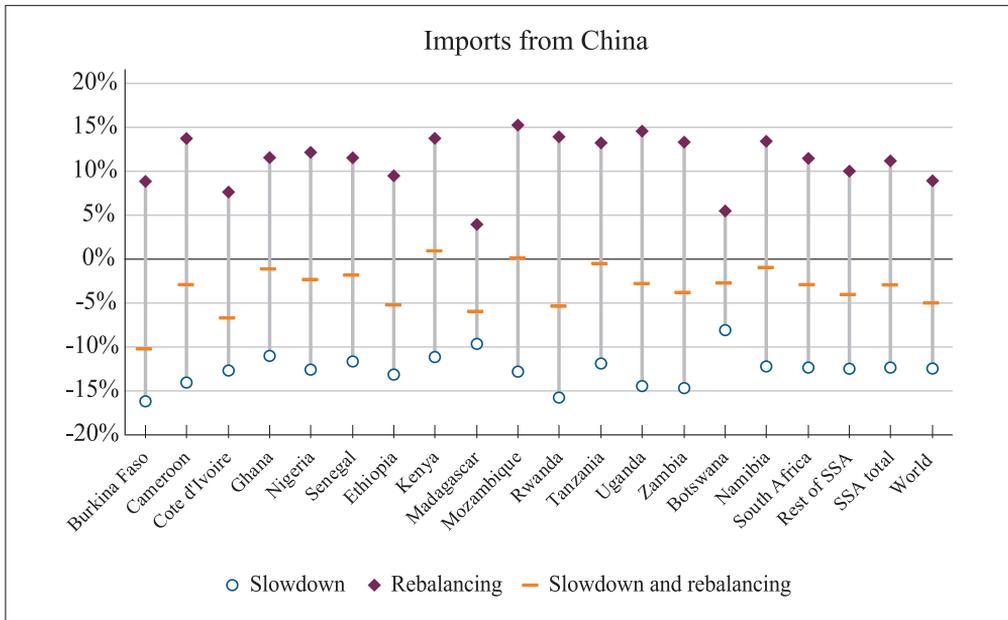
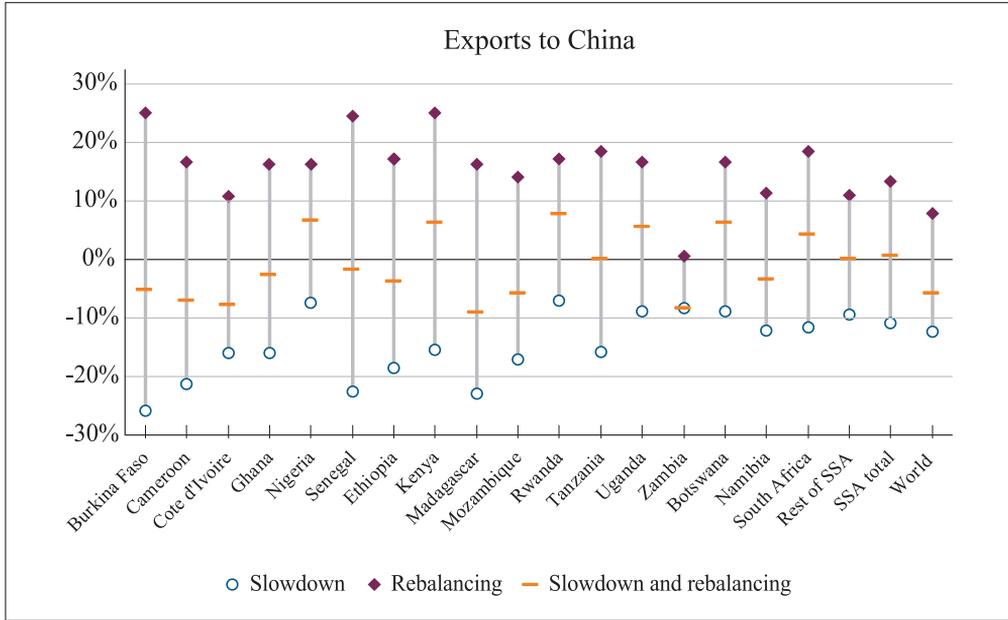
(Percent change relative to past trends scenario)



