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**New Growth Drivers for Low-Income Countries: The Role of BRICs**

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(In collaboration with the African Department)

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<b>Acronyms</b>	
AFR	Africa
AGOA	African Growth and Opportunity Act
APD	Asia and Pacific Islands
BRICs	Brazil, Russia, India, and China
CADFund	China Africa Development Fund
CAEU	Central Asia and Europe
CDE	Constant Difference in Elasticity
CES	Constant Elasticity of Substitution
CMS	Constant Market Share
CNOOC	China National Offshore Oil Corporation
CNPC	China National Petroleum Corporation
CPI	Consumer Price Index
CPIA	Country Policy and Institution Assessments
DAC	Development Assistance Committee
DSF	Debt Sustainability Framework
EBA	Everything But Arms
EXIM	Export-Import Bank of China
FDI	Foreign Direct Investment
G20	Group of Twenty
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GTAP	Global Trade Analysis Project
GVAR	Global Vector Autoregressive Model
IMF	International Monetary Fund
LDCs	Least Developed Countries
LICs	Low-income Countries
LAC	Latin America and Caribbean
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
PPIAF	Public-Private Infrastructure Advisory Facility
RMB	Chinese Renminbi/Yuan
SMEs	Small and Medium-Sized Enterprises
SSA	Sub-Saharan Africa
UNCTAD	United Nation Conference on Trade and Development
UNDP	United Nations Development Program
WHD	Western Hemisphere
WTO	World Trade Organization

## Preface

This paper was prepared by a staff team led by Yongzheng Yang under the direction of Catherine Pattillo, Dominique Desruelle and Hugh Bredenkamp. Yongzheng Yang was also responsible for the section on turning to the future, and Catherine Pattillo coordinated the project in its final stages. The team consisted of Montfort Mlachila (foreign direct investment), Nkunde Mwase (development financing), Nagwa Riad (trade linkages), Issouf Samake (growth spillovers), Misa Takebe (foreign direct investment), Ke Wang and Sibabrata Das (research assistance).<sup>1</sup> Trung Bui, Ioana Niculcea, and Tushara Ekanayake also provided valuable research assistance. Production was assisted by Neri Gomes and Janyne Quarm.

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<sup>1</sup> Background papers in each of these areas are forthcoming, and listed in the references.

## Executive Summary

**The emergence of BRICs—Brazil, Russia, India, and China—is reshaping low-income countries’ (LICs) international economic relations.** While industrial countries remain LICs’ dominant development partners, LIC-BRIC ties have increased so rapidly over the past decade that BRICs have become new growth drivers for LICs. Trade with BRICs is already close to half of the value of combined trade with the European Union and the United States, and larger than with other emerging market economies. BRIC FDI and development financing are making a significant impact in some key areas despite their relatively small volumes compared with those from advanced countries. Beyond the increased flows of goods and capital, BRICs have brought new dynamics in LICs’ economic relations with the rest of the world, complementing as well as competing with OECD partners. Nevertheless, while potential benefits from the LIC-BRIC ties are enormous, there are challenges and risks in realizing such benefits.

**Neither BRICs nor LICs are homogeneous and relations at a bilateral level vary considerably.** For this reason, detailed analysis will be needed to inform policy formulation in individual countries. However, many underlying trends and challenges facing LICs are similar, and identifying these would help place country issues in a global context and facilitate policy discussions. This study is not intended to address detailed bilateral issues at the country level.

**Bilateral trade, which grew exponentially over the past decade, is the backbone of LIC-BRIC relations.** These expanding trade flows have had a significant positive impact on LICs’ overall trade performance. Rapid economic expansion in BRICs and the strong economic complementarity between the two groups of countries have underpinned the rapid growth and high intensity of bilateral trade—many LICs in general have a strong comparative advantage in commodities while most BRICs are competitive producers of manufactured goods. BRIC demand for commodities resulted in a significant improvement in LICs’ terms of trade. There is potential to further increase LIC-BRIC trade by lowering tariff and nontariff barriers on both sides, reducing tariff escalation, extending preferential access for LIC exports, and making rules of origin more liberal in the existing preference schemes.

**The current pattern of LIC-BRIC trade has accentuated a concern that LICs could get stuck in a commodity trap to the detriment of long-term growth.** Appropriate responses to this concern cannot be limiting commodity exports, which would deprive LICs of the resources needed for investment and poverty reduction, or erecting import barriers to protect domestic industries, which would hurt LIC consumers and undermine LIC competitiveness. The ultimate way out is through strengthening domestic productive capacity. There is no short-cut in this respect: improving infrastructure, creating a conducive investment climate, and facilitating private sector access to capital, skills, technology, and markets are among the key requirements.

**BRIC foreign direct investment holds the potential to boost productivity of LIC industries.** Starting from a low base, BRIC FDI inflows to LICs have grown rapidly. Initial investment, mostly by state-owned companies, has often been destined for natural resource industries. Over time, however, investment appears to be spreading to agriculture, manufacturing, and service industries (e.g., telecommunications). Many non resource-rich countries have also attracted significant investment. Moreover, private companies, particularly small and medium-sized ones from BRICs, have become active investors, with the potential to form industrial clusters in some LICs as seen in East Asia.

**A key challenge for LIC policymakers is to ensure that BRIC FDI inflows, as well as FDI from other sources, continue to boost local firms' links to the global economy and help enhance domestic resource mobilization.** Thus, continued improvement in the investment climate is important, as are policies to encourage joint ventures and local employment. At the same time, however, policymakers should be forward-looking to ensure adequate skill supply required by local and foreign-invested firms; local content and employment requirements can serve only as temporary measures. The development of new activities financed by FDI, particularly new resource extraction, should contribute to enhancing domestic revenue mobilization and, by extension, financing of priority public spending. Thus, LIC governments need to carefully consider fiscal costs of any policy incentives for FDI, ensuring that public resources are devoted to the highest development priorities.

**Development financing provided by BRICs can help LICs alleviate some key bottlenecks to domestic economic activity.** Despite its still relatively small volumes compared to financing by OECD DAC members, BRIC financing is highly significant in some areas and in some countries. In the area of infrastructure financing—a key BRIC focus—it is now comparable to that from OECD DAC donors, and is expected to contribute significantly to electricity generation capacity and the construction of roads and railways in many LICs.

**To maximize its benefits, BRIC financing should be used for high-return projects, and its debt implications carefully assessed.** The concentration of BRIC financing in infrastructure is encouraging as it is broadly in line with investment priorities in LICs. However, financing of each project must be carefully analyzed to ensure that it generates sufficiently high returns, particularly since financing terms may not be concessional. At the same time, in assessing the impact on debt sustainability, it is important that the growth effect of projects be adequately considered. Packaged financing with natural resources used as collateral—grants for social projects, FDI for industries, and loans for infrastructure—can generate synergies and help overcome inter-temporal financing constraints. However, complex financing packages present challenges and require careful, comprehensive cost-benefit analysis. Moreover, potential contingent fiscal risks should be assessed and limited and associated spending on operation and maintenance adequately budgeted. Greater

dissemination of information on financing amounts and terms would help such analysis. Enhancing transparency and clarity on financing flows, ensuring competitive bidding in projects, and fully assessing the macroeconomic impact of financing would be in the interest of both LICs and BRICs. Strengthening governance and institutional capacity in LICs is critical to this goal.

**Growing LIC-BRIC ties have boosted growth in LICs.** Model estimates suggest that the main channels of spillovers from BRICs to LICs include trade, productivity increases, and FDI. These spillovers are found to be generally significant and persistent, with those through trade being the most powerful. The spillovers are most evident in Asian and African LICs, whose trade ties with BRICs are among the strongest. Given the prominence of commodities in LIC-BRIC trade, resource-rich countries have seen the largest spillover effects from BRICs. Such effects are re-enforced by indirect spillovers from BRICs through the impact of their import demand and productivity innovations on world commodity markets. The positive growth spillovers from BRICs have helped cushion LICs from the impact of the recent global financial crisis.

**Beyond their impact on short-run economic cycles, BRICs (particularly China) could have a profound impact on LIC economies in the long run.** Over time, prices of manufactured products are likely to rise as BRICs devote more resources to non-tradable sectors and upgrade their exports to higher value-added products. Thus, LICs could have increased opportunities to export labor-intensive manufactures and, more generally, to diversify their economies. The challenge for LICs is to lay the ground work to seize the opportunity from this possible new phase of global relocation of labor-intensive manufacturing activities.



## I. INTRODUCTION

1. **The emergence of BRICs—Brazil, Russia, India, and China—has changed the landscape of low-income countries’ (LICs) engagement with the rest of the world.** The rapid growth of the BRIC economies has helped create the global commodity booms of the past decade and contributed to a significant improvement in the terms of trade for LICs (Wang, 2007). The value of LIC-BRIC trade has grown six-fold over the past decade. As bilateral trade has expanded, financial flows from BRICs to LICs—both in the form of foreign direct investment and development financing—have also increased rapidly. During the same period, LIC economies have grown at an annual average rate of 4.7 percent. While improved macroeconomic management has been critical to this strong economic performance, the more favorable external environment that the emergence of BRICs has helped to create has also been an important contributing factor.

2. **The role of BRICs in LICs’ economic development is likely to become more prominent in the post-crisis era.** BRICs are already major players in the world economy and their role is only likely to increase over time (Table 1). With expected sluggish growth in industrial countries in the short run (IMF, 2010a, 2010b), external demand for LIC exports is expected to be driven increasingly by growth in BRICs and other emerging markets economies. LICs’ terms of trade could also become more dependent on the growth of BRIC economies. Moreover, in contrast with many industrial countries which are facing large fiscal consolidation and consequent challenges to meet their aid commitments, BRICs are in a strong position to continue increasing their type of development financing.

Table 1. BRICs in the Global Economy, 1991–2015<sup>1/</sup>

	1991–94	2000–04	2005–09	2015
(In percent of world total; period average)				
Population				
BRICs	44.7	43.6	42.8	41.8
Other EMEs <sup>2/</sup>	23.1	23.2	23.6	23.9
United States	4.8	4.7	4.6	4.5
Euro Area	5.6	5.1	4.9	4.6
GDP <sup>3/</sup>				
BRICs	5.8	8.5	13.1	21.6
Other EMEs	10.6	10.8	13.3	15.4
United States	26.2	30.6	25.6	22.0
Euro Area	24.8	21.3	22.0	16.6
Exports				
BRICs	4.2	7.9	12.4	20.1
Other EMEs	13.0	15.8	18.6	18.3
United States	13.3	12.0	9.7	9.6
Euro Area	34.7	30.9	29.1	23.0
Imports				
BRICs	4.0	7.0	10.5	18.8
Other EMEs	14.4	14.8	17.2	18.0
United States	14.6	17.1	14.1	12.3
Euro Area	34.0	29.5	28.5	21.9

Sources: IMF and World Economic Outlook, October 2010.

<sup>1/</sup> WEO Projections for 2015.

<sup>2/</sup> Emerging market economies excluding BRICs.

<sup>3/</sup> At market exchange rates.

3. **The aim of this study is to deepen our understanding of the role of BRICs in LIC development and discuss how to deal with the ensuing challenges.** We have chosen LICs’ relations with BRICs for this study because of BRICs’ large and growing significance to the world economy, and their rapidly growing (faster than other emerging market economies) trade and financial relations with LICs. Among emerging market economies, BRICs have now become LICs’ largest trading partners. China, India and, to a lesser extent, Brazil are among the largest emerging market sources of FDI and development finance to LICs. Although their approaches to engagement with LICs vary, together they symbolize the evolving relationships between LICs and emerging market economies over the past decade.

A deeper understanding of these relationships would help us appreciate the opportunities and challenges of economic cooperation between LICs and emerging markets in a rapidly evolving world economy.

4. **The paper focuses on the following key questions:**

- How has the emergence of BRICs impacted LICs' trade flows and what can be done to sustain the strong trade growth of the past decade?
- How have FDI inflows from BRICs to LICs affected local economies and what is the potential for these inflows, together with development financing, to increase LIC productive capacity?
- How can LICs use greater inflows of development financing for public investment while ensuring debt sustainability?
- What are the spillover effects on LICs from BRIC economies?
- In the medium to long run, what would the continued evolution of BRICs entail for LIC economies, and in particular, could it mean more room for LICs to expand the production and export of labor-intensive manufactures?

5. Because of considerable data weaknesses, especially on FDI and development financing (Box 1), the findings presented in this paper should be viewed as stylized facts rather than precise descriptions of recent trends.<sup>2</sup>

6. **This paper is organized as follows.** Sections II, III, and IV examine respectively the recent evolution of trade relations between LICs and BRICs, BRIC FDI in LICs, and BRIC development financing in LIC economies, highlighting benefits and challenges stemming from these trends. Section V brings together the various channels of LIC-BRIC linkages in an attempt to quantify the spillover effects of BRICs on LIC growth. Section VI considers how the future evolution of BRICs could affect LIC economies in the medium term and the longer run. Section VII concludes.

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<sup>2</sup> In this paper LICs include all countries eligible to use the Fund's concessional financing facilities as of January 2010. The LIC samples used in each section of the paper vary, depending on availability of data.

### Box 1. LIC-BRIC Data Weaknesses

Assembling a reliable database of various BRIC-LIC linkages is challenging. This is particularly the case for FDI and development financing data. In part to overcome known data weaknesses, a survey of IMF LIC desk officers was conducted to supplement official sources. This survey covers 34 LICs and spans 2000–2009.

Data on BRIC financing are largely based on the above-mentioned survey and the World Bank's *Global Development Finance* database. Data on Brazil's flows are limited to non-concessional loans while data on Russia's financing are only available for a few LICs. The survey data includes some decomposition of development assistance into grants (in-kind, budget and project) and loans (concessional and non-concessional). The World Bank debt database has information on loan commitments based on recipient country data and includes 49 LICs. It spans 2000–2008. OECD data were also used to obtain estimates of OECD commitments for comparison purposes.

For FDI data, the most commonly used source is UNCTAD, which publishes annual reports on FDI, both inbound and outbound. The data is in the form of flows and stocks. (Unlike for the other sections, all sub-Saharan countries are covered in the FDI section, including a few lower-middle income countries, given the importance of BRIC FDI in these countries.) There are large discrepancies between changes in stocks and flows that cannot be easily explained by valuation changes. Moreover, there are large gaps in the reported data, except for China. For data on Chinese FDI, UNCTAD data was supplemented by data from the Ministry of Commerce and the State Administration of Foreign Exchange (SAFE), and the National Bureau of Statistics' *Statistical Bulletin of China's Outward Foreign Direct Investment*. The first two of these sources provide data only on FDI in LICs' nonfinancial sectors.

There are three main problems in tracking FDI data in individual countries. First, headline FDI numbers published in the press are usually exaggerated. These announcements typically cover *intentions* to invest over several years, and sometimes investment decisions can be reversed or modified substantially. Second, because financing packages are often used, it is difficult to disentangle FDI *per se* from bilateral aid and suppliers' contracts. Third, a very large amount of reported FDI flows goes to some offshore financial centers—these flows may have subsequently been re-routed to LICs.

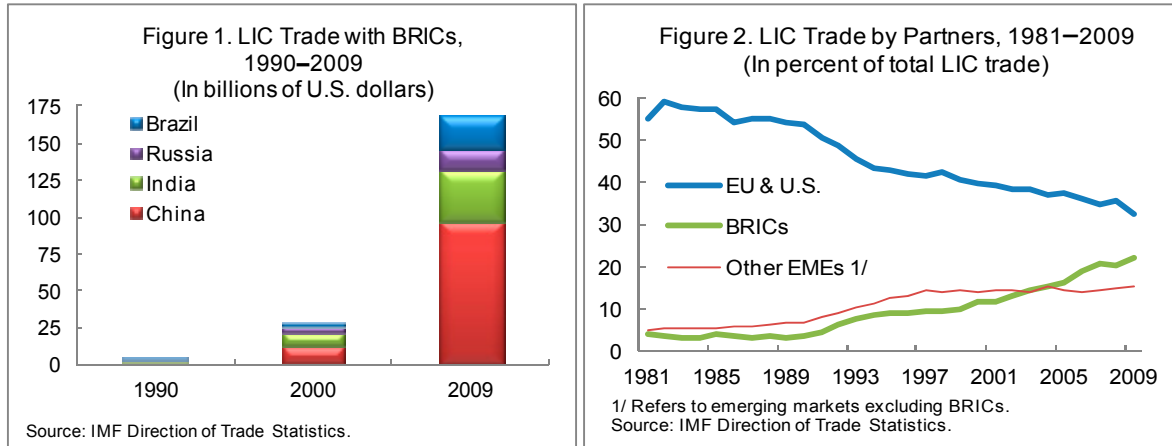
## II. TRADE LINKAGES

### A. Evolving Patterns of LIC Trade

7. **Bilateral trade between LICs and BRICs has increased dramatically in recent years.** Between 2000 and 2009, total LIC exports to BRICs grew at an annual rate of almost 25 percent—much higher than the average for other emerging market economies—rising from US\$15 billion to US\$61 billion, with total trade reaching close to US\$170 billion (Figure 1). As a result, BRICs have become increasingly important trade partners for LICs, accounting for about 20 percent of total LIC exports in 2009, a sharp increase from 12½ percent in 2000 and 7¾ percent in 1995 (Figure 2). LICs' traditional trading partners, particularly the European Union and the United States, remain important, but their share in total LIC exports fell from 60 percent in 1980 to less than 45 percent in 2009. The importance of BRICs as a source of LIC imports has increased similarly, with China alone accounting for 15 percent of LICs' total imports in 2009.