(Source) LINKAGE simulations

Figure 7. SSA–China bilateral trade

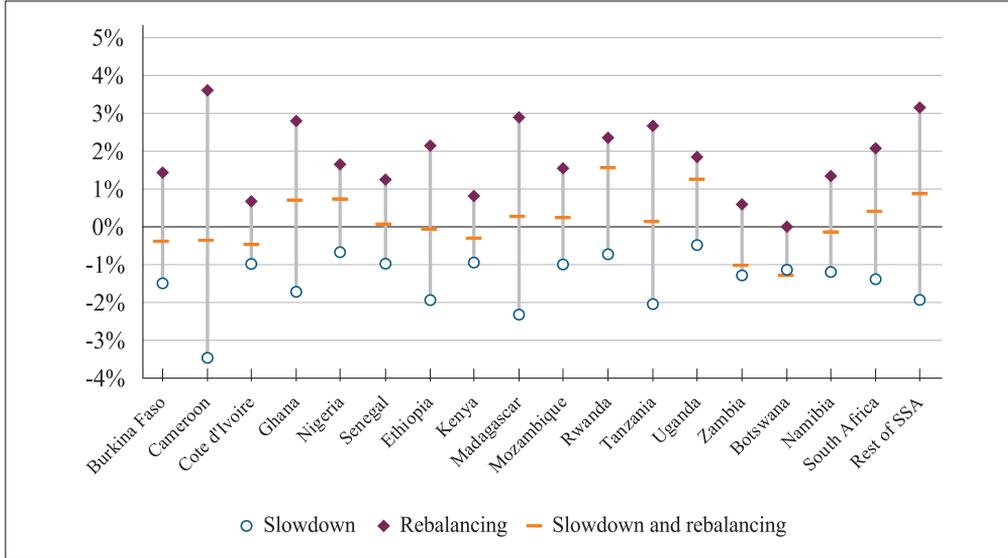
(Percent change relative to the past trends scenario)



(Source) LINKAGE simulations

Figure 8. Terms of trade effects

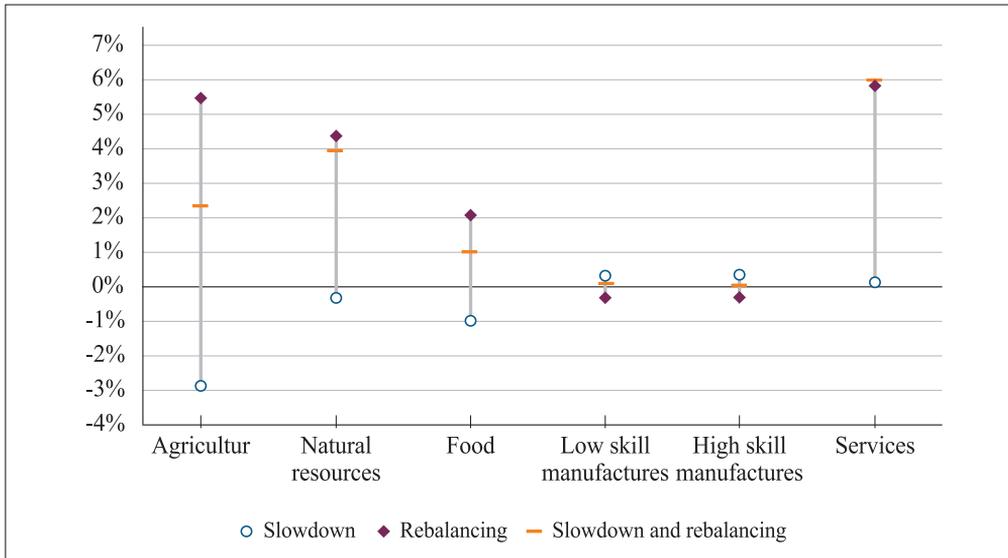
(Percent change relative to the past trends scenario)



(Source) LINKAGE simulations

Figure 9. World prices

(Percent change relative to the past trends scenario)



(Source) LINKAGE simulations

E. Impacts of China's slowdown and rebalancing

Finally, we consider the impacts of both slowdown and rebalancing. Our results indicate that China's transformation, if it entails substantial rebalancing, is expected to have an overall positive impact on the global economy and SSA's economy. We find that the negative impacts of China's slowdown are outweighed by positive changes brought by rebalancing because it entails higher overall imports by China and positive terms-of-trade effects for exporters of agricultural commodities. An average annual 1 percent GDP slowdown in China results in a 0.12 percent GDP decline in SSA and a 0.03 percent decline globally. However, if accompanied by a substantial rebalancing as envisaged by the World Bank (2014)'s past trends scenario, the average annual growth rate could instead be higher on an average by 0.34 percent in SSA and 0.36 percent globally. China's transformation is expected to be beneficial for both the rest of the world and SSA, with GDP gains of 4.8 percent and 4.7 percent, respectively, relative to the past trends scenario by 2030.

Countries that benefit the most are the ones that enjoy the highest relative gains from China's rebalancing i.e., Kenya, Botswana, and Nigeria, which should experience 6.2 percent, 5.8 percent, and 5.5 percent increases in GDP by 2030. Zambia, a big copper exporter, is shown to be the only SSA country that experiences small overall losses from China's transition. Decrease in the world price of these products as a result of China's switch from an investment- to consumption-based growth model, terms of trade and GDP gains for Zambia are small in the rebalancing scenario.