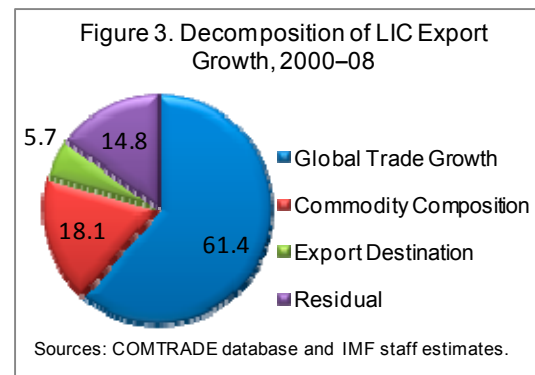
8. **Among emerging market economies (EMEs), BRICs have become LICs' largest trading partners.** BRICs accounted for 60 percent of LICs' trade with EMEs in 2009.

China, India, and Brazil (in descending order, 2009 data) are LICs' three largest partners, accounting for 58 percent of LIC exports to EMEs, whereas China and India are the two largest partners on the import side, accounting for 48 percent of LIC imports from EMEs. Russia has a slightly less dominant position—ranking seventh among EMEs for both LIC exports and imports in 2009.



**9. The rapid growth of trade with BRICs has had a significant positive impact on LICs' overall trade performance.** From 2000 to 2009, LICs' share of exports in world trade increased from 1.6 to 2.6 percent, reversing a previous declining trend. The important contribution of BRICs to this outcome can be seen from various perspectives:

- A simple analysis of exports by destination shows that BRICs accounted for about a quarter of the increase in LICs' total exports during the last decade, a figure comparable to the contribution of the United States.
- A constant market share analysis of the growth of LIC exports points to two main factors: the growth in the value of world trade (“Global Trade Growth” slice in Figure 3) and the concentration of LIC exports in primary commodities, as worldwide exports of primary commodities have expanded faster than that worldwide exports of other goods (“Commodity Composition” slice in Figure 3).<sup>3</sup> In turn, BRICs' economic growth and rising demand for

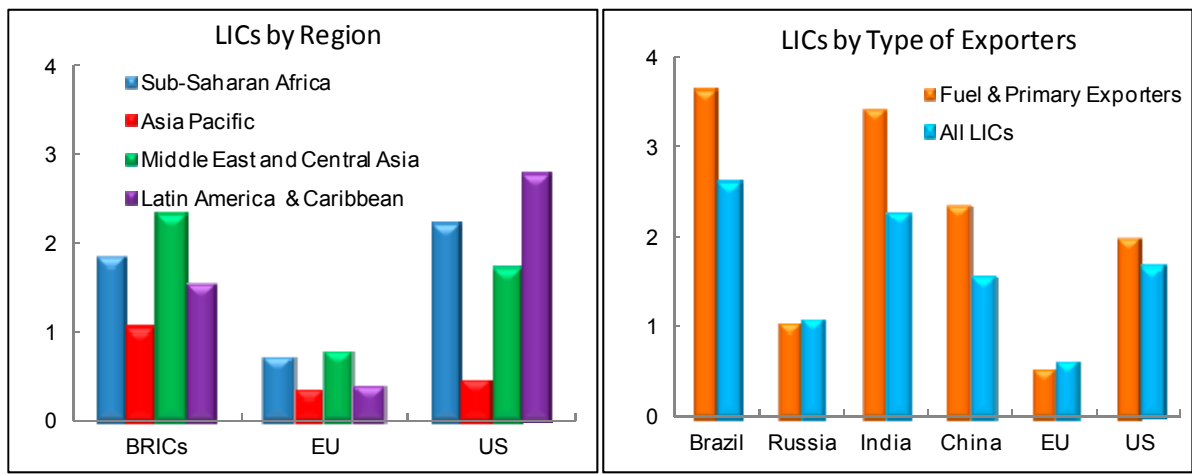


<sup>3</sup> As discussed in greater detail in Appendix I, a constant market share analysis decomposes export growth into four components: overall growth of world trade, growth of exports by type of goods, growth of exports by country of destination, and an unexplained residual, which can be interpreted as a catch-all “competitiveness effect”. As is the case here, a positive residual indicates that exports grew even faster than can be explained from global trade expansion and the exporting countries' composition of exports by commodity and destination.

primary commodities have been key factors behind the growth of world trade and booms in international trade of primary commodities.<sup>4</sup>

- LIC-BRIC bilateral trade relations are particularly strong. On average over 2005–08, the share of BRICs in LICs’ total exports was about 70 percent higher than the share of BRICs in world exports—a “trade intensity” of 1.7 (Figure 4).<sup>5</sup> This share is even higher for fuel exporters—a trade intensity of 2.4.

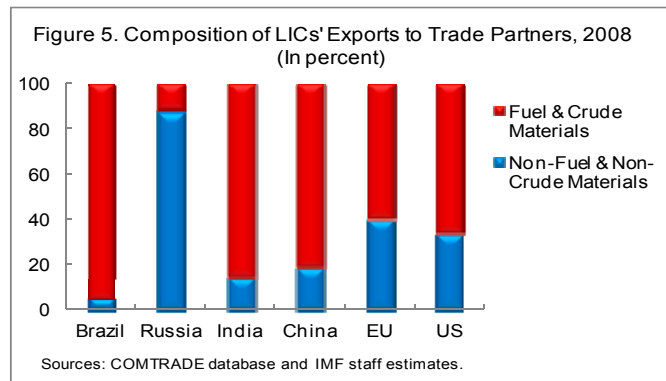
Figure 4. LICs’ Trade Intensity Index  
(Average of 2005–08)



Sources: COMTRADE database and IMF staff estimates.

#### 10. The pattern of LIC-BRIC trade is generally well explained by comparative advantage.

- *Resource-based commodities, such as fuel, ores, and metals form the bulk of LIC exports to BRICs, except to Russia (Figure 5).*<sup>6</sup> LIC exports to the European Union and the United States are also



Sources: COMTRADE database and IMF staff estimates.

<sup>4</sup> Rising demand for primary commodities and increased supply of manufactures driven by BRICs’ economic growth have also contributed to improved LIC terms of trade, especially since early 2000 (See Figure A1.1 in Appendix I).

<sup>5</sup> “Trade intensity” between exporter(s)  $i$  and importer(s)  $j$  is defined as  $(x_{ij} / x_i) / (x_{wj} / x_w)$ , where  $x_{ij}$  is country  $i$ ’s exports to country  $j$ ,  $x_i$  is  $i$ ’s total exports,  $x_{wj}$  is world exports to country  $j$ , and  $x_w$  is total world exports. An index above one indicates larger exports from country  $i$  to country  $j$  than would be expected from country  $j$ ’s importance in world trade (see Ng and Yeats (2003)).

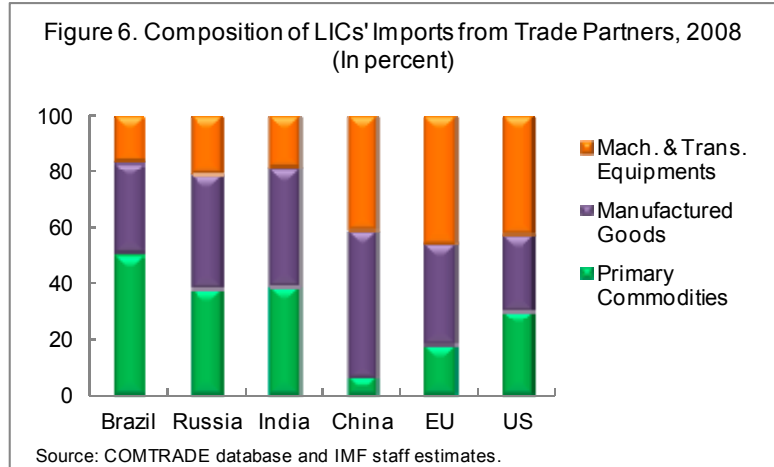
<sup>6</sup> Among the BRICs, Russia is relatively more resource-endowed and thus its import pattern from LICs is much less concentrated in primary commodities. See Appendix Box A1.1 for detail on the heterogeneity of LIC-BRIC trade.

dominated by resource-based commodities, but are more diversified. This pattern may be influenced by trade policy, with trade in light manufactured goods stimulated by the United States' African Growth and Opportunity Act (AGOA) and the European Union's Everything But Arms (EBA) initiative.<sup>7,8</sup>

- ***LICs' imports from BRICs are dominated by manufactured goods.***

China stands out as a source of manufactured imports (Figure 6). Another salient feature of LICs' imports from China is the significance of machinery and transport equipment, which account for over 40 percent of total

LICs' imports from China, a level similar to LICs' imports of these products from the European Union and the United States. LICs' imports from other BRICs also consist of mostly manufactured goods, but primary commodities, such as agricultural products, are relatively important.



**11. Complementarity in trade structures underpins increased LIC-BRIC trade flows.** A trade complementarity index is used to provide a measure of overlap between the composition of LIC exports and those of partner country imports.<sup>9</sup> As shown in Figure A2.1 in Appendix II, export complementarity is generally higher between LICs and China or India than between LICs and the United States or the European Union. Analysis using a gravity model confirms the importance of high LIC-BRIC trade complementarity for overall LIC exports.<sup>10</sup> The gravity model also suggests that LIC imports from China and India are even

<sup>7</sup> AGOA allows non-quota, duty free entry of a range of African products such as textiles and leather goods into the U.S. market from countries adhering to open market reforms. The 'Everything-But-Arms' initiative was established in 2000 and grants exports from least developed countries, except for arms and ammunition, duty- and quota-free access to the European Union market.

<sup>8</sup> Beginning in January 2005, China offered duty-free entry for some 95 percent of exports (by category) from the least developed countries (LDC) in Africa. Although exports of these products have grown rapidly (Wang, 2007), the overall impact of the scheme is not yet evident. In April 2008, India announced an LDC preference scheme on 94 percent of tariff lines comprising 92 percent of LDC global exports. In 2008 Brazil also announced its intention to offer duty-free quota-free access for LDC exports, initially covering 80 percent of tariff lines. See Elborgh-Wytek et al (2010) for details.

<sup>9</sup> The trade complementarity index used here is a variant of the Finger-Kreinin export similarity index and is calculated as  $S(ab, c) = \{\sum_i \text{Minimum} [X_i(ac), X_i(bc)]\} \times 100$ , which measures the similarity of the export pattern of country 'a' and the import pattern of country 'b' to market 'c', where 'a' are LICs, 'b' are partner countries and 'c' is the world. See Finger and Kreinin (1979) for details.

<sup>10</sup> See Appendix II for details on the gravity model and the results.

higher than can be explained from standard gravity model variables and complementarity in trade structures (the effect for Russia and Brazil on LIC trade is less robust). This could reflect the effect of complementarities from BRICs' FDI and development financing.

## **B. Policy Implications**

12. **The burgeoning LIC-BRIC trade brings important benefits to LICs, as it does to BRICs.** In LICs, higher exports immediately translate into stronger GDP growth. Stronger world demand for primary commodities also creates greater economic incentives to develop new sources of production of natural resources in LICs, thus promising further production gains in the future (see Sections III and IV). In addition, competitively-priced manufactured imports from BRICs benefit consumers of final and intermediate goods, albeit recognizing that such manufactures could exert pressures on import-competing producers and on LIC exports to third markets.<sup>11</sup> In the short to medium-term, LICs are expected to see a stronger growth in demand for their exports from dynamic emerging economies including BRICs, compared to advanced economies, where the post-crisis growth recovery is more sluggish.

13. **However, the prominence of commodities in LICs' exports to BRICs has heightened concerns about the pattern of specialization of many LICs and implications for growth over the medium to long term.** These concerns are not new but may now appear more daunting given BRIC-induced commodity booms. They are typically expressed as a fear that commodity exports exert upward pressures on real exchange rates and make manufactured exports uncompetitive—a standard “Dutch disease” effect, (Ademola et al., 2009) or a worry that, contrary to diversification into manufacturing or new business services, specialization in primary commodities does not allow for strong productivity gains that will sustain high growth rates. Some have also raised concerns that for some commodities, demand from China and India is mainly for unprocessed goods (compared to demand from advanced economies where satisfying production standards implies a need for more value-added), adding to the risk that LICs could be trapped into low value-added production structures (Kaplinsky and Farooki, 2010a; Kaplinsky et al, 2010b).

14. **A long-term solution lies in strengthening the competitiveness of LIC non-resource-related sectors rather than trade protection.** Some LICs have resorted to import restrictions against BRIC imports: this approach has short-term costs—it raises the prices of consumer and capital goods—and is not likely to yield long-term benefits—in particular, it reduces incentives for local industries to be competitive internationally. Instead, policies should be focused on relaxing both demand- and supply-side constraints on LICs' production. Continued improvement in the business environment—through infrastructure and human capital investment and policy reforms—would be essential.

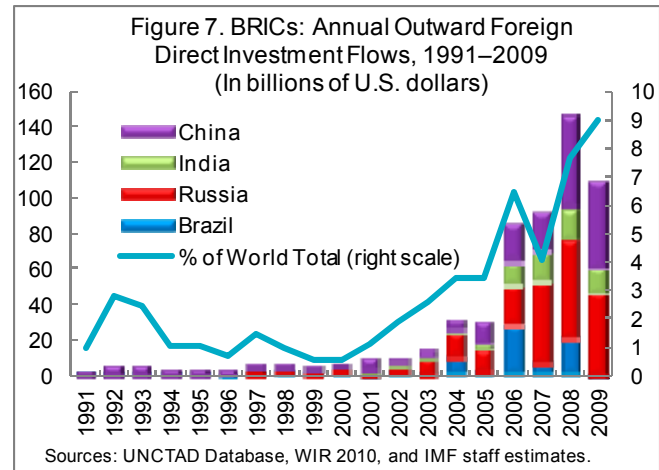
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<sup>11</sup> Subramanian (2010) argues that higher production of tradable goods in China entails lowers production of these goods elsewhere in the developing world.

15. **Trade policy has an important role to play in supporting LICs' efforts to increase and diversify their trade.** Both advanced economies and emerging market countries could contribute in such an effort. Measures could include further reductions in tariff and nontariff barriers where these barriers remain high and serve as disincentives to export.<sup>12</sup> Trading partners should also reduce tariff escalation that discourages exports of higher value-added products from LICs. In addition, existing trade preferences, including from BRICs, could be made more effective by extending them to more products and making rules of origin more liberal. Reform of agricultural policies, both unilaterally and through the Doha Round trade negotiations, would help increase agricultural exports of many LICs (Elborgh-Woytek et al, 2010). Efforts should also be made to help LICs meet technical standards, especially in agriculture but also in manufacturing, that pose a major hurdle to LIC exports (Kee et al, 2009).

### III. FOREIGN DIRECT INVESTMENT

16. **Outward FDI by BRICs has grown rapidly in recent years, particularly since the mid-2000s** (Figure 7). The total value of BRIC FDI rose from less than US\$10 billion a year in the late 1990s to about US\$147 billion in 2008 before declining to US\$100 billion in 2009.<sup>13</sup> This growth is much faster than that of global FDI, which only doubled over the period 1998–2007. As a result, BRICs' share in global outbound FDI increased from 1–2 percent to 4–5 percent over the period.