V. Poverty and Inequality

The effects of these different scenarios on poverty and income distribution are analyzed using the Global Income Distribution Dynamics (GIDD) model. The GIDD is a top-down macro-micro simulation framework that distributes a consistent set of price and volume changes from a CGE model into household surveys (Bussolo, De Hoyos and Medvedev 2010, Bourguignon and Bussolo 2013). Counterfactuals for income distribution are obtained by applying the following changes to the initial distribution

observed on household level data: (1) demographic changes⁸ (considering the age-gender structure and improvements in education); (2) sectoral employment relocation; (3) changes in relative wages across skills and sectors; (4) growth in consumption per capita; and (5) relative changes in food and non-food prices. Recent applications using LINKAGE and GIDD include the effect of agriculture distortions in the global economy (Dessus, Herrera, and de Hoyos 2008, Bussolo *et al.* 2009), the effect of global growth and income distribution (Bussolo *et al.* 2012), the effect of demographic change on Africa (Ahmed *et al.* 2016), and external and internal shocks in Africa (Devarajan *et al.* 2015).

We employ a large sample of 130 household surveys, covering approximately 90 percent of global population and global GDP. The GIDD model allows the analysis of macro shocks on the World Bank's twin goals of reducing extreme poverty and promoting shared prosperity. Moreover, the richness of the micro data can provide insights regarding regional and demographic characteristics of the most affected households, which can be useful for defining contingent policies.

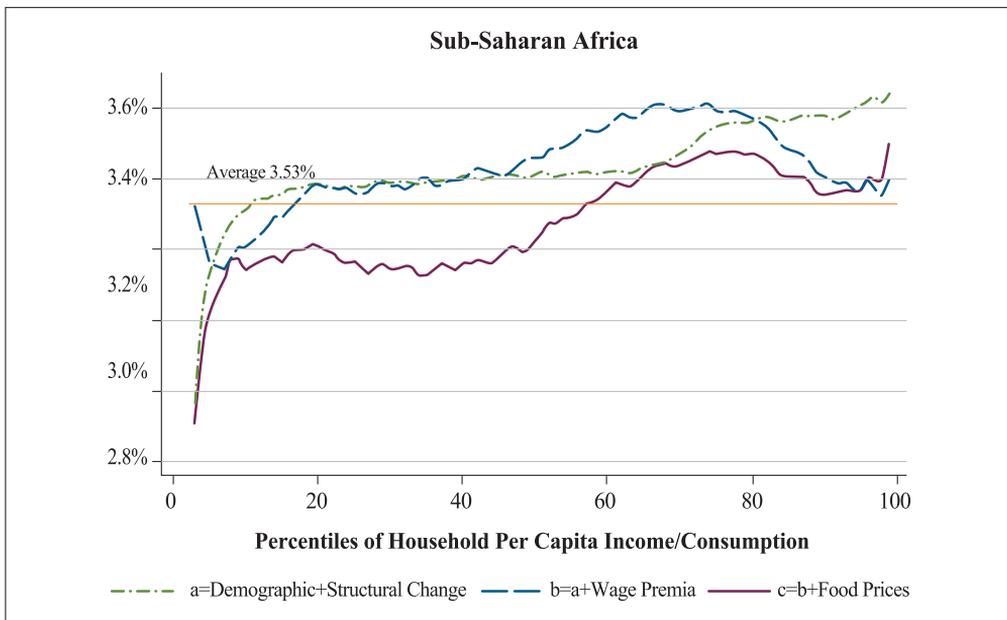
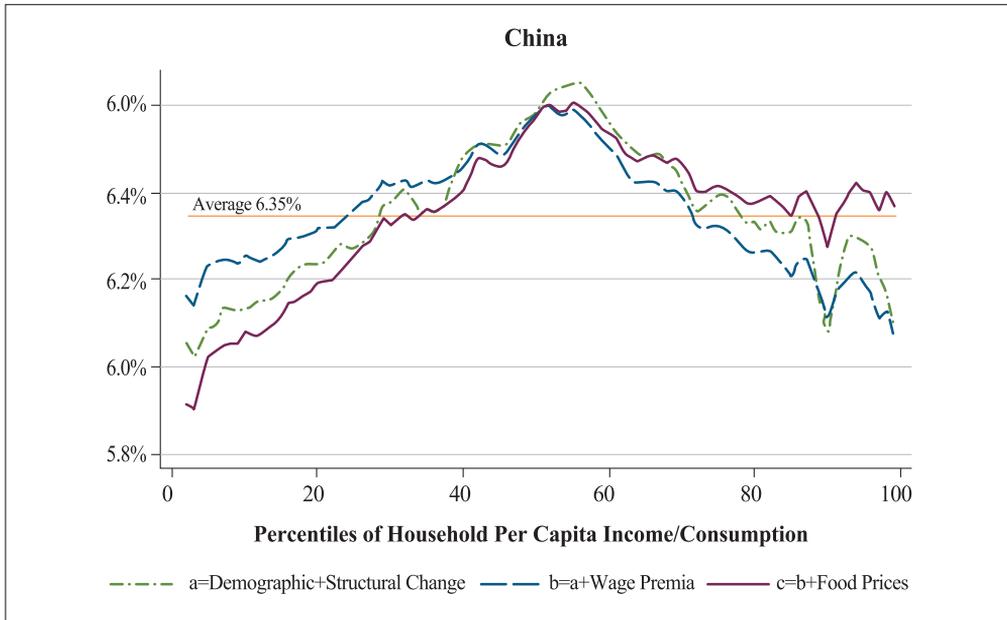
Figure 10 decomposes changes in the past trends scenario into three components, which correspond to the micro-simulation framework. The starting point is the flat red line, which corresponds to a distribution-neutral simulation from 2011 to 2030. In a distribution-neutral simulation, only a change in per capita growth is applied. The second step corresponds to demographic and structural changes (inter-sectoral labor shifts), marked by letter *a*. In China, these changes relatively benefit households in the middle of the income distribution, but in SSA, demographic and structural changes slightly benefit households at the top of the income distribution. Third, households in the bottom 40 percent (B40) in China benefit from higher relative wages, while households in SSA are hurt. This result is shown in Figure 10 via the movements from curve *a* to curve *b*. Finally, changes in relative prices of food to non-food will more drastically affect consumers in the lower part of the income distribution in both China and SSA. The final distributional effects from 2011 to 2030 are depicted by the growth incidence curves marked by letter *c*.