#### A. BRIC FDI in LICs

17. **LICs have been among the beneficiaries of the surge in FDI from BRICs.** FDI flows from BRICs to LICs reached about US\$2.2 billion in 2009, about 2–3 percent of total FDI flows from BRICs. Of this total, Sub-Saharan Africa (SSA) LICs received about US\$0.9

<sup>12</sup> Exports from LICs still face important tariff and non-tariff barriers in both advanced and emerging economies. The import tariff rates that LIC exporters face in BRICs are generally higher (a simple average of 13 percent in 2008) than those they face in the U.S. and the EU (4 percent). Both BRICs and advanced economies have substantially higher agricultural than industrial tariffs (Brazil is an exception). Tariff escalation is also a constraint on the export of higher value-added processed goods from LICs to both BRICs and advanced economy partners, including in some important categories such as coffee, knitwear and footwear.

<sup>13</sup> UNCTAD FDI database (<http://www.unctad.org/Templates/Page.asp?intItemID=1923>).



billion. The growth of the stock of Chinese FDI is particularly striking; it increased 20-fold in just seven years from 2003 to 2009 (Table 2).

18. **There is considerable heterogeneity in the way BRICs invest.** FDI in LICs and SSA from some BRICs tends to be concentrated in a limited number of countries. For instance, the bulk of Indian FDI in Africa is destined for Mauritius and a dominant portion of its investment in Asia is in its neighborhood (Bhutan, Sri Lanka, and Nepal), and it is mostly in manufacturing and services. Similarly, Brazilian FDI is mainly concentrated in Bolivia, Angola, and Liberia, mostly in the energy and mineral industries. Chinese FDI appears to be the most geographically diversified among BRICs, spreading to all regions of the world (see below). That said, among Asian LICs, its FDI is mostly in manufacturing, while in SSA the lion's share in volume terms is in natural resources, although there has been more diversification in recent years.

Table 2. BRICs: Stocks of Outward Foreign Direct Investment to Low-Income Countries<sup>14</sup>  
(In millions of U.S. dollars)

	2003	2004	2005	2006	2007	2008	2009
Total	3,131	4,002	5,385	...	...	...	...
Brazil	172	202	506	96	151	...	...
India	2,320	2,546	2,945	...	...	...	...
China	639	1,254	1,934	3,299	6,071	10,419	13,258

Sources: UNCTAD FDI Database; Bulletin of China's Outward Foreign Direct Investment, 2009.

<sup>14</sup> Data for Russia are not available.

19. **Because of its size relative to the domestic economy, partly stemming from geographical concentration, BRIC FDI can be highly important for recipient countries.** In the case of Mauritius, the stock of Indian FDI at end-2005 was as high as US\$1.5 billion (22 percent of GDP), with a broad-based sectoral distribution in manufacturing, finance, tourism and other services. In African countries such as Nigeria and Zambia, amounts from China of over US\$100 million per year have been the norm over the past few years. In Zambia, for instance, this has represented 1–1½ percent of GDP. In Mongolia, FDI from China reached over 4½ percent of GDP in 2008.

## B. Chinese FDI Flows to LICs and Sub-Saharan Africa<sup>14</sup>

20. **Chinese FDI to LICs has increased in importance, rising from 5.7 percent of its total outbound FDI in 2003 to nearly 10 percent in 2009.** Asia and Sub-Saharan Africa are the major recipients of Chinese FDI to LICs, accounting for more than 90 percent of the total (Table 3). Pakistan, which was classified as a LIC until early 2010, was the top recipient during 2003–09. Other large Asian recipients included Mongolia, Myanmar, Cambodia, and Vietnam. The rest of the top destinations are mainly SSA countries, often

Table 3. China: FDI Flows to Low-Income Countries

	2003	2004	2005	2006	2007	2008	2009
	(In percent of total Chinese FDI)						
Total	7.1	14.5	5.1	6.5	18.7	39.4	11.5
Sub-Saharan Africa	4.1	5.3	2.3	3.4	10.2	33.0	5.2
of which LICs	2.8	4.4	1.6	2.4	6.0	3.6	4.6
Latin America	0.3	0.0	0.0	0.2	0.5	0.1	0.0
Asia	2.5	3.4	1.3	2.1	6.4	5.5	5.9
Middle East	0.2	5.7	1.4	0.8	1.5	0.9	0.4

Source: Statistical Bulletin of China's Outward Foreign Direct Investment .

<sup>14</sup> The focus on Chinese FDI in this section is largely dictated by data availability.

with natural resources, such as the Democratic Republic of Congo, Nigeria, and Zambia. In fact, excluding Pakistan, SSA countries account for 60–70 percent of Chinese FDI in LICs.

**21. Chinese FDI flows to SSA countries (including non-LICs) have grown very rapidly over the past few years, although they remain a small fraction of total FDI flows to SSA.**<sup>15</sup>

They rose from about US\$70 million in 2003 to about US\$5½ billion in 2008 (about one-third of China’s global FDI outflows that year) before declining to US\$1.1 billion in 2009. Most of the 2008 growth was recorded in South

Africa, where the Chinese Industrial and Commercial Bank acquired a 20 percent stake in the Standard Bank. Other major recipients of Chinese FDI by order of importance were Nigeria, Zambia, and the Democratic Republic of Congo (Table 4). Despite its rapid growth, Chinese FDI to the region has so far remained relatively small, accounting for about 4½ percent of global flows to SSA in 2007.

**22. The natural resource and infrastructure sectors attract the biggest share of Chinese FDI in terms of volume, but Chinese FDI is not limited to these areas of activity** (Table 5).<sup>16</sup> In general, large state-owned firms tend to have a strong focus on resources and infrastructure, while private firms tend to concentrate in manufacturing and service industries (Kaplinsky and Morris, 2009). Even in resource-rich countries, Chinese FDI is not necessarily concentrated in the resource sector, as the Zambia case demonstrates (Box 2 and Table 6). While resource and infrastructure investment is likely the largest in value terms, the number of private projects in other sectors is high and growing.<sup>17</sup> Chinese investment in the resource sector extends to many countries (Box 3). Outside the resource sector, the biggest volume of Chinese FDI has gone to large SSA countries with greater market potential, such as Ethiopia and South Africa, but smaller countries such as Ghana, Madagascar, and Mauritius have also attracted substantial flows. Official statistics indicate that at a global

Table 4. China: Top FDI Destinations in Sub-Saharan Africa  
(In millions of U.S. dollars)

Ranking Based on Average , 2003–09		Ranking Based on 2007	
South Africa	774	South Africa	454
Nigeria	131	Nigeria	390
Zambia	79	Zambia	119
Congo, Dem. Rep. of	52	Niger	101
Niger	26	Congo, Dem. Rep. of	57
Madagascar	19	Angola	41
Ethiopia	18	Mauritius	16
Mauritius	13	Ethiopia	13
Chad	13	Madagascar	13
Guinea	12	Guinea	13

Source : Statistical Bulletin of China’s Outward Foreign Direct Investment

<sup>15</sup> SSA includes a number of non-LICs, such as Mauritius, Namibia, and South Africa. We cover SSA because of the interest in the region as whole.

<sup>16</sup> According to UNCTAD (2010), there has been a general trend of diversifying inflows to Africa.

<sup>17</sup> Estimates of the number of Chinese FDI firms vary widely. UNDP/UNCTAD (2007) estimated that there were approximately 700 Chinese enterprises operating in Africa alone, including in three of its eight overseas economic and trade cooperation zones in Africa. The Chinese EXIM Bank puts the number at 800 in 2006. Other Chinese sources suggest that there were at least 2,000 Chinese enterprises in Africa in 2007–08. The exact number of FDI firms is difficult to estimate, as the situation is quite dynamic, and many small and medium sized enterprises (SMEs) are often not covered by official statistics. Baah and Jauch (2009) report that of the 450 recorded Chinese investment projects in Africa, an estimated 46 percent are in manufacturing, 40 percent in services and 9 percent in resource-related industries. The latter account for 28 percent of the total in value terms.

level, China's outward FDI has shifted toward the service sector, and mining (including oil) accounted for less than one quarter of the total in value terms in 2009.<sup>18</sup>

Table 5. Chinese FDI in Selected Sub-Saharan African Economies<sup>1/</sup>

Country	Oil/gas	Mining	Agriculture	Services	Infrastructure	Manufacturing
Angola	X	--	--	Telecommunications	Housing, roads, railways	Light vehicles
Chad	X	--	--	--	Roads, power plant	--
Ethiopia	--	X	--	Telecommunications, electricity, water	Construction	Garments, shoes/leather
Gabon	X	X			Port, railway, power plant	
Ghana	--	--	Poultry	Small-scale trading, import/export	--	Garments, shoes/leather
Kenya		X	Coffee	Telecommunications	Roads	Garments, shoes
Madagascar	--	--	Sugar	Financial, telecommunications	--	Garments
Mali	--	--	Cotton	Electricity, water	Construction	Food processing
Nigeria	X	--	--	Telecommunications, technical services	Construction	Agro-processing
Mauritius	--	--	--	Small-scale trading, import/export	--	Garments, textiles
Uganda	--	X	Cotton	Telecommunications, electricity	Construction	Electronic goods, agro-processing
Zambia	--	X	Cotton	Financial, telecommunications, tourism	Construction	Garments, textiles, agro-processing

Source: Kaplinsky and Morris (2009), Ademola et al. (2008), and IMF staff survey.

<sup>1/</sup>It is not possible to give an order of magnitude as this information is mostly from case studies.

23. **Chinese FDI comes in various forms with different financing mechanisms and focuses.** There are many actors involved, ranging from individual private entrepreneurs to large state-owned enterprises, including enterprises owned by local governments. The financing arrangements range from own private financing to loans from the China EXIM Bank or other state-owned banks. The China-Africa Development Fund (CADFund) has played an increasingly important role in providing private equity financing for joint ventures in Africa.

Table 6. Chinese FDI in Zambia, 2007

	Number of companies	Investment pledges (US\$ million)	Employment (No. of people)
Agriculture	23	10	1,093
Construction	30	37	1,625
Manufacturing	82	530	6,011
Mining	9	47	1,066
Services	37	12	1,126
Timber	3	0	0
<b>Total</b>	<b>184</b>	<b>402</b>	<b>12,334</b>

Source: Kragelund (2009).

<sup>18</sup> See *Bulletin of China's Outward Foreign Direct Investment*, 2009.

### Box 2. Chinese FDI in Zambia

Zambia has had long-standing relations with China since independence. The construction of the Tanzania-Zambia Railway (Tazara) in the 1970s was a high point in this relationship. However, for most of the 1980s and 1990s, there was very little Chinese FDI. The combination of China's "going global" strategy, and Zambia's privatization program, spurred Chinese FDI flows, particularly into the mining sector. At the same time, Zambia adopted quite liberal investment climate regulations with the establishment of the Zambia Development Agency, a one-stop shop for foreign investors. There is free repatriation of profits, royalties, fees and wages, and no requirements for use of local content and local sub-contractors for inward FDI. Over the past decade, China became the third largest provider of FDI. Based on UNCTAD data (which is likely underestimated), Chinese FDI reached US\$214 million (1½ percent of GDP) in 2008. Most of the FDI has been in the mining and related sectors, especially in copper and nickel production. For instance, China Non-Ferrous Company Africa invested US\$150 million during 1998–03.

One of the features of the government's industrial development strategy is the development of industrial parks. In 2007 the government adopted legislation for Multi-Facility Economic Zones. These have special incentives such as duty-free importation of raw materials and capital goods for five years. Chinese investment has been at the core of the Zambian special economic zone strategy. For instance, the planned Chambishi multi-facility economic zone in the Copper Belt is expected to involve over 60 Chinese companies in a broad range of sub-sectors, anchored by a US\$200 million copper smelter. Once finalized, Chinese companies would have a presence along the entire copper value chain. The total cost is expected to be over US\$800 million, and the project would also cater to the nearby major mining regions of the Democratic Republic of Congo.

Private Chinese companies are attracted to Zambia mainly because of its liberal investment climate, relatively limited domestic competition, and the ability to service other Chinese companies. As a result, there are a large number of registered private Chinese businesses (over 200). The largest private companies are in manufacturing (e.g., textiles), construction (e.g., Hainan), telecommunications (e.g., Huawei), and retail trade (e.g., Budget Stores). Recently, the Bank of China, a state-owned commercial bank, opened its first branch in Africa in Zambia. Finally, there are also a very large number of small operators in the trading and restaurant sectors.

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Sources: Kragelund (2009), Kamwanga and Koyi (2009), and IMF staff.

24. **There is some evidence that FDI by Chinese private firms has increased rapidly and now plays an important role in SSA countries.** The China EXIM Bank estimated that of the 800 Chinese companies operating in Africa in 2006, approximately 85 percent were privately owned and are small and medium enterprises (SMEs). According to Gu (2009), most of these firms began their engagement with Africa by trading, leading on to investment to tap into local markets. Since local supplies are often weak, these firms tend to source most of their parts and equipment from China and other countries (notably South Africa). More recently, there has been a push to establish industrial parks, based on their experience in coastal China. This approach is aimed at creating industry clusters, which would enable firms to source most of the inputs locally, reducing both costs and delivery time.

25. **The links of Chinese FDI firms with local economies appear weak in the construction sector, but may be stronger in manufacturing.** For construction projects, it is often reported that Chinese firms prefer to bring in their own workers and hence rely little on local labor (Anshan, 2007; ACET, 2009).<sup>19</sup> ACET (2009) notes that Chinese firms win contracts on the basis of low cost and quick delivery and suggest that, because of skill shortages and labor law restrictions, hiring local labor can undermine project efficiency. In

<sup>19</sup> Kragelund (2009) indicates, however, that this is not unique to Chinese firms.

the manufacturing sector, Gu (2009) suggests that there may be several constraints on the employment of local workers, such as skill mismatch and language barriers. However, based on a survey in Ghana, Nigeria, and Madagascar, Gu also observes that once Chinese firms are committed to establishing local operations, the majority of the employment is drawn from the local labor force. This appears to be the case especially for labor-intensive manufacturing.

### **Box 3. Chinese FDI in Natural Resources in Africa, 2001–2007**

Chinese firms became very active in investing directly in natural resources in SSA countries starting in 2003. During 2003–2007, Chinese firms were involved in 81 projects in at least 25 SSA countries, 40 percent of them in the oil sector, 55 percent in mining, and 5 percent in natural gas. In terms of value, more than 70 percent of the total commitment of about US\$10 billion (cumulatively) was in the oil sector.

In the oil sector, Chinese firms usually acquire exploration and drilling rights, or directly purchase oil blocks or production-sharing contracts. In most cases, the investment has been made in the exploration stage, but some investment was recently made in the refining stage. Between 2001 and 2007, Chinese firms were involved in oil investment projects in 18 SSA countries across the continent, most of them among the top recipients of Chinese economic cooperation. Most investments were initiated under bilateral agreements and run by one or more of three state-owned enterprises: China National Petroleum Corporation (CNPC), China Petroleum & Chemical Corporation (Sinopec), and China National Offshore Oil Corporation (CNOOC).

In the mining sector, Chinese firms usually form a joint venture with local firms or directly purchase equity of local entities. Chinese firms were involved in mining projects in 16 SSA countries, especially in the mining belt of central-southern Africa (especially Zambia and Tanzania). Unlike in the oil sector, both Chinese state-owned and private companies are active in mining projects.

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Sources: The World Bank—PPIAF Chinese Project Database and IMF staff survey.

## **C. The Impact of BRIC FDI**

**26. While they are difficult to quantify, the effects of BRIC FDI on local economies have been tangible:**

- **BRIC FDI has helped tap natural resources in many LICs.** This is most evident in the rapid growth of oil and mining industries in Africa, partly made possible by BRIC investment, leading to sharp increases in production, exports, and processing capacity. In some cases, BRICs' investment may also have strengthened the bargaining power of LICs, helping them to negotiate more favorable contracts with foreign firms.
- **BRIC financing has helped increase manufacturing capacity in some LICs.** This is clearly the case in countries such as Ghana where most Chinese FDI is involved in agro-processing and garment manufacturing. Even in resource-rich countries, there is now a greater emphasis on increasing value added in both upstream and downstream industries

(e.g., building refining capacity in Nigeria, and processing copper into electric wires in Zambia).

27. **The key challenge for LICs is to amplify these positive effects of BRIC FDI by continuing to attract more inflows, ensuring that natural resource extraction contributes to strengthening domestic revenue mobilization, and fostering greater linkages with local economies.** As is the case for trade flows, this challenge is not specific to BRIC FDI but is heightened by the prospect of attracting more FDI than in the past from a broader array of countries.

- **Recipient countries can foster FDI by improving their business environment.** The focus should be on improvements in areas that are critical for attracting FDI such as the availability of adequate and reliable infrastructure, rule of law, and reduction of red tape and corruption (Dabla-Norris et al., 2010). At the same time, reducing high trade barriers is important, especially for FDI in search of intermediate inputs and regional exports.
- **Recipient countries should ensure that greater FDI, particularly in natural resources, translates into higher fiscal revenue, which can then be spent in priority areas.** In the face of strong competition for FDI among recipient countries, LIC policymakers should carefully evaluate the benefits of policy incentives against the cost and the fiscal implications of such incentives to ensure that public resources are used for the highest priorities. Regional policy coordination could help countries limit incentive competition. Deeper regional integration could also make small LIC economies more attractive to FDI, notably by having regional projects especially in the power and transport sectors.<sup>20</sup> Moreover, policies aimed at attracting FDI should avoid discriminating against domestic firms.
- **BRICs and LICs can cooperate more closely in promoting local employment and industrial linkages.** While an important goal of attracting FDI is to increase local employment and strengthen local productive capacity, excessive local employment and input requirements could deter FDI inflows and undermine the efficiency of foreign-invested firms. To avoid such an outcome, investors could be encouraged to hire and train more local workers while, at the same time, recipient countries could aim to facilitate firms' access to necessary skills, including by upgrading education programs and rationalizing labor market regulations. Similarly, linkages to local firms could be facilitated by encouraging joint ventures, improving internal transport systems, and ensuring equal access to industrial clustering by local firms (Broadman, 2006).

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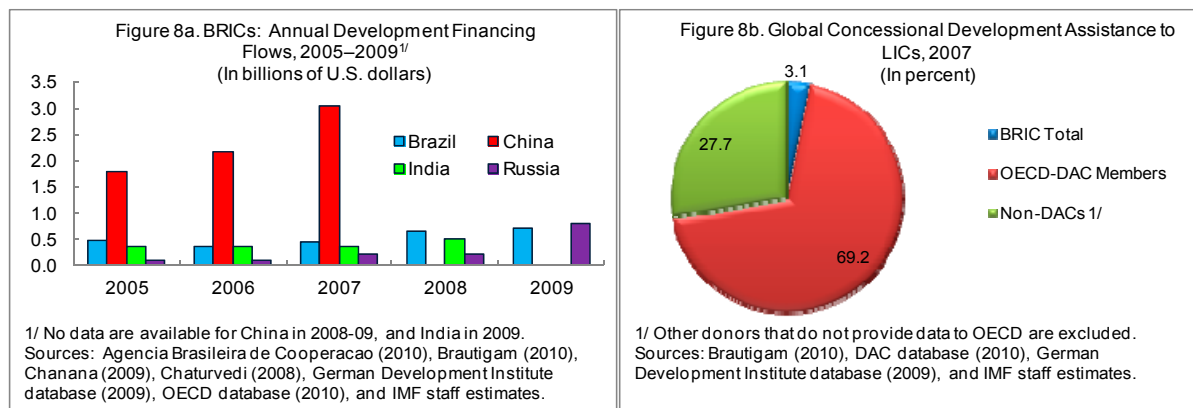
<sup>20</sup> For instance, the West Africa Power Pool, which is working on a regional approach to power projects, could benefit from better coordination in order to reduce the region's very high unit power costs.

#### IV. DEVELOPMENT FINANCING

28. **BRICs have long-standing development programs going as far back as the 1950s and 1960s.** Historically, Brazil, China, and India have provided support to developing countries as part of South-South cooperation, while Russia's engagement dated back to the Soviet era. Brazil, China and India see themselves as 'development partners,' not 'donors.' They view South-South cooperation as emphasizing mutual benefits, and focusing on promoting commercial activities, without attachment of policy conditions to financing and investment.

##### A. Stylized Facts on BRIC Development Financing

29. **BRIC development financing has surged in recent years, but remains significantly smaller than financial support provided by OECD donors.**<sup>21</sup> World Bank data suggest that, including non-concessional loans, total BRIC loan commitments amounted to about US\$26 billion in 2000–08, compared to about US\$296 billion from OECD ODA during the same period.<sup>22</sup> Estimates also suggest that, in 2007, BRIC concessional financing (grants and concessional loans) was about 3 percent of total concessional resources provided to LICs—nearly US\$4 billion compared to about US\$90 billion of total concessional financing from OECD donors (Figure 8a and Figure 8b).<sup>23</sup>



<sup>21</sup> Data on BRIC financing used in this analysis are largely based on an IMF Survey and the World Bank debt database (see Appendix III). Data are not directly comparable with ODA as the modalities of BRIC financing generally differ from the concepts used in the DAC methodology. For example, China's data excludes items such as humanitarian aid that it does not consider as development assistance, while the OECD includes this aid (Davies *et al.*, 2008). Thus, the figures on China's grants could be underestimated.

<sup>22</sup> The sample set for both the OECD and BRIC data is limited to 49 LICs. The OECD data reflect total ODA commitments from all countries reporting to the OECD.

<sup>23</sup> BRICs are also among the most important providers of development finance among emerging market creditors. Data are weak but suggest that the largest emerging market providers of assistance to LICs, particularly African countries, are China, India and Brazil. Saudi Arabia and Venezuela are also important sources of development assistance to LICs in some regions.

30. **BRICs have also provided other support to LICs, including technical assistance, research support and training, especially in agriculture and health.** Technical assistance is often in the form of turn-key joint ventures. There has been significant focus on the agricultural sector from Brazil, China, and India, including improving technology in rice production, drawing on their own experience with the Green Revolution. For example, China built 14 turn-key agricultural aid projects in Africa between 2003 and 2008 (Brautigam, 2010).<sup>24</sup> This support has occurred against the backdrop of declining assistance in this area from traditional donors.

31. **BRIC development financing has been concentrated in the infrastructure sector.**<sup>25</sup> Chinese and Indian infrastructure financing alone is now of similar magnitude to that from traditional donors (Foster et al., 2009). However, there are substantial differences across BRICs and across recipient countries. For Chinese financing, grants are offered mostly for construction of social infrastructure (e.g., stadiums, market squares, and government complexes) while loans are provided for productive infrastructure, such as hydropower, water generation, and roads/railways. India's development financing is similar to China's but on a smaller scale (Kragelund, 2009). It is mostly allocated to the agricultural and infrastructure sectors (electricity, hydropower, and railways). Russia's concessional financing has largely been in the form of budget support.

32. **BRIC financing, particularly from China, often complements FDI and comes as part of a "package".** Such a package tends to involve multi-year financing including grants, loans, and lines of credit with various participants. These various elements are intended to tackle multiple constraints on development and the "package" can be complex, especially when natural resource reserves are used as collateral. For example, under what has been coined the "Angola Model", Chinese financing is used to build a project, usually an infrastructure project; the project is often contracted to a Chinese company, which sources its supply from China; a Chinese company acquires rights to a FDI project (e.g., mining), and invests in this project. The complexity of the multi-sector financing packages can make it difficult to assess the impact on public finances and debt sustainability.

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<sup>24</sup> China has pledged to double the number of agricultural technology demonstration centers and Chinese agricultural experts and technicians dispatched to developing countries. It has also pledged to donate US\$30 million to the FAO to establish a trust fund assisting development countries to carry out projects and activities enhancing agricultural productivity. Since the signing of the general agreement in March 2009, China has completed donation work worth US\$10 million. See <http://www.china-un.org/eng/zt/shnh60/t212916.htm>.

<sup>25</sup> This finding is subject to caution as it is based on a sample of countries that responded to the survey and indicated sectoral allocation. There was no information on concessional financing from Brazil and very limited data on nonconcessional loans from Brazil.



#### **Box 4. Packaged Investment in Natural Resources and Related Infrastructure in Sub-Saharan Africa**

The lack of appropriate infrastructure has been a key reason why natural resources in SSA countries are left relatively untouched by traditional investors (Collier, 2010). SSA lags behind other developing regions on most infrastructure indicators, especially paved roads, railways, electricity supply, and communications. To overcome the infrastructure and financing constraints, China has been offering packaged investment projects both in natural resources and in related infrastructure, often under multi-year programs. In some cases (e.g., the Democratic Republic of Congo, (DRC)), aid for social projects, such as building hospitals and schools and training, has been part of the package (Kaplinsky and Morris, 2009).

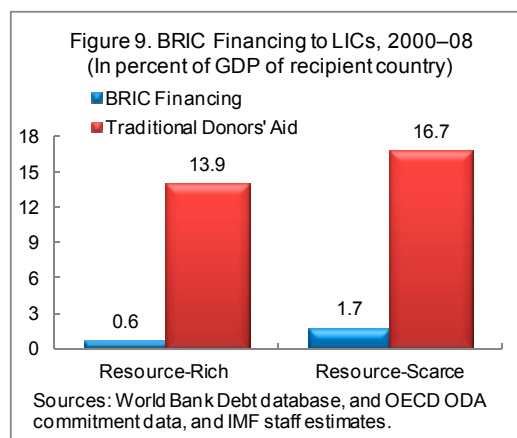
From a political economy perspective, such arrangements have several advantages. First, they are appealing to recipient countries because inadequate infrastructure has been one of the biggest impediments for attracting FDI and enhancing growth. Moreover, some BRICs, China in particular, have a very competitive construction sector that can provide value for money. Second, packages can be aimed at solving multiple development constraints that are inter-related: infrastructure paves the way for production, which in turn provides resources to repay the infrastructure construction loans, while social projects reduce poverty, which in turn increases the attractiveness of projects. Moreover, packages allow source countries to gain a competitive edge against competitors by exploiting synergies of component projects. Third, they enable source countries to demonstrate to a recipient country that they are in “for the long haul”. Finally, source countries can secure their loans using resources as collateral while recipient countries overcome their short-term financing constraints.

That said, LICs should be aware of several risks, especially those related to lack of competitive bidding, opacity in deals, and potential contingent liabilities. For instance, in April 2008, the DRC signed a cooperation agreement with a consortium of Chinese enterprises involving a US\$3.2 billion mining project and a set of US\$6 billion public infrastructure projects to be implemented in two phases. The structure of the deal was highly complex, making it difficult to assess its impact on the economy and public finances. As the financing was not in the form of a traditional loan with a pre-determined repayment schedule, its degree of concessionality and impact on debt sustainability were challenging to assess. Following concerns that the deal would make DRC’s debt level unsustainable, the agreement was amended in October 2009 to remove the public guarantee on the mining loan and to exclude the second phase of public infrastructure projects, leaving just a single phase. Under the amended agreement, a joint venture (SICOMINES) between a Congolese parastatal mining enterprise (GECAMINES) and a consortium of Chinese enterprises plans to invest US\$3.2 billion in a mining project along with a series of public infrastructure projects estimated at US\$3 billion over the period 2009-14 (which include schools, hospitals, roads and railways). The amended agreement also limited the government guarantee to the financing of the infrastructure projects. Net operating profits from the mining project will be used to repay the public infrastructure loans.

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Sources: Foster et al. (2009) and IMF staff.

33. **There is some empirical evidence suggesting that commercial considerations influence the allocation of BRIC financing.**<sup>26</sup> A preliminary empirical analysis shows that LICs with higher income and lower Country Policy and Institution Assessments (CPIA) scores tend to receive larger amounts of loan commitments. This could suggest that BRIC financing is not necessarily need-based. The CPIA score result is consistent with findings from related research on the determinants of bilateral aid that finds no significant positive relationship between aid allocations and institutions (e.g., Svensson, 1999; Alesina and Dollar, 2000). The analysis also confirms that geographic proximity increases financing flows from BRICs, while landlocked, resource-scarce countries tend to receive less financing than resource-rich countries and coastal resource-scarce countries (Figure 9).



34. **The concessionality of BRIC financing may also be influenced by commercial factors.**

The degree of concessionality is negatively correlated with the amount of financing, suggesting that BRIC financing could be based in part on a commercial calculation—the higher the risks, the higher the required returns. Consistent with this, countries with better institutional indicators (e.g., planning capacity, degree of transparency and higher CPIA scores) also received greater concessionality. There is also some evidence that countries that export more to BRICs tend to get less concessional financing terms. While this may seem puzzling, this result could reflect BRICs seeking to access new markets to satisfy their growing import needs (and so offering better terms to these new markets where trade volumes are low). Not surprisingly, having a Fund-supported program is associated with greater concessionality of BRIC financing, albeit with lower loan amounts.

## B. The Impact of BRIC Financing

35. **Given the recent evolution of BRIC development financing, it is difficult to evaluate its quantitative impact on LIC economies.** Instead, experience of various countries was considered to draw broad conclusions on the effect of BRIC financing on local economies. The focus was placed on three aspects: economic growth and development, debt sustainability, and relationships between LICs and their development partners. The key findings are as follows:

- **BRIC financing plays an important role in alleviating infrastructure bottlenecks in many LICs.** A number of studies note the benefits of such financing—for example, it has

<sup>26</sup> See Appendix IV for details of an econometric analysis that supports the discussion here.

resulted in a 35 percent improvement in electricity supply in Africa (including 6,000 megawatts of hydropower), a 10 percent increase in rail capacity, and reduced prices for telephone services (Foster et al., 2009; Sebastian 2008; Onjala, 2008). At least 35 countries in SSA have benefited from, or are actively discussing, Chinese infrastructure financing (Doemeland et al., 2010).

- **The resulting infrastructure improvement should help raise productivity.** Two recent surveys of the empirical literature (Agénor et al. (2006), Straub (2008)) conclude that the majority of studies, covering a broad range of countries, find a positive relationship between the stock of infrastructure assets and the rate of economic growth, with the largest growth impact coming from telecommunications, roads and electricity networks.
- **BRIC financing has helped boost LIC exports.** The strong focus of most of the financing (particularly the large non-concessional flows) on facilitating trade has been associated with a sharp increase in bilateral trade flows, as discussed in Section II.
- **BRIC financing can strengthen regional trade linkages.** For instance, the rehabilitation of the Benguela railway line should facilitate trade between Angola, Democratic Republic of Congo and Zambia, and exports from the mineral belt of Congo and Zambia; and the building of rail and port facilities in Liberia can facilitate the export of iron ore in both Liberia and Guinea.
- **BRIC assistance has been by and large complementary to aid from traditional donors.** The different sectoral concentration of BRICs' and traditional donors' assistance could help LICs obtain both critical financing for infrastructure as well as other poverty alleviation needs.

36. **While benefits from BRIC financing are significant, there are real challenges in managing risks associated with these inflows.** While many of these challenges are not uniquely related to BRIC financing, the rapidly growing BRIC-LIC ties have “raised the stakes” for sound policy responses to these challenges. BRICs’ “package” financing also raises particular challenges not usually present in relations with other LIC partners.

- **LICs need to ensure that BRIC financing is used for high return projects.** As with other sources of financing, it is critical that LICs align BRIC-financed projects with national development priorities. The concentration of BRIC financing in infrastructure is encouraging, but this in itself does not guarantee high returns. Appropriate processes of project selection (including through feasibility studies), implementation, and maintenance need to be put in place to ensure desired outcomes. On the cost side, transparent and competitive bidding for projects is essential and would help reduce financing costs.
- **Ensuring that development financing does not jeopardize debt sustainability will be critical to mutually beneficial engagement.** BRIC financing can be large in relation to the size of the recipient economy. This fact, combined with its relatively low concessionality, means that its impact on debt sustainability needs to be carefully

examined. Macroeconomic analysis of total project financing, including assessments of risk, implications for public finances (including how maintenance costs will be financed) and growth impact, is in the interest of both the recipients and their development partners. Assessments may need to consider the entire financing package, given contingent liabilities associated with some FDI projects. Development partners could also assist LICs in analyzing the implications of complex financing packages.