In China, extreme poverty would almost be completely eradicated even under the most pessimistic assumptions. With an initial poverty headcount of 6.49 percent in 2012,

⁸ The GIDD methodology updates the household survey data for the end year of our simulation, 2030. This is done by re-weighting the population characterized by most recent available household survey in GIDD using non-parametric cross-entropy methods as in Wittenberg (2010) maintaining consistency with the UN 2012 population projections.

Figure 10. Growth incidence curves for China and SSA, past trends scenario

(2011~2030)



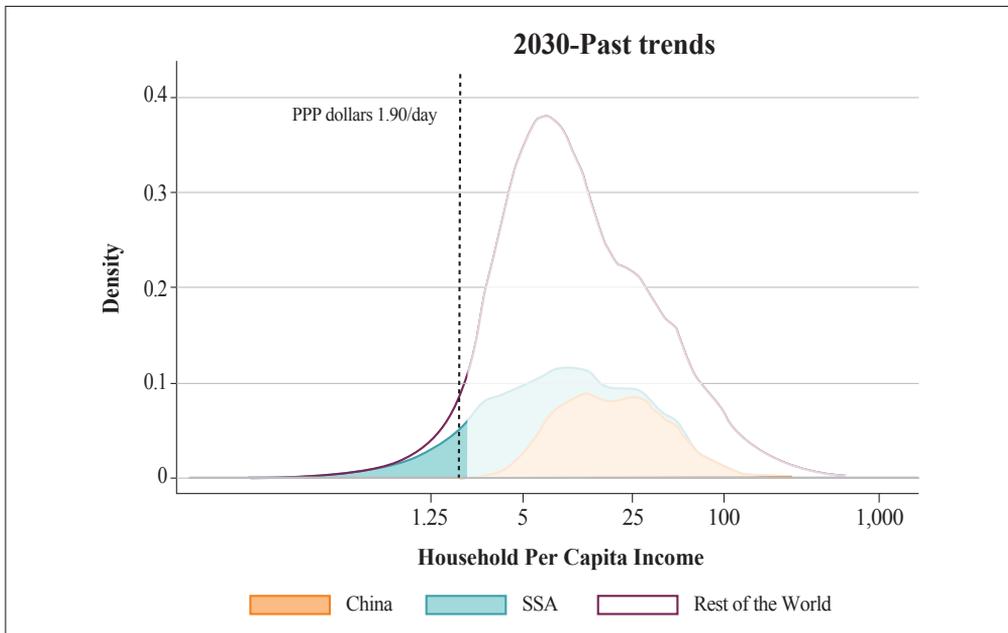
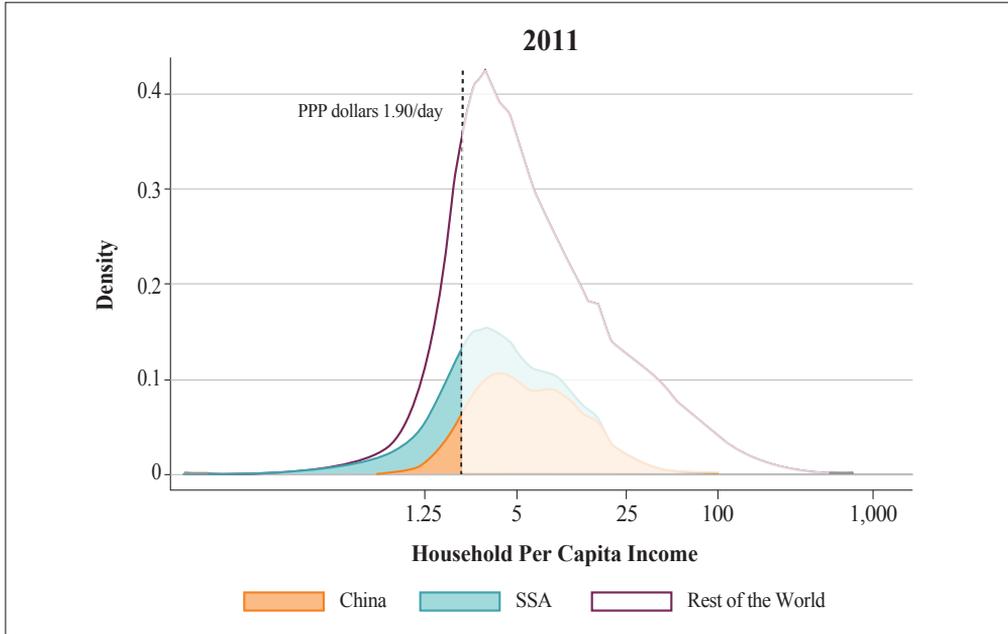
(Source) Authors' calculations