- **Greater transparency is essential to assess the micro- and macro-economic impact of projects.** Efforts should be made to improve data availability and transparency on the size and terms of BRIC financing flows, the structure and conditions of packaged deals, as well as the costs of the rights of concessions for natural resources. Greater transparency would also allow for better project assessment and, possibly, implementation. The challenge is to make the process of project selection, financing, and implementation as transparent as possible to ensure the best use of scarce resources. This is also in the interest of both LICs and their development partners.
- **To maximize benefits from engaging with BRICs, LICs could seek to deepen linkages of the BRIC-financed projects with the rest of the economy.** This would help develop human capital, increase local employment, and could strengthen competitiveness of domestic industries in LICs.
- **Continuing to strengthen governance in LICs, to reduce the scope for misallocation of resources, needs to be high on the agenda.** The importance of governance for safeguarding growth performance is particularly important for natural resource exporters, where often governance challenges are the greatest (Collier, 2010).
- **The momentum of domestic reforms needs to be maintained in the presence of greater competition among development partners.** While LICs generally welcome the no-strings-attached policy practiced by BRICs (Brautigam, 2010), financing alone cannot substitute for sound macroeconomic policies and structural reforms necessary for sustained growth and stability.

## V. GROWTH SPILLOVERS

37. **The rapidly growing trade and financial ties between LICs and BRICs, discussed above, suggest that economic developments in BRICs exert significant spillovers on LICs growth.**<sup>27</sup> These spillovers can be “direct”—e.g. changes in import demand, productivity, FDI, and exchange rates in BRICs can boost LIC growth. They can also be indirect—e.g. BRIC demand and productivity impact world oil and commodity prices, global demand, and global financial conditions; in turn, these effects can also affect

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<sup>27</sup> See related work in Ademola, Bankole, and Adewuyi (2009), and Arora and Vamvakidis (2010) on China’s spillovers to the rest of the world.

LIC growth. A dynamic multivariate multi-country autoregression model is employed to investigate the extent of spillovers from BRICs to LICs through these various channels.<sup>28</sup>

**38. The overall impact of BRICs on LIC growth appears to be both substantial and becoming larger.**

- The total impact of a 1 percentage point increase in BRICs' demand and productivity leads (through both direct and indirect channels) to 0.7 percentage point increase in LICs' output over 3 years and 1.2 percentage point over 5 years.<sup>29</sup> (These magnitudes are broadly similar to the direct impact of demand and productivity increases in advanced economies).<sup>30</sup> The impact has increased from the pre-2007 period, when a 1 percentage point increase in BRICs' demand and productivity would change LICs' output by about 0.5 percentage point over 3 years and 0.6 percentage point over 5 years.
- The BRICs' contribution to LIC growth has increased during the global financial crisis. Before the crisis, BRICs accounted for some one-fifth to a third of LIC growth variations (Table 7). This share increased in all

Table 7. Contribution to Changes in LICs' Growth Rates<sup>1/</sup>  
(Unweighted averages for each region, in percent)

	Factors		
	Country & Idiosyncratic	BRICs	Rest of the World
<i>Before, During, and Post-Crisis</i> <sup>2/</sup>			
Africa	43.1	29.7	27.2
Asia	53.8	27.6	18.6
Europe & Middle-East	37.1	31.1	31.8
Latin America	41.0	19.1	39.9
Oil Exporters	52.5	37.0	10.5
Other Commodity Exporters	35.1	37.4	27.4
<i>Before Crisis</i> <sup>3/</sup>			
Africa	39.9	18.8	41.3
Asia	44.4	25.1	30.4
Europe & Middle-East	44.9	30.5	24.5
Latin America	48.7	18.7	32.6
Oil Exporters	49.0	28.9	22.1
Other Commodity Exporters	32.1	28.8	39.1
<i>Change in Contribution</i> <sup>4/</sup>			
Africa	3.2	10.9	-14.1
Asia	9.4	2.5	-11.9
Europe & Middle-East	-7.8	0.6	7.2
Latin America	-7.7	0.5	7.2
Oil Exporters	3.5	8.1	-11.6
Other Commodity Exporters	3.1	8.6	-11.7

Source: IMF staff estimates.

<sup>1/</sup> The table shows the fraction of the variance of output growth attributable to each factor.

<sup>2/</sup> Generated from variance decomposition of VAR regression, for period covering 1972-2009.

<sup>3/</sup> Generated from variance decomposition of VAR regression for period covering 1972-2007.

<sup>4/</sup> Difference between "During and post-crisis" and "Before the crisis". Positive sign implies an increase in contribution, and a negative sign means the opposite.

<sup>28</sup> Appendix V provides more detail on the global vector autoregression methodology and the list of LICs in the sample (see Table A5.1).

<sup>29</sup> Calculated from the impulse response functions shown in Appendix Figure A5.2. Note that there are significant variations across regions and type of exporters.

<sup>30</sup> A 1 percentage point increase in advanced economy's demand and productivity is associated with 0.9 and 1 percentage point increase in LIC output over 3 and 5 years respectively. Note that while helpful to broadly gauge magnitudes of the spillovers from advanced economies, these estimates of direct impacts are based on a different methodology and so are not strictly comparable to the BRIC spillover estimates. See Appendix V.

LIC regions during the crisis. The impact appears to be strongest in African and Asian LICs, and for oil and other commodity exporters, consistent with the earlier analysis.

**39. The most important direct channel of transmission from BRICs to LICs is trade.** Productivity improvements in BRICs, and FDI flows from BRICs to LICs also matter.

- The trade channel accounts for around 60 percent of the impact of BRICs on LIC growth. It is the most significant and persistent channel of transmission for all regions.<sup>31</sup> The response in African LICs is particularly strong, reflecting the growing trade ties that these countries have forged with BRICs in recent years.
- The direct impact of BRICs' productivity changes, in turn, represents around 13 percent of the combined impact of the various channels. The growth impact on Asian LICs is the strongest, probably reflecting the closer integration of Asian LICs into global manufacturing supply chains, in which BRICs (particularly India and China) play a critical role. The FDI channel also matters but, compared with other spillover channels, its impact on LIC growth is more modest.

**40. Spillovers from BRICs to LICs through global demand and price channels are also significant, though smaller than the direct spillovers.**

- BRICs' demand and productivity growth exert considerable influence over changes in some global variables (Table 8). In particular, roughly one third of changes in world oil prices can be attributed to shocks originating in BRICs.
- Among the indirect spillovers from BRICs (mainly from BRIC demand) to LICs, those operating through world oil and other commodity prices are the largest in the short run, and those through global demand and interest rates are generally small or negligible. This seems to reflect the fact that commodity supply is generally inelastic in the short run and the hence price impact is large.

Table 8. Changes in Global Variables—Contributions of BRICs  
(Average, in percent, 10 years ahead)

	Contribution of BRICs:			Other Factors
	Total	of which:		
		GDP	Demand <sup>1/</sup>	
To 10 percent change in:				
Global Demand <sup>2/</sup>	<b>20.4</b>	2.3	18.1	79.6
World Oil Prices	<b>33.5</b>	14.2	19.3	66.5
Other Global Commodity Prices	<b>17.6</b>	6.2	11.4	82.4
US Fed Rates	<b>8.1</b>	2.7	5.4	91.9

Source: IMF staff estimates.

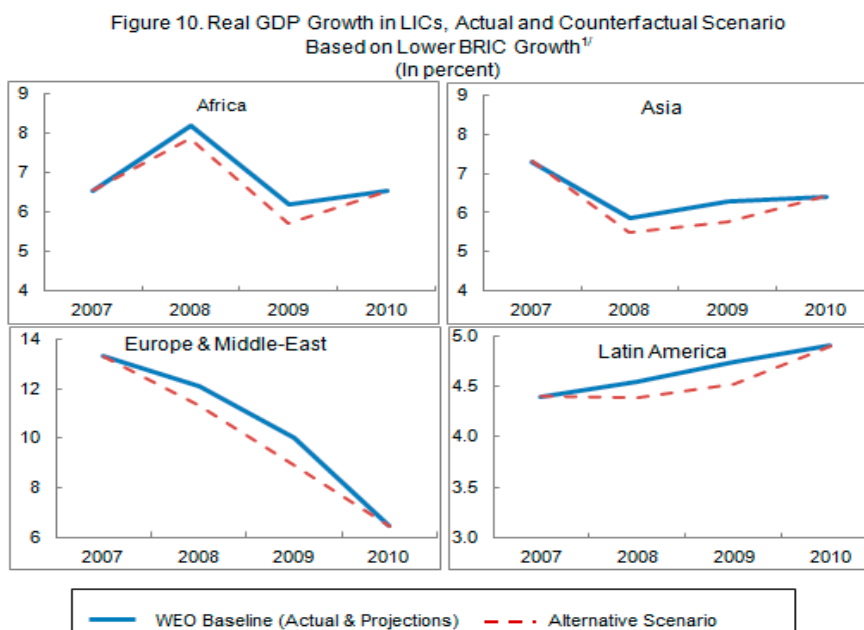
<sup>1/</sup>Total BRIC imports of goods and services.

<sup>2/</sup>Total World imports of goods and services, excluding BRIC imports.

<sup>31</sup> See Table A5.1 in Appendix V.

- The indirect channels (demand and productivity through their impacts on global variables) account for around 29 percent of the total impact of BRICs on LIC growth.

41. **The analysis confirms that LICs’ strong ties with BRICs, particularly through robust trade links, helped cushion LICs’ growth decline during the crisis.** BRICs’ growth declined by less than advanced economies during the crisis, providing stronger demand for LIC exports. Simulation results suggest that LIC growth would have been 0.3 percentage point to 1.1 percentage points lower during the crisis if BRICs’ GDP growth had declined at the same pace as advanced economies (See counterfactual scenario in Figure 10).<sup>32</sup>



Sources: WEO projections, and IMF staff estimates.

<sup>1/</sup> Assumes that BRICs’ growth declines at the same rate as that of Advanced Economies (2.5 percent in 2008, and 3.5 percent in 2009).

## VI. TURNING TO THE FUTURE

42. **The previous sections focused on past and current economic links between LICs and BRICs.** This section turns to the future and considers how LICs might be affected by the continued evolution of the global economy, and the BRICs in particular. It does so in two ways, looking first at a model simulating a hypothetical scenario of global rebalancing, and second at the implications of likely further shifts in BRICs’ production patterns.

<sup>32</sup> See Appendix V for more detail.

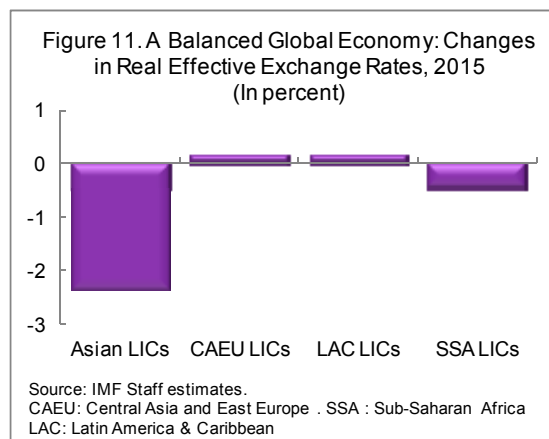
### A. Global Rebalancing: How could it affect LICs?

43. **Global rebalancing has been a key focus of policy debates in recent years. How it would affect LICs is an important issue in the context of LIC-BRIC linkages.** Much research has been devoted to examine the impact of global rebalancing on the major economies that will be key players in this global exercise, but little is known about how LICs might be affected.<sup>33</sup> Global rebalancing would entail significant adjustments in global variables, such as major bilateral exchange rates, global interest rates, relative prices of various commodities, and levels of demand in major trade partners. Over time, changes in these variables could have important effects on LICs' trade and financial flows as well as on their competitiveness in various sectors.

44. **To analyze the potential impact of global rebalancing on LICs, a general equilibrium model is run on a purely illustrative scenario in which current account imbalances in major countries (or regions) are eliminated by 2015.**<sup>34</sup> Clearly, this scenario is not meant to portray likely global developments but rather is solely used to illustrate how large changes in global variables may affect LICs. Under this scenario, by design, exports rise (fall), imports fall (rise), and the currency depreciates (appreciates) in advanced and emerging market countries presently experiencing a current account deficit (surplus).

45. **The model's main results for LICs are as follows:**

- **The impact on real exchange rates in LICs is limited.** Even in Asian LICs, where adjustment is expected to be more significant because of close trade ties with China, only a moderate depreciation would be expected (Figure 11). The key driving force for real depreciation in LICs is the increase in the world price of manufactures, which leads to declines in terms of trade for some LICs and to lower consumption and investment, putting downward pressure on the prices of domestically produced goods. However, contractions of consumption and investment are largely offset by increases in net exports, rendering the impact on domestic output very small.

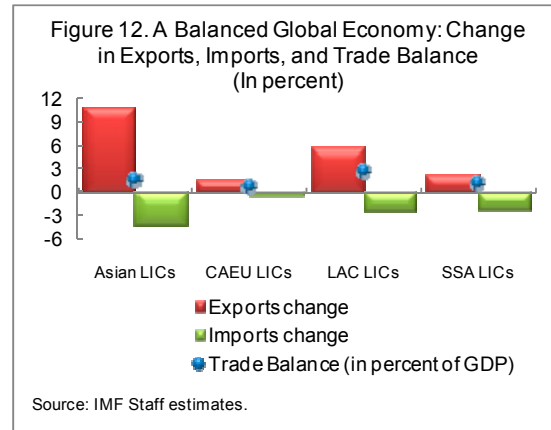


<sup>33</sup> See Blanchard and Milesi-Ferretti (2009) for a more detailed overview of the current global imbalances.

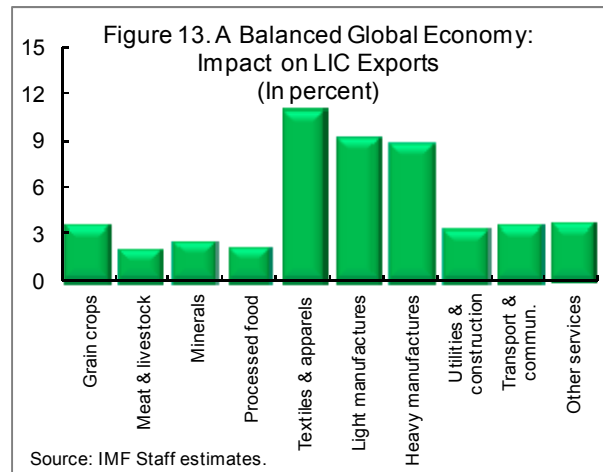
<sup>34</sup> The analysis was conducted with the Global Trade Analysis Project (GTAP) model. Appendix VI provides a brief description of the model and modeling strategy.



- Global rebalancing would generally improve trade account balances in all LIC regions.** The improvement ranges from 0.8 percent of GDP in Central Asia and Europe (CAEU) to 2.8 percent in LAC (Figure 12). Exports to most major markets expand considerably, except those to the United States where a contraction in overall imports reduces demand for some products from the rest of the world. The strong export growth in Asian LICs reflects their closer trade ties with China and their export composition—Asian LICs are much more specialized in labor-intensive manufactured goods than their counterparts in other parts of the world.



- Global rebalancing would provide a significant boost to manufactured exports from LICs.** While all LIC exports are set to benefit from global rebalancing, manufactured products stand out, especially labor-intensive ones, as Chinese exports contract (relative to the baseline, but not in absolute terms), pushing up world prices (Figure 13). Manufactured products would account for 80 percent of the total LIC export expansion.<sup>35</sup>



- While global rebalancing would have only limited medium-term output impacts in LICs according to this “comparative statics” scenario, dynamic effects are likely to be larger.** Fund staff analysis suggests that collaborative policy actions by the G20 would reduce global imbalances, and lift global GDP growth by up to 2½ percentage points over the medium term (IMF, 2010c). For some country groups, structural reforms that deliver large productivity gains are an important component of the policy package. Faster growth in G20 countries would increase demand for LIC exports. Perhaps more importantly, increases in manufactured exports could generate technology and skill spillovers, benefiting LICs’ long-run growth. A full dynamic analysis of the implications of global rebalancing for LICs would also need to consider potential productivity

<sup>35</sup> While this result may imply that some LIC manufacturing industries have been under competitive pressure from their Chinese counterparts—as discussed in the trade section—it should be placed in the broader context of LIC-BRIC relations in considering the implications for LIC growth. These relations, including financing and investment, and positive impacts on LIC terms of trade, have boosted LIC growth and are in many ways helping lay the groundwork for LICs to take advantage of future opportunities for manufactured exports.

spillovers from advanced and emerging economies, as well as productivity and growth benefits as LICs increase their exports of manufactured exports.