simulations suggest that even moderate per capita income growth would be sufficient to lift the large majority of China's remaining 87.4 million poor out of poverty. Table 3 reports initial and simulated poverty and shared prosperity indicators for each one of our scenarios. Under the past trends scenario's conditions, per capita income growth for B40 in China is expected to grow at an annual rate of 6.19 percent, which is slightly lower than the 6.35 percent national average. The emergence of China's global middle class is fully revealed in Figure 11, which depicts the global distribution of income for 2012 and 2030, with the latter showing the slowdown and rebalance scenario. By 2030, 66.1 percent of the Chinese households would enjoy a per capita daily income between 10 to 50 US dollars a day, starting from 23.5 percent in 2012. From a global perspective, China would have a net contribution of 620 million to the global middle-class earning between 10 to 50 US dollars a day.

For the case of SSA, the prevalence of extreme poverty would be reduced from 43.73 percent in 2012 to 19.83 percent by 2030. During this period, SSA will experience a rapid population increase of 60 percent, reaching 1.216 billion. Under the past trends scenario, approximately 333 million would still be living with less than Purchasing Power Parity (PPP) 1.90 dollars /day. Results also suggest that China's transformation is expected to increase the income of B40 across SSA countries (Figure 12) and lower poverty by an additional 4.0 million by 2030 (Table 3). This net decrease is the outcome of two opposite trends. On the one hand, the isolated effect of slowdown increases extreme poverty in SSA (+2.45 million), while rebalancing helps to reduce it (-7.18 million). The combined effect of slowdown and rebalancing leans toward reducing poverty, although the magnitude of these effects varies across countries given its overwhelming dependence on the trade intensity with China. Despite the fact that extreme poverty would be halved by 2030 in SSA, a large proportion of the population would still be living in vulnerable conditions. Given the combined effects of China's slowdown and rebalancing, 64 percent of the total population in SSA, or 785 million, would be living on a daily income between PPP 1.90 dollars and PPP 10.00 dollars a day in 2030. The full set of country poverty and shared prosperity impacts is presented in Table C in Appendix.

Figure 11. Global income distribution

(PPP dollars per day, log scale, 2011 and 2030)



(Source) Authors' calculations

Table 3. Poverty and shared prosperity results

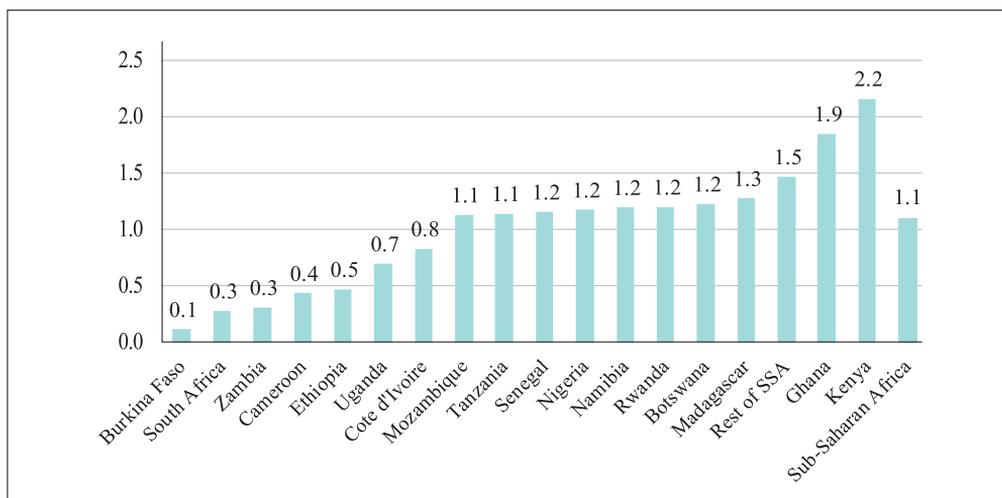
Indicator/Scenario		Initial*	Past trends	Slowdown	Rebalancing	Slowdown + Rebalance
Poverty Headcount (PPP dollars 1.90/day), %	China	6.49	0.07	+0.02	-0.03	-0.03
	<i>Sub-Saharan Africa</i>	43.73	19.83	+0.20	-0.59	-0.33
Poverty (millions)	China	87.44	0.95	+0.23	-0.38	-0.38
	<i>Sub-Saharan Africa</i>	332.83	241.19	+2.45	-7.18	-4.00
Daily per capita income (PPP dollars)	China	7.71	6.35	5.63	7.69	6.97
	<i>Sub-Saharan Africa</i>	3.71	3.53	+3.50	+3.63	+3.60
Daily per capita income of B40 (PPP dollars)	China	2.79	6.19	5.51	7.55	6.88
	<i>Sub-Saharan Africa</i>	1.22	3.33	+3.28	+3.43	+3.38

(Note) Sub-Saharan Africa: Based on countries with available household survey data and data from World Population Prospects (2012).

(Source) Global Income Distribution Dynamics.

Figure 12. Bottom 40 percent in Africa could benefit from China's rebalancing

(%)



(Source) Authors' calculations.

VI. Conclusions

Given China's importance in the global economy, the anticipated transformation of its economy will have important repercussions for the global economy as a whole, with varying consequences for individual economies. This paper aims to quantify the impact of a changing China on the rest of the world with a special focus on SSA as well as to disentangle the effects of China's predicted slowdown from the rebalancing away from investment toward domestic consumption. Results show that a Chinese economic transformation that entails substantial rebalancing is expected to have an overall positive impact on the global and Sub-Saharan as African countries' economy, with the negative impacts of China's slowdown expected to be outweighed by the positive changes induced by rebalancing. Overall, our results indicate that China's transformation could translate into GDP gains of 4.8 percent and 4.5 percent by 2030 relative to the past trends scenario for the rest of the world and SSA, respectively. Furthermore, rebalancing is shown to reduce the prevalence of poverty in SSA compared with the isolated negative effect of a slowdown, which increases the incidence of poverty. For SSA, the combined effect of slowdown and rebalancing leans toward poverty reduction, but the extent of this intensity varies by country.

A closer look at the drivers of the heterogeneity in country-level estimates points toward important policy implications. SSA countries have numerous policy options that will allow them to minimize the losses from China's slowdown and maximize the benefits of rebalancing. First, it is implied that the lack of diversification of production and exports may exacerbate negative terms-of-trade shocks. Policies that encourage diversification while simultaneously supporting countries in their comparative advantages could help countries avoid the negative impacts of China's slowdown. For resource-rich countries, these would imply, for instance, policies that support increasing the depth of processing of exports or developing services sectors. Economic policies that will boost SSA's gains from China's rebalancing relate to improving its integration in global value chains. As highlighted by IMF (2015), the quality of infrastructure is the most important impediment to the expansion of exports from the region, followed by governance, overall business climate, and availability of credit to the private sector.

Results reported in this paper are novel in that they highlight that rebalancing in China is expected to have much more significant impacts on the rest of the world than the anticipated slowdown. In addition, the poverty and shared prosperity implications

are uniquely derived. Future studies could focus on assessing the costs and benefits of various policy responses to identify ways in which countries could enhance the benefits they could derive from China's upcoming transformation.

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Appendix 1: Sectoral classification

Agriculture	Paddy rice, Wheat, Cereal grains nec, Vegetables, Fruit, Nuts, Oil seeds, Sugar cane, Sugar beet, Plant-based fibers, Crops nec, Bovine cattle, Sheep and Goats, Horses, Animal products nec, Raw milk, Wool, Silk-worm cocoons, Forestry, Fishing
Natural resources	Coal, Oil, Gas, Minerals nec, Petroleum, Coal products
Food products	Bovine meat products, Meat products nec, Vegetable oils and fats, Dairy products, Processed rice, Sugar, Food products nec, Beverages, and Tobacco products
Low skill manufacturing	Textiles, Wearing apparel, Leather products, Wood products, Mineral products nec, Ferrous metals, Metals nec, Metal products, and Manufactures nec
High skill manufacturing	Paper products, Publishing, Chemical, Rubber, Plastic products, Motor vehicles and parts, Transport equipment nec, Electronic equipment, Machinery and equipment nec
Services	Electricity, Gas manufacture, distribution, Water, Construction, Trade, Transport nec, Water transport, Air transport, Communication, Financial services nec, Insurance, Business services nec, Recreational and other services, Public administration, Defense, Education, Health, Dwellings