## B. A Long-Run Perspective

46. **The economic structure of BRICs, particularly China, is likely to continue to evolve at a fast pace.** Industrial upgrading will be a key aspect of this adjustment as levels of income and technological sophistication increase.

47. **For LICs, a key question is whether the evolving pattern of production in BRICs will help them diversify into new sectors of production.**

- **Some observers are skeptical. They see BRICs continuing as exporters of labor-intensive products for a long time to come and doubt that LICs can diversify into manufacturing in the presence of BRIC competition.** Collier (2007), for example, contends that the bottom billion—a group of stagnating LICs—has missed the boat in the global relocation of labor-intensive manufacturing and their next opportunity will only come after Asian exporters graduate from this segment of the market. Similarly, Goldstein et al. (2007) argue that the emergence of China and India has reinforced Africa’s comparative advantage in the production of resource-based commodities and the continent now runs a greater risk of falling into a trap of resource dependence.
- **However, history shows that some poor countries endowed with rich natural resources were able to diversify their exports as they grew.** Malaysia, Indonesia, and Chile, for example, had been heavily dependent on resource-based exports before they were able to diversify into manufactured exports. Obviously, how quickly a LIC can diversify depends on initial endowments and domestic policies, as well as on the external environment. While there has been much debate on the role of industrial policy in export diversification and growth, a common characteristic among successful countries has been their ability to use revenues generated from resource-based exports to build up productive capacity, including infrastructure and human capital that are critical for the production and export of manufactures.

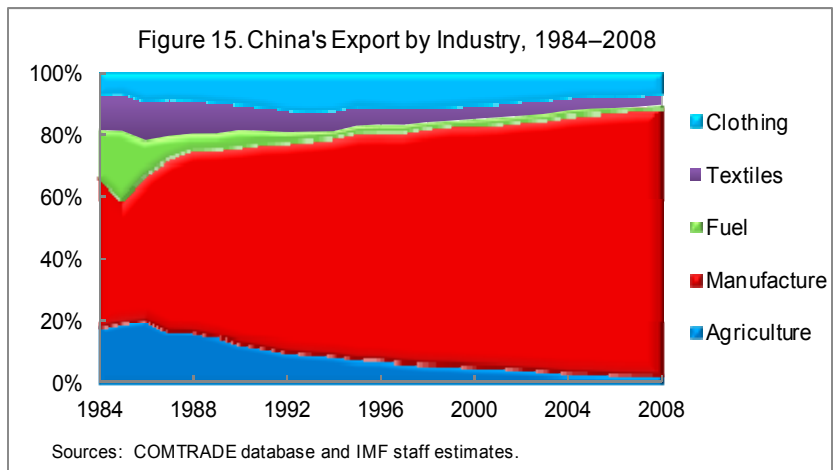
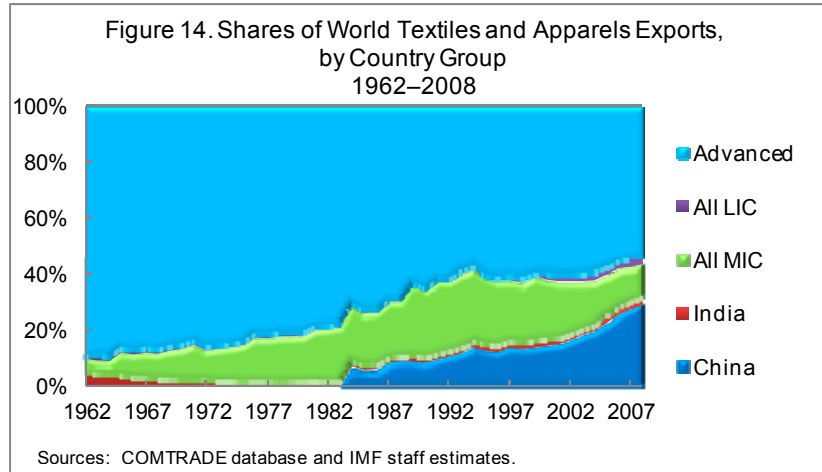
48. **The evolution of the global textiles and clothing markets illustrates how industrial upgrading in BRICs might help LICs export these products, which have often been a spearhead of industrialization.** Starting with Japan, many Asian countries have been able to take advantage of this development strategy. Japan’s dominant position in textiles and clothing in the 1950s and 1960s was gradually replaced by the Asian newly industrialized economies (People’s Republic of China—Hong Kong SAR, the Republic of Korea, Singapore, and Taiwan, Province of China) and the more advanced ASEAN countries (Indonesia, Malaysia, and Thailand) in the 1970s and 1980s. China began to gain competitiveness in this sector in the late 1970s and has since become a dominant exporter. In the 1990s, several Asian LICs, particularly Bangladesh, Vietnam, and Cambodia, have managed to increase their exports of textiles and clothing, often with the help of FDI from

neighboring countries. If the rapid increases in BRIC FDI inflows to LICs continue and diversify, the Asian LICs' experience might be replicated more widely.<sup>36</sup>

**49. Much will depend on how fast BRICs, particularly China, move out of labor-intensive manufacturing.**

Measured by its share in the world market, China is not yet moving out of textiles and clothing (Figure 14). As a share of China's total exports, however, textiles and apparels are clearly on the decline (Figure 15). Recent developments suggest that the growth of labor-intensive exports is likely to slow. Wage increases in coastal China have accelerated and the supply of unskilled labor is tightening, both as a result of tremendous labor absorption over the past three decades and of an expected decline in the young labor force (Garnaut, 2010).<sup>37</sup> Moving manufacturing activities further inland will slow wage increases, but this is only a medium-term solution

(Cai and Wang, 2008). It is difficult to predict how fast China will move out of the labor-intensive segments of manufacturing, but anecdotal evidence suggests that rising production costs in China have already led to greater demand for exports from some other Asian countries.<sup>38</sup> Given China's large share in the world market for labor-intensive manufactures, its upgrading to higher value-added products should leave sufficient room for LICs and other latecomers, including India.



<sup>36</sup> There are also success stories outside Asia. Mauritius, for example, was a competitive exporter of textiles and clothing beginning in the 1990s.

<sup>37</sup> See also "Is China's labour market at a turning-point?" *The Economist*, June 12, 2010, page 86.

<sup>38</sup> Some Australian textiles traders have reportedly switched their orders from China to other Asian countries because Chinese factories could not fill in orders with a reasonable lead time.

50. **To increase manufactured exports, LICs do not have to wait for China and other Asian emerging market economies to graduate from the market for labor-intensive manufactures.** The way forward is to undertake necessary reforms to build up export capacity. This would lay the ground work to embrace a possible new round of global relocation of manufacturing, which may be coming sooner than many have expected.

## VII. CONCLUSIONS

51. **Economic relations between LICs and BRICs have strengthened remarkably over the past decade.** In many respects, there is nothing surprising in these rapidly evolving relations: as BRICs' weight in the world economy increases and LICs' economic performance improves, both sets of countries have found it beneficial to boost their economic cooperation. There are, however, some unique characteristics of the LIC-BRIC relations that underlie the dynamics and challenges of this cooperation, and both BRICs and LICs have a role to play in realizing the potential benefits from expanding LIC-BRIC ties. The long-term impact of these dynamics is still unfolding and could be far-reaching.

52. **BRICs' engagement with LICs is broad-based, encompassing trade, FDI and development financing.** Indeed, these three areas are seen to be complementary. Benefits have become evident in all three areas and they re-enforce each other:

- **The emergence of BRICs has boosted LICs' exports and improved their terms of trade.** The rapid growth of BRIC economies has generated huge demand for primary commodities and raised their world prices. At the same time, LIC imports of manufactured goods from BRICs have surged, benefiting both LIC consumers and intermediate users. The explosion of this bilateral trade has been driven not only by economic growth, but also by a high degree of complementarity between LICs and BRICs in resource endowments. Yet there remains great potential for further increases in LIC-BRIC bilateral trade as trade barriers in both sets of countries remain relatively high and further reforms can only increase bilateral trade.
- **BRIC FDI is playing a growing role in improving productive capacity in LICs.** BRIC FDI has helped tap natural resources as well as strengthen the manufacturing base in many LICs. There are signs that BRIC FDI is spreading beyond the resource sector to agriculture, manufacturing, and services (telecommunications in particular). Moreover, the private sector, including its SME segment, is increasingly participating in investment projects, which could further increase the diversity of BRIC FDI and broaden LICs' production and export base.
- **Development financing has helped many LICs alleviate infrastructure bottlenecks and reduce poverty.** Despite its small overall volume compared with OECD financing, development financing from BRICs has enabled many LICs to increase power generation and transport networks substantially. BRICs' specialization in infrastructure financing has generally been complementary with aid from many OECD donors, who had

increasingly shifted their resources to social spending. Moreover, BRICs' development financing is often designed to complement trade and investment at the project level and forms part of a larger package. There are pros and cons of this approach, but if well leveraged, it could significantly increase the development impact of BRIC financing, including offsetting the potential Dutch disease effect of commodity booms.

- **Closer LIC-BRIC ties have helped sustain economic growth in LICs in recent years.** In particular, the strong growth of BRIC economies during the global financial crisis has helped dampen the downturn of economic activity in LICs. Such growth spillover effects are transmitted mostly through direct channels such as trade (BRIC demand), FDI, and productivity increases in BRICs and with trade being the most powerful transmitter. Indirect channels are, nevertheless, non-trivial, particularly through world commodity prices. These spillover effects are persistent and long-lasting. As LIC-BRIC trade and financial ties continue to strengthen, LIC policymakers need to pay greater attention to economic developments in BRICs, which could either amplify or dampen LIC economic cycles depending on the degree of synchronization between BRICs and LICs' traditional development partners.

53. **While bringing substantial benefits to LICs, closer LIC-BRIC ties have also highlighted some of the key challenges facing LICs in sustaining economic growth.** Most of these challenges are not new, but they deserve renewed attention, as the rapidly growing importance of BRICs in the world economy and for LICs has significantly "raised the stakes." Some of these challenges, especially those stemming from BRICs' "package" financing, are not typically present in interactions with other donors.

- **Avoiding resource dependency in the long run:** While the improved terms of trade for LICs resulted in large gains to consumers and producers of primary commodities, it has also put more pressures on import-competing manufacturers and generated fears that LICs could fall into a commodity trap, to the detriment of long-term growth. These are legitimate concerns given the past experience with resource booms in some LICs. However, the solution does not lie in retreating from exports of commodities and increasing trade protection, but rather in making the best use of resource revenues and increasing the efficiency of domestic manufacturing.
- **Attracting more FDI and maximizing its benefits:** Given the relatively low saving rates and lack of technology and skills in most LICs, more FDI is needed to help strengthen domestic productive capacity and improve competitiveness. However, any fiscal incentive provided to FDI should be based on careful cost-benefit analysis in the context of articulating development priorities. Continued efforts should be made to improve the business environment, upgrade labor skills, foster technology transfer, and integrate FDI firms into local economies.
- **Making greater use of development financing without jeopardizing debt sustainability:** Small as it may be, BRIC development financing is generally less concessional than ODA and more concentrated in country distribution. Moreover,

packaging of various forms of financing and tied procurement sometimes makes it difficult to assess debt implications, and this can be exacerbated by the lack of public information on details of financing, pointing to the pressing need for greater transparency. LIC governments need to ensure that BRIC financing—like any other financing—generates sufficient social returns and government revenues to avoid unsustainable debt. This entails a need for a well developed process of project selection, execution, and evaluation. In this respect, development partners, including BRICs, can play a critical role in strengthening LICs' capacity. Moreover, increased availability of unconditional financing from BRICs should not distract LICs policymakers from their continued efforts to improve governance.

54. **Embracing policy reforms to meet these challenges will place LICs in a stronger position to reap the long-term benefits of global integration.** Over time, prices of manufactured products, particularly labor-intensive ones, are likely to rise as BRICs devote more resources to non-tradable sectors and upgrade their exports to higher value-added products. Global rebalancing could accelerate this process. Thus, LICs could have increased opportunities, perhaps sooner than many have expected, to export labor-intensive manufactures and, more generally, to diversify their economies. The challenge for LICs is to accelerate their reforms accordingly, which would lay the ground work to seize the opportunity from this possible new phase of global relocation of labor-intensive manufacturing activities.

## Appendix I. Constant Market Share Analysis of LIC Exports

The geographical distribution of LIC exports has changed significantly during the past decade. There has been a shift of merchandise exports from traditional partners, most notably the European Union, towards rapidly integrating BRICs. The sectoral composition of LIC merchandise exports has also changed. The share of fuels and minerals in total LIC exports increased markedly in recent years up to 2008 while that of agricultural goods and manufactures has declined, reflecting recent global commodity booms. Constant market share (CMS) analysis provides a useful platform for assessing the extent to which the increase in exports reflects greater penetration of existing markets or a shift towards more dynamic regions/markets and products.

For a given time period, CMS analysis decomposes the growth in exports into four components: global market growth effect (measures the increase necessary to keep LIC's share in world trade unchanged); commodity composition effect (the extent to which export growth has benefited from the concentration of exports in commodities for which demand has been growing more rapidly); market distribution effect (whether export growth has benefited from the concentration of exports in more dynamic markets or regions); and the competitiveness effect, a residual assumed to capture exchange rate developments, changes in the quality of exports, as well as changes in terms of trade. The specification is as follows:

$$X^1 - X^0 = rX^0 + \sum_i (r_i - r)X_i^0 + \sum_{ij} (r_{ij} - r_i)X_{ij}^0 + \sum_{ij} (\rho_{ij} - r_{ij})X_{ij}^0$$

Global market growth + Commodity composition + Market distribution + Competitiveness

where  $X_{ij}^t$  = value of LIC exports of commodity  $i$  to country  $j$  during period  $t$

$r$  = growth rate of world exports

$r_i$  = growth rate of world exports of commodity  $i$

$r_{ij}$  = growth rate of world exports of commodity  $i$  to country  $j$

$\rho_{ij}$  = growth rate of LIC exports of commodity  $i$  to country  $j$

$0$  and  $1$  refer to beginning and end period, respectively

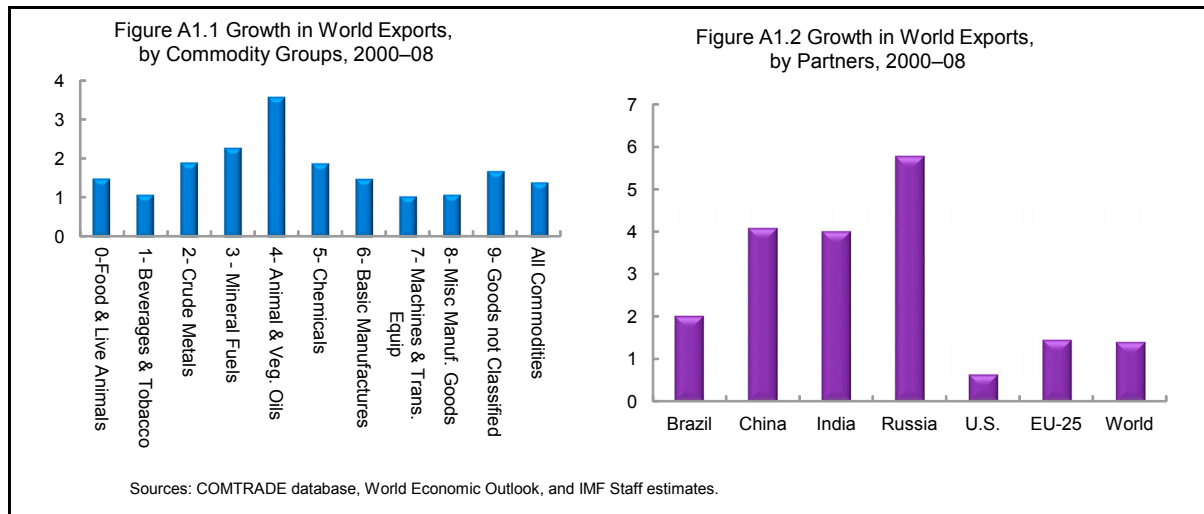
This exercise was conducted using data at the one-digit SITC (revision 1) level, with individual BRICs, the EU, the US, and the rest of the world (residual) as separately identified export markets.