Appendix 2: Regional classification

Botswana	Botswana
Burkina Faso	Burkina Faso
Cameroon	Cameroon
China	China, Hong Kong
Cote d'Ivoire	Cote d'Ivoire
Ethiopia	Ethiopia
EU28 + EFTA	Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom, Switzerland, Norway, Rest of EFTA, Bulgaria, Croatia, Romania
Ghana	Ghana
India	India
Kenya	Kenya

(continued)

Madagascar	Madagascar
Mozambique	Mozambique
Namibia	Namibia
Nigeria	Nigeria
Rest of high income	Australia, New Zealand, Japan, Korea Republic of, Taiwan, Singapore, Canada, Rest of North America, Russian Federation, Bahrain, Israel, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates
Rest of Sub Saharan Africa	Benin, Guinea, Togo, Rest of Western Africa, Zimbabwe, Central Africa, South Central Africa, Malawi, Mauritius, Rest of Eastern Africa, Rest of South African Customs Union
Rest of the world	Rest of Oceania, Mongolia, Rest of East Asia, Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Philippines, Thailand, Viet Nam, Rest of Southeast Asia, Bangladesh, Nepal, Pakistan, Sri Lanka, Rest of South Asia, Mexico, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela, Rest of South America, Costa Rica, Guatemala, Honduras, Nicaragua, Panama, El Salvador, Rest of Central America, Dominican Republic, Jamaica, Puerto Rico, Trinidad and Tobago, Caribbean, Albania, Belarus, Ukraine, Rest of Eastern Europe, Rest of Europe, Kazakhstan, Kyrgyzstan, Rest of Former Soviet Union, Armenia, Azerbaijan, Georgia, Iran Islamic Republic of, Jordan, Turkey, Rest of Western Asia, Egypt, Morocco, Tunisia, Rest of North Africa, Rest of the World
Rwanda	Rwanda
Senegal	Senegal
South Africa	South Africa
Tanzania	Tanzania United Republic of
Uganda	Uganda
United States of America	United States of America
Zambia	Zambia

Appendix 3: Poverty and shared prosperity results in China and Sub-Saharan African countries

Indicator/Scenario	Initial*	Past trends	Slowdown	Rebalancing	Slowdown + Rebalancing
Poverty Headcount* (PPP 1.90 dollars/ day, % of population).					
<i>(Initial, past trends, and p.p. deviations w.r.t past trends)</i>					
Botswana	13.45	4.19	+0.04	+0.00	-0.02
Burkina Faso	46.48	10.19	+0.30	-0.32	-0.15
Cameroon	27.05	7.82	+0.58	-0.85	-0.10
China	6.49	0.07	+0.02	-0.03	-0.03
Cote d'Ivoire	27.7	2.55	-0.01	-0.12	-0.05
Ethiopia	29.18	5.75	-0.17	-0.16	-0.30
Europe	1.95	1.72	0.00	0.00	0.00
Ghana	12.7	4.83	+0.07	-0.15	-0.01
India	18.66	0.60	0.01	0.00	0.00
Kenya	25.78	12.98	+0.13	-0.59	-0.54
Madagascar	82.15	74.53	+0.58	-1.28	-0.65
Mozambique	62.03	25.01	-0.10	-0.89	-0.31
Namibia	19.68	9.00	-0.34	-0.61	-0.58
Nigeria	51.74	17.53	+0.02	-0.28	-0.29
Rest of High-Income	2.59	1.81	0.00	-0.03	-0.02
Rest of SSA	57.8	32.41	+0.51	-1.12	-0.57
Rest of the World	10.47	2.84	0.05	-0.09	-0.1
Rwanda	57.2	29.17	-0.42	-0.91	-0.47
Senegal	37.89	30.6	+0.44	-0.99	-0.49
South Africa	16.22	7.43	+0.16	-0.27	-0.12
Sub-Saharan Africa*	43.73	19.83	+0.20	-0.59	-0.33
Tanzania	45.14	20.1	+0.14	-0.65	-0.15
Uganda	33.38	6.64	+0.28	-0.07	-0.07
United States	1.85	1.54	0.00	-0.01	-0.01
Zambia	62.21	30.21	+1.13	-1.52	-0.06

(continued)

Indicator/Scenario	Initial*	Past trends	Slowdown	Rebalancing	Slowdown + Rebalancing
Poverty, millions					
<i>(Initial, past trends, and p.p. deviations w.r.t past trends)</i>					
Botswana	0.27	0.10	+0.00	+0.00	-0.00
Burkina Faso	7.43	2.70	+0.08	-0.09	-0.04
Cameroon	5.70	2.57	+0.19	-0.28	-0.03
China	87.44	0.95	+0.23	-0.38	-0.38
Cote d'Ivoire	5.37	0.74	-0.00	-0.04	-0.02
Ethiopia	25.99	7.86	-0.24	-0.22	-0.41
Europe	10.08	8.38	0.00	-0.02	-0.02
Ghana	3.13	1.70	+0.03	-0.05	-0.00
India	226.14	8.76	0.19	-0.06	0.04
Kenya	10.80	8.57	+0.09	-0.39	-0.35
Madagascar	17.77	26.71	+0.21	-0.46	-0.23
Mozambique	15.12	9.62	-0.04	-0.34	-0.12
Namibia	0.44	0.27	-0.01	-0.02	-0.02
Nigeria	84.94	47.76	+0.06	-0.76	-0.78
Rest of High-Income	4.76	3.53	0.00	-0.05	-0.05
Rest of SSA	95.10	88.94	+1.40	-3.07	-1.55
Rest of the World	191.84	64.66	1.03	-2.09	-2.16
Rwanda	6.36	5.16	-0.08	-0.16	-0.08
Senegal	5.04	6.67	+0.10	-0.21	-0.11
South Africa	8.33	4.26	+0.09	-0.16	-0.07
Sub-Saharan Africa*	332.83	241.19	+2.45	-7.18	-4.00
Tanzania	20.88	15.87	+0.11	-0.51	-0.12
Uganda	11.69	4.18	+0.18	-0.04	-0.04
United States	5.60	5.29	0.00	-0.03	-0.03
Zambia	8.48	7.51	+0.28	-0.38	-0.01

(continued)

Indicator/Scenario	Initial*	Past trends	Slowdown	Rebalancing	Slowdown + Rebalancing
Daily per capita income, PPP dollars					
<i>(Initial, and annual % change 2011~2030)</i>					
02 Burkina Faso	88.36	4.59	4.56	4.66	4.63
03 Botswana	787.65	5.54	5.53	5.62	5.61
04 Cote d'Ivoire	133.41	6.27	6.26	6.35	6.33
05 Cameroon	130.69	2.65	2.60	2.76	2.70
China	7.71	6.35	5.63	7.69	6.97
06 Ethiopia	112.88	3.63	3.62	3.68	3.67
07 Ghana	219.51	2.83	2.81	2.97	2.93
08 Kenya	145.12	2.51	2.50	2.68	2.66
09 Madagascar	41.29	0.99	0.94	1.14	1.08
10 Mozambique	78.09	6.48	6.46	6.58	6.56
11 Namibia	362.23	3.12	3.09	3.19	3.16
12 Nigeria	74.99	4.44	4.44	4.52	4.52
13 Rwanda	97.32	3.54	3.54	3.59	3.59
14 Senegal	100.50	0.87	0.85	0.97	0.94
15 Tanzania	97.21	2.54	2.51	2.64	2.61
16 Uganda	107.96	4.19	4.19	4.26	4.26
17 South Africa	279.88	2.50	2.47	2.61	2.57
18 Zambia	86.69	4.12	4.09	4.14	4.10
19 Rest of SSA	83.88	3.01	2.96	3.16	3.10
20 India	115.61	4.77	4.77	4.82	4.82
21 United States	2,343.00	2.01	1.99	2.08	2.06
22 Europe	1,017.48	1.63	1.62	1.71	1.70
23 Rest of High-Income	1,066.19	2.21	2.19	2.27	2.25
24 Rest of the World	415.99	3.09	3.05	3.19	3.15
Sub-Saharan Africa*	3.71	3.53	+3.50	+3.63	+3.60

(continued)

Indicator/Scenario	Initial*	Past trends	Slowdown	Rebalancing	Slowdown + Rebalancing
Daily per capita income of B40, PPP dollars					
Botswana	84.44	6.04	6.01	6.11	6.11
Burkina Faso	33.15	4.54	4.47	4.63	4.54
Cameroon	49.52	2.72	2.62	2.85	2.75
China	2.79	6.19	5.51	7.55	6.88
Cote d'Ivoire	46.63	6.02	5.99	6.09	6.06
Ethiopia	49.32	2.66	2.64	2.73	2.68
Ghana	74.48	2.61	2.60	2.75	2.71
Kenya	48.92	2.00	1.96	2.12	2.11
Madagascar	15.64	1.19	1.10	1.34	1.26
Mozambique	16.13	6.01	6.01	6.18	6.07
Namibia	58.22	2.56	2.55	2.68	2.62
Nigeria	26.03	4.48	4.46	4.55	4.54
Rest of SSA	29.18	3.02	2.95	3.16	3.09
Rwanda	24.89	3.06	3.06	3.16	3.12
Senegal	40.45	0.71	0.67	0.82	0.77
South Africa	62.35	2.87	2.75	3.02	2.89
<i>Sub-Saharan Africa</i>	<i>1.22</i>	<i>3.33</i>	<i>+3.28</i>	<i>+3.43</i>	<i>+3.38</i>
Tanzania	32.11	2.19	2.15	2.30	2.25
Uganda	45.06	3.45	3.36	3.50	3.49
Zambia	19.49	4.27	4.20	4.37	4.28

(Note) Sub-Saharan Africa : Based on countries with available household survey data and data from World Population Prospects (2012).

(Source) Authors' calculations. Aggregate results based on available household surveys.