The results of the CMS analysis suggest that growth in LIC exports is explained largely by rising world trade, in addition to a commodity composition effect and

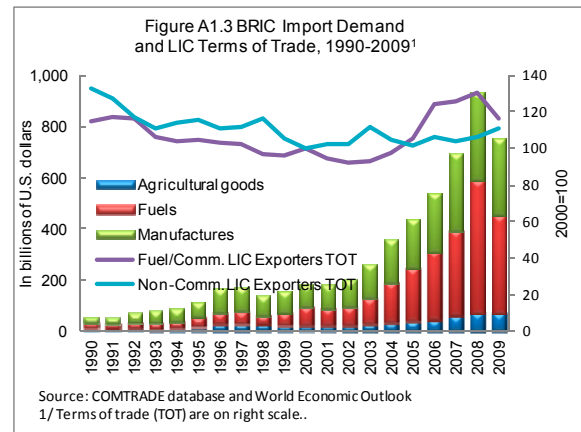
Table A1.1 CMS Analysis of Export Changes	
2000–2008	
Change in exports	
In billions of US dollars	205.9
Average annual growth rate (percent)	25.4
Due to	
Global trade effect	61.4
Commodity composition effect	18.1
Market distribution effect	5.7
Competitiveness effect	14.8

Sources: COMTRADE database and staff calculation.

improvement in competitiveness (Table A1.1). About 60 percent of the increase in LIC exports between 2000 and 2008 is driven by the increase in global trade in general. Moreover, close to 25 percent of this increase can be attributed to the concentration of LIC exports on commodities for which demand has grown at above average rates (such as fuels, metals, and agricultural products) and on rapidly growing markets such as the BRICs (Figure A1.1). As shown, export demand by China, India and Russia grew at twice the world average since 2000 (Figure A1.2).



Finally, about 15 percent of the export expansion is due to improved competitiveness. However, the interpretation of this residual is not straightforward since it could reflect either differential rates of export price inflation or differential improvement rates in efficiency of marketing or financing sale of export goods. In the case of nominal trade flows, the competitiveness effect also incorporates the effect of changes in the terms of trade, which have been particularly strong for commodities during 2005–2008 (Figure A1.3).<sup>39</sup>

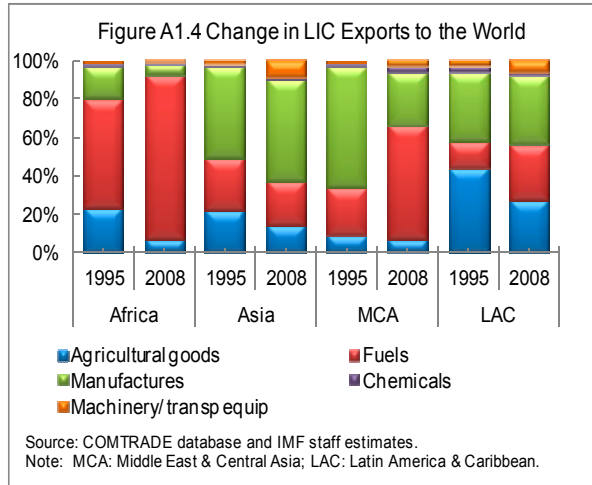


<sup>39</sup> See IMF World Economic Outlook, April 2008.



**Box A1.1 Heterogeneity of LIC Trade Patterns**

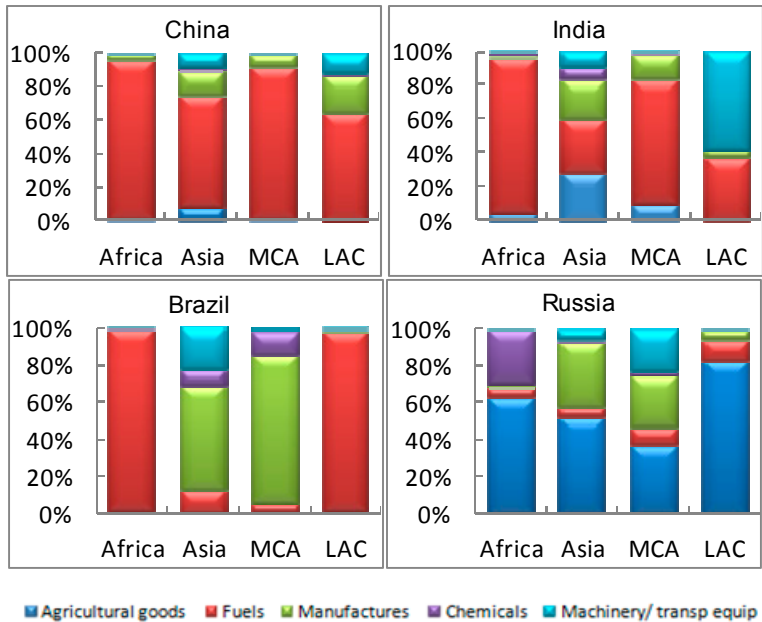
**There is considerable heterogeneity in LIC export patterns across regions and product categories.** Overall, more than two-thirds of LIC exports consist of primary commodities (agricultural and fuel/mineral goods). This pattern, however, is largely driven by LICs in Africa and the Middle East and Central Asia (MCA), where the share of fuel exports increased markedly since 1995 (Figure A1.4). In contrast, exports of Asian LICs are dominated by manufacturing (including machinery)—a share which these countries have managed to increase to about two-thirds of total exports in 2008. LICs in Latin America and the Caribbean have also maintained the share of manufacturing exports at about a third of total exports, and primary commodities at about 58 percent.



**BRIC import demand from LICs also reflects differences in endowment patterns.**

Import demand is dominated by fuel commodities in China and India--and to a lesser extent Brazil—and by agricultural commodities in Russia and India (Figure A1.5). The predominance of fuel imports from African LICs for China, India and Brazil is consistent with the shift in overall export patterns outlined above. Import demand tends to be more diversified for Asian LICs, with a higher proportion of manufacturing in India's and Russia's imports. (Note that Brazil's imports from Asia and MCA are very small.)

Figure A1.5 Composition of LIC Exports to BRICs by Region, 2008



Source: IMF staff compilation.

## Appendix II. Gravity Model Analysis of LIC-BRIC Trade

A gravity model is used to assess whether LIC levels of exports and imports are consistent with predictions of economic theory. The gravity equation relates bilateral trade between two countries to their GDP and population (or GDP per capita)—larger and richer countries will tend to trade more with each other. The gravity equation is augmented to capture distance effects on bilateral trade and country-specific factors such as common language, border, and colonizer. Following Rose (2004) and Subramanian and Wei (2006), among others, the model is further augmented to investigate the effect of policy-specific variables, such as membership in the WTO, free trade agreements, or other preferential access schemes.

A key innovation of the model employed here is the introduction of a complementarity index to the analysis. The rapid growth of BRIC economies has led to profound changes in their structure and generated trade that cannot be fully explained by typical variables included in a gravity model. We constructed an export complementarity index as follows:  $S(ab, c) = \{\sum_i \text{Minimum}[X_i(ac), X_i(bc)]\} \times 100$ , which measures the similarity of the export pattern of country 'a' and imports of country 'b' to market 'c', where 'a' are LICs, 'b' are partner countries and 'c' is the world (See Finger and Kreinin (1979) for details).

While including the complementarity index, our specification is a parsimonious adaptation of Rose (2004) and Carrere et al. (2010) of the following form:

$$\begin{aligned} \ln(X_{ijt}) = & \beta_0 + \beta_1 \ln(Y_i) + \beta_2 \ln(Y_j) + \beta_3 \ln(YP_i) + \beta_4 \ln(YP_j) + \beta_5 \ln(D_{ij}) + \beta_6 (Bord_{ij}) \\ & + \beta_7 (Lang_{ij}) + \beta_8 \ln(Complement_{ij}) + \beta_9 (WTO_{ijt}) + \beta_{10} (EBA_{ijt}) \\ & + \beta_{11} (AGO_{ijt}) + \beta_{12} (DumBRIC_{ij}) + YDUM_t + \varepsilon_{ijt} \end{aligned}$$

where  $i$  and  $j$  denotes trading partners,  $t$  denotes time, and the variables are defined as follows:  $X_{ijt}$  denotes value of bilateral trade in real terms between  $i$  and  $j$  at time  $t$ ;  $Y_i$  and  $Y_j$  is real GDP of reporter and partner country, respectively;  $YP_i$  and  $YP_j$  is real GDP per capita (in constant 2000 US dollars) of reporter and partner country, respectively;  $D_{ij}$  is the distance between  $i$  and  $j$ ;  $Bord_{ij}$  is a binary variable that takes the value of 1 if country  $i$  and  $j$  share a common border;  $Lang_{ij}$  is a binary variable that takes the value of 1 if country  $i$  and  $j$  have a common language;  $Complement_{ij}$  is a trade complementarity index between exports of LICs and imports of partners;  $WTO_{ijt}$  is a dummy taking the value of 1 if either reporter or partner are WTO members at time  $t$ , 2 if both are members, and zero otherwise;  $EBA_{ijt}$  is a dummy taking the value 1 if the reporter and partner are parties to a preferential agreement at time  $t$  (in this case the EU);  $AGO_{ijt}$  dummy taking the value 1 if the reporter and partner are parties to a preferential agreement at time  $t$  (in this case the U.S.);  $DumBRIC_{ij}$  dummy that takes the value of 1 if the partner is Brazil, China, India or Russia;  $YDum_t$  dummy that takes

the value of 1 for 2001–2008;  $\varepsilon_{ijt}$  represents other omitted influences on bilateral trade, assumed to be well-behaved. The results are presented in Table A2.1.

The results for the core export and import regressions are broadly in line with theoretical predictions and highly statistically significant at the one-percent level. Equation 1 estimates the core model using time fixed effects and shows that economic size of both reporter and partner country impacts trade positively, with a larger effect on bilateral exports. The effect of economic size on bilateral trade flows is also greater for the more recent period. On the other hand, the impact of per capita income is positive albeit small and statistically significant only for the latter period. As expected, distance impacts bilateral trade negatively (a 10 percent increase in distance reduces bilateral exports by almost 13 percent), whereas sharing a common border and language increase bilateral trade.

Equation 2 introduces the trade complementarity index, which is positive and statistically significant. A 10 percent increase in complementarity between the structure of LIC exports and that of partner imports leads to a 1.3 percent increase in bilateral exports. This is consistent with the analytical presentation of the changing composition of LIC exports as underlying increased bilateral trade. Trade complementarity impacts LIC imports positively, albeit modestly. This could be interpreted as higher complementarity on the LIC export side generating positive effects on the import side as well (i.e., LICs tend to import more from countries to whom they also export more) (Figure A2.1).

The evidence on the effect of membership in the WTO and preferential access arrangements is somewhat mixed (Equations 3 and 5). For the full sample, it appears that membership in the WTO does not confer benefits to LIC exports: the WTO dummy is negative and statistically significant. The impact of WTO membership is positive only in the shorter sample and is statistically significant only for imports. These results are not entirely surprising. Rose (2004) failed to detect positive evidence of GATT/WTO membership between 1948 and 1999. In addition to potential misspecification issues, Subramanian and Wei (2006) argue that this could reflect the limited liberalization that developing countries effectively undertook until the Uruguay Round. Results for the recent period could be picking up this latter effect. For preferential access schemes, the impact is positive and significant only for the Everything-But-Arms (EBA) initiative with the European Union. For the African Growth and Opportunity Act (AGOA) with the United States, the impact is very small and statistically insignificant from zero. While suggestive, these findings should be interpreted with caution since dummy variables may not adequately capture the effect of preferential access schemes on export levels.<sup>40</sup>

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<sup>40</sup> Aiello and Cardamone (2010) suggest that the impact of preferential agreements is best captured by calculating ‘preference margins’ which apply only to those sectors that the preferences are supposed to impact, as opposed to dummy variables which assume the same level preferences for all exports. Using preference margins, they find mixed effects of EBA on sectoral exports of developing countries.

The results suggest a positive impact on LIC exports and imports arising from relations with China and India, especially since 1995 (Equations 4 and 6). On the export side, increased trade with China and India has an additional positive impact on LIC exports (i.e., over and above the effect of standard gravity variables). The impact is also stronger on the import side and larger for the shorter sample, reflecting BRICs' growing importance in the world economy. The effect for Russia and Brazil on LIC trade is less robust. These findings are generally supportive of the analysis suggesting the positive impact of broader, deepening relations between LICs on the one hand and China and India on the other, compared to Russia and Brazil which are relatively endowed with resources and are less integrated with LIC economies.

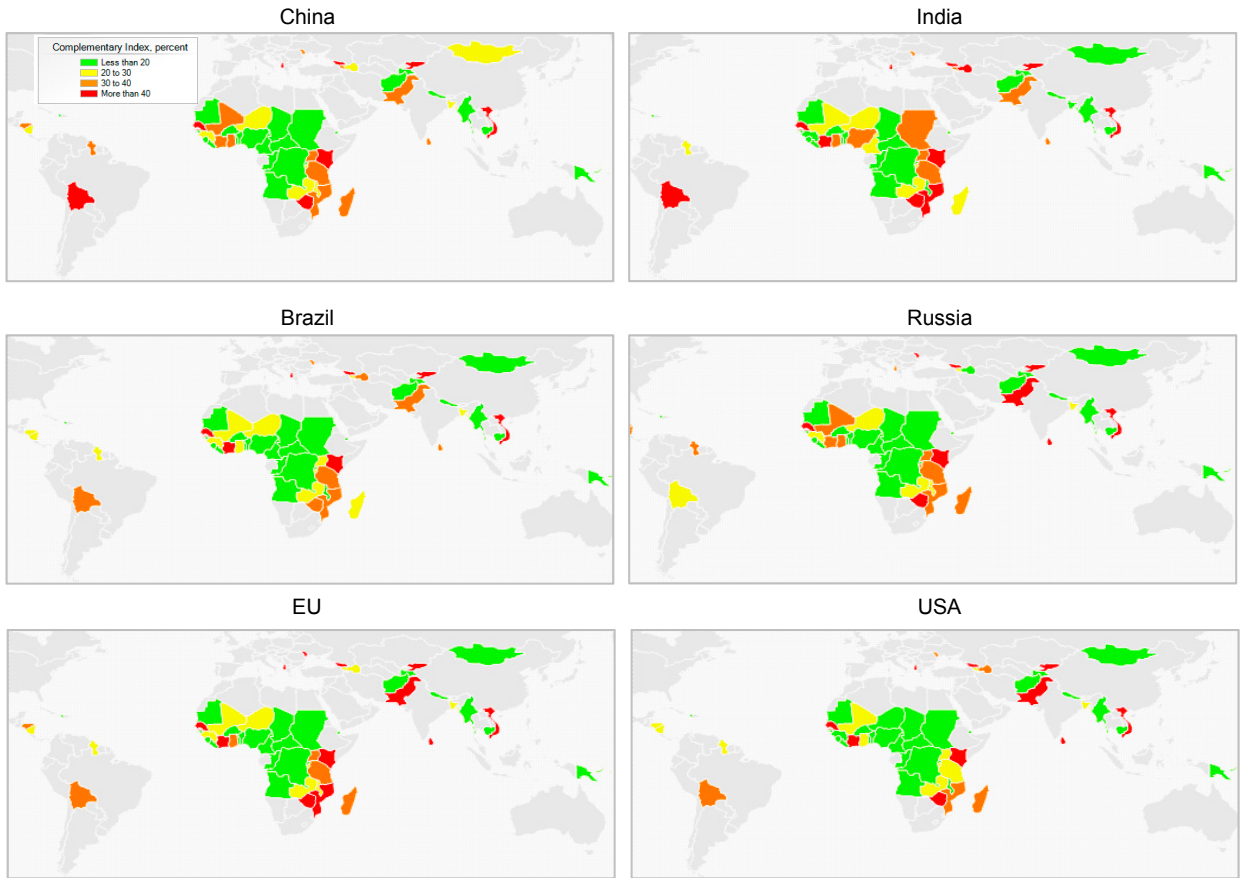
Table A2.1 - Gravity Model Estimation Results <sup>1/</sup>

	Dependent Variable: Log Real Exports						Dependent Variable: Log Real Imports					
	Eqn 1	Eqn 2	Eqn 3	Eqn 4	Eqn 5	Eqn 6	Eqn 1	Eqn 2	Eqn 3	Eqn 4	Eqn 5	Eqn 6
Log GDP reporter	0.92 (0.02)***	1.08 (0.03)***	1.08 (0.03)***	1.08 (0.03)***	1.11 (0.03)***	1.11 (0.03)***	0.59 (0.02)***	0.73 (0.02)***	0.73 (0.02)***	0.73 (0.02)***	0.73 (0.02)***	0.73 (0.02)***
Log GDP partner	0.81 (0.02)***	0.84 (0.02)***	0.83 (0.02)***	0.84 (0.03)***	0.85 (0.03)***	0.84 (0.03)***	0.82 (0.02)***	0.90 (0.02)***	0.90 (0.02)***	0.84 (0.02)***	0.92 (0.02)***	0.85 (0.02)***
Log GDP per capita reporter	0.19 (0.05)***	0.004 (0.06)	-0.003 (0.06)	-0.001 (0.06)	-0.01 (0.06)	-0.01 (0.06)	0.01 (0.033)	0.06 (0.039)	0.06 (0.038)	0.05 (0.038)	0.09 (0.04)**	0.08 (0.04)**
Log GDP per capita partner	0.02 (0.03)	0.07 (0.03)	0.07 (0.03)	0.07 (0.04)**	0.03 (0.03)	0.06 (0.04)	0.11 (0.02)***	0.12 (0.03)***	0.12 (0.03)***	0.21 (0.03)***	0.09 (0.03)***	0.18 (0.03)***
Log Distance	-1.29 (0.06)***	-1.42 (0.06)***	-1.41 (0.06)***	-1.41 (0.06)***	-1.44 (0.06)***	-1.45 (0.06)***	-1.19 (0.05)***	-1.36 (0.05)***	-1.35 (0.05)***	-1.37 (0.05)***	-1.34 (0.05)***	-1.36 (0.05)***
Border	1.34 (0.16)***	1.24 (0.21)***	1.26 (0.21)***	1.28 (0.21)***	1.39 (0.22)***	1.39 (0.22)***	0.89 (0.14)***	0.87 (0.18)***	0.87 (0.18)***	0.81 (0.18)***	1.01 (0.19)***	0.97 (0.19)***
Language	0.69 (0.09)***	0.87 (0.11)***	0.87 (0.11)***	0.85 (0.11)***	0.82 (0.12)***	0.79 (0.12)***	0.51 (0.08)***	0.56 (0.09)***	0.57 (0.09)***	0.59 (0.09)***	0.58 (0.09)***	0.59 (0.09)***
Year Dummy (2001-08)		-0.63 (0.05)***	-0.47 (0.05)***	-0.47 (0.05)***	-0.39 (0.05)***	-0.39 (0.05)***		0.15 (0.03)***	0.19 (0.04)***	0.18 (0.04)***	0.23 (0.03)***	0.23 (0.03)***
Log_Complementarity		0.13 (0.03)***	0.13 (0.03)***	0.13 (0.03)***	0.13 (0.03)***	0.13 (0.03)***		0.04 (0.02)*	0.04 (0.02)*	0.04 (0.02)*	0.04 (0.02)*	0.05 (0.02)**
Dum_WTO			-0.21 (0.04)***	-0.21 (0.04)***	0.07 (0.09)	0.11 (0.09)			-0.05 (0.03)*	-0.03 (0.03)	0.13 (0.07)**	0.18 (0.079)***
Dum_EBA			1.67 (0.26)***	1.62 (0.26)***	1.71 (0.26)***	1.73 (0.27)***						
Dum_AGOA			-0.01 (0.35)	-0.07 (0.35)	-0.01 (0.36)	-0.001 (0.36)						
Dum_China				0.20 (0.27)		0.51 (0.28)*				1.59 (0.16)***		1.66 (0.17)***
Dum_India				0.21 (0.33)		0.60 (0.33)*				0.87 (0.21)***		1.14 (0.21)***
Dum_Brazil				-1.53 (0.31)		-1.36 (0.34)***				0.10 (0.14)		0.13 (0.15)
Dum_Russia				-0.06 (0.41)		0.28 (0.42)				0.11 (0.30)		0.31 (0.31)
C	-4.64 (0.72)***	-6.58 (0.91)***	-6.42 (0.91)***	-6.45 (0.95)***	-7.49 (0.94)***	-7.19 (0.97)***	-2.64 (0.59)***	-2.97 (0.66)***	-2.95 (0.66)***	-1.82 (0.68)***	-3.65 (0.69)***	-2.45 (0.69)***
Dummy	Period FE						Period FE					
R2	0.38	0.42	0.43	0.43	0.42	0.42	0.46	0.53	0.53	0.54	0.54	0.54
Period	1980-2008	1980-2008	1980-2008	1980-2008	1995-2008	1995-2008	1980-2008	1980-2008	1980-2008	1980-2008	1995-2008	1995-2008
No. observations	73,599	35,034	35,034	35,034	27,215	27,215	77,642	38,572	38,572	38,572	29,703	29,703
No. country pairs	6,494	4,260	4,260	4,260	4,016	4,016	6,228	4,213	4,213	4,213	3,963	3,963

Note: OLS with year fixed effects where indicated. Standard errors in parentheses. \*\*\*, \*\*, \* denote statistical significance at the 1 percent, 5 percent and 10 percent level, respectively.

<sup>1/</sup> The data set includes 71 LIC reporter countries and 153 partner countries for the period 1980-2008, yielding a panel of 10,863 country pairs. A subset of equations is estimated for the period 1995-2008 to detect possible changes in economic and policy variables. The specification using the year dummy (2001-08) is to account for possible effects for the larger partners such as China's accession to the WTO.

Figure A2.1 Heat Map of Complementarity Index for LICs with Partners Average, 2005–08



Sources: COMTRADE database, IMF staff estimates.

### Appendix III. Data on Development Financing

Data on BRIC financing used in this analysis are largely based on an IMF survey and the World Bank's debt database. The IMF survey data draws on information provided by LIC desk officers during a 2010 survey and has some data on 34 countries spanning 2000–2009 (see Table A3.1 for country list)<sup>41</sup>. Data on Brazil is limited to non-concessional loans while Russia data is limited to a few countries. The survey data includes some detailed decomposition of the development assistance into grants (in-kind, budget and project) and loans (concessional and non-concessional). The World Bank debt database has information on loan commitments based on recipient country data and includes 49 countries spanning 2000–2008. OECD data was also used to obtain estimates of OECD commitments for comparison.

Table A3.1 Country List of World Bank Debt Database and IMF Survey

World Bank Debt Database		IMF Survey 2010	
Country	Country	Country	Country
Angola	Lesotho	Bhutan	Senegal
Bangladesh	Madagascar	Bolivia	Seychelles
Benin	Malawi	Djibouti	Sri Lanka
Bhutan	Maldives	Dominica	Suriname
Bolivia	Mali	Cote D'Ivoire	Tajikistan
Burkina Faso	Mauritania	Ethiopia	Uganda
Burundi	Mozambique	Ghana	Vietnam
Cambodia	Nepal	Grenada	Vanuatu
Cameroon	Nicaragua	Guyana	Yemen
Cape Verde	Niger	Haiti	
Chad	Nigeria	Kenya	
Congo, DR	Samoa	Kyrgyz Republic	
Cote D'Ivoire	São Tomé & Príncipe	Cambodia	
Dominica	Senegal	Lao People's Dem. Rep	
Eritrea	Sierra Leone	Liberia	
Ethiopia	Sudan	Mali	
Gambia	Tajikistan	Moldova	
Georgia	Tanzania	Madagascar	
Ghana	Togo	Maldives	
Grenada	Tonga	Mongolia	
Guinea	Uganda	Myanmar	
Guyana	Yemen	Nepal	
Honduras	Zambia	Papua New Guinea	
Kenya	Zimbabwe	Rwanda	
Kyrgyz Republic		Samoa	

<sup>41</sup> LICs include all countries that were PRGF-eligible between 2000 and 2009 for which data is available.

## Appendix IV. Dynamic Panel Analysis of Determinants of Development Financing Data

Annual data on BRIC financing flows to LICs during 2000–08 are pooled across 49 LICs (Table A4.1).<sup>42</sup> Variable sources, definitions, and rationale are presented in Table A4.2.<sup>43</sup>

Table A4.1 List of Variables in Dynamic Panel Analysis

Variable	Code	Rationale
BRIC Financing	Loan	Dependent variable and debt impact in the degree of concessionality model
ODA Flows	ODA	Same as above
Degree of Concessionality	Concessionality	Dependent variable and also considered as explanatory variable capturing impact of concessionality.
Income	GDP	Relative income is used as a proxy for "needs"
Infant Mortality	Mort	Proxy for "physical needs"
Reserves	Reserves	Proxy for "foreign exchange needs"
Trade Openness	Openness	Proxy for donor interests
Imports	Imp	Proxy for donor commercial interests
Exports	Exp	Proxy for donor commercial interests
Resource-Rich	Res	Proxy for donor commercial interests, captures the impact of endowment
Resource-Scarce Landlocked	Land	Proxy for donor commercial interests, captures the impact of endowment and location
Resource-Scarce Coastal	Port	Same as above
Regional Dummy		Proxy for "political interest" (geography)
Asian and Pacific LICs	Asia	Same as above
African LICs	AFR	Same as above
Western Hemisphere LICs	WHD	Same as above
Size of Government	Gcons	Proxy for institutions, focusing on size and scope of government. In line with the literature, bigger government signifies weaker institutions
Fund Program	Prog	Reflects impact of Fund conditionality, which takes into account debt sustainability in setting debt limits
CPIA	CPIA	Proxy for institutions, focuses on quality of institutions, policies & management
Government Effectiveness	KK	Proxy for institutions, focusing on governance
Planning	Plan	Proxy for institutions, focusing on budget planning
Transparency	Transp	Proxy for institutions, focusing on transparency

<sup>42</sup> We utilize a World Bank database that draws on recipient information on loan commitments for the regression analysis. See Table A3.1 in Appendix III for LICs in the sample.

<sup>43</sup> We include a discrete variable to control for whether or not a country has received loan commitments. Given that some countries do not have loan commitments on a continuous basis, we control for the break of the data in some years.

Table A4.2 Variable Definitions in the Dynamic Panel Model <sup>1/</sup>

Variable	Code	Description	Source
BRIC Financing	Loan	The individual BRIC country financing commitments (on a loan-by-loan basis) are aggregated to create total BRIC financing. The loan amount is then divided by GDP	World Bank debt database
ODA Flows	ODA	Total commitments by all donors reporting to the OECD, as a share of GDP	OECD; WEO, IMF
Degree of Concessionality	Concessionality	The grant equivalent of a loan is defined as the difference between the present values of the loan's disbursements and stream of expected debt service payments	World Bank debt database; IMF grant element calculator
Income	GDP	Income per capita as a ratio of average income per capita that year ( $Y_{it} - Y_t^*$ ), lagged by one period	WEO, IMF
Infant mortality	Mort	Infant mortality	WDI, World Bank
Reserves	Reserves	Gross reserves in months of imports, lagged by one period	WDI, World Bank
Trade openness	Openness	Exports and imports divided by GDP, lagged by one period	WEO, IMF
Imports	Imp	Imports (from BRICs) as a share of GDP, lagged by one period	WEO, IMF
Exports	Exp	Exports (from BRICs) as a share of GDP, lagged by one period	WEO, IMF
Resource-Rich	Res	Dummy variable = 1 if mineral-resource rich (at present or prospective); 0 otherwise	WEO, IMF and various other sources
Resource-Scarce landlocked	Land	Dummy variable = 1 if mineral-resource scarce and landlocked; 0 otherwise	Same as above
Resource-Scarce Port	Port	Dummy variable = 1 if mineral-resource scarce and coastal with a port; 0 otherwise	Same as above
Regional Dummy		A dummy reflecting a country's regional location	WEO, IMF
Asian and Pacific LICs	Asia	Dummy variable = 1 if in Asia and Pacific; 0 otherwise	WEO, IMF
African LICs	AFR	Dummy variable = 1 if in Africa; 0 otherwise	WEO, IMF
Western Hemisphere LICs	WHD	Dummy variable = 1 if in Western hemisphere; 0 otherwise	WEO, IMF
Size of Government	Gcons	Public consumption as a share of GDP, lagged by one period	WEO, IMF
Fund Program	Prog	Dummy variable = 1 if has a Fund arrangement	MONA database, IMF
Quality of Institutions, Policies & Management		Index ranges from 1 to 5, with higher values are associated with a better environment	World Bank
Government Effectiveness	KK	Governance indicators	World Bank, Kaufman and Kraay Governance indicators
Planning	Plan	Planning index	Dabla-Norris et al, 2010
Transparency	Transp	Transparency index	Dabla-Norris et al, 2010

<sup>1/</sup>WEO : World Economic Outlook Database; MONA : Monitoring of Fund Arrangements Database; WDI: World Development Indicators.

The results should be interpreted with caution due to the effects of changing composition of the BRICs and weaknesses in the data.<sup>44</sup>

## Empirical Results

### *Determinants of loan commitments*

Overall we find that income and the size of government have a positive and significant impact on the loan commitments, while the CPIA has a negative impact (Table A4.3). A 100 percent increase in a country's income per capita relative to the mean income per capita is associated with a 0.1 percent to 0.2 percent increase in BRIC financing.<sup>45</sup> A 100 percent increase in government consumption-to-GDP ratio is associated with a 1.2 percent to 1.6 percent increase in BRIC financing.<sup>46</sup> A 100 percent increase in a country's CPIA index

<sup>44</sup> The data is based on recipient data.

<sup>45</sup> This could suggest that this variable has a very small economic impact on financing.

<sup>46</sup> These findings are robust to alternative specifications without any institutional indicators (i.e., CPIA, planning, transparency). Correlation analysis suggests that the institutional indicators, government size and

(continued...)



implies a 0.3 percent decrease in BRIC financing. Control variables to take into account the impact of geography, endowment and IMF programs also matter.

### ***Determinants of the degree of concessionality of financing***

Overall, we find that LICs' exports to BRICs, government size, and BRIC loan commitments have negative and significant impact on concessionality, while the institutional variables (CPIA, transparency, and planning) have a positive and significant effect (Table A4.3). A one percent increase in the exports-to-GDP ratio to BRICs is associated with a 2.3 percent to 2.7 percent decrease in the degree of concessionality. A one percent increase in government consumption as a share of GDP is associated with 0.8–1.3 percent decrease in the degree of concessionality. A one percent increase in the loan commitment is associated with a 10 percent decrease in the degree of concessionality. A one percent increase in the CPIA index is associated with a 0.3 percent increase in BRIC financing (models 1–2). A one percent increase in the planning index implies a 0.13 percent increase in financing (model 3); a similar result is obtained for transparency index (model 4). Control variables to take into account the impact of population, IMF programs, geography, and complementarities with traditional donors also matter.

### **Variance Decompositions**

The results indicate that most of the variation in loan commitments is explained by its own innovation (Table A4.4). In the period immediately following a shock, the loan commitments variable explains about 53 percent of its own shocks and has strong persistence.<sup>47</sup> Nevertheless, the contribution of size of government (13 percent), Fund program (14 percent) and CPIA (8 percent) to loan commitments appears to be large and lasting.

The degree of concessionality explains the predominance of its own shocks (Table A4.5). In the period immediately following a shock, the degree of concessionality explains about 65 percent of its own shocks and has a large and lasting effect. Loan commitments and Fund program variables explain a substantial share of the variance of concessionality totaling about 27 percent. In contrast, CPIA, size of government and ODA flows make a small contribution totaling about 8 percent, suggesting that they have a small economic impact.

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relative income are not strongly correlated. For example, the correlation between CPIA and relative income was less than 0.31.

<sup>47</sup> These results could also reflect some weaknesses in the dataset, including the limited sample size, omitted variables and heterogeneity. For example, LICs that receive more continuous loan commitments may be more likely to monitor and report this. The impact of strategic political interest variables has not been examined. There could also be differences in determinants across the individual BRICs and between concessional and nonconcessional loans.

Table A4.3 Results: The Determinants of the Amount of BRIC Financing Flows, Panel VAR Results<sup>1/</sup>

Variables	Baseline model		Alternative specification					
	(Model 1)		(Model 2)		(Model 3)		(Model 4)	
	Loan	Concessionality	Loan	Concessionality	Loan	Concessionality	Loan	Concessionality
Loan (1 year lag)	0.089 (0.052)**	-10.150 (3.354)***	0.092 (0.053)**	-9.825 (3.364)**	0.088 (0.053)*	-9.565 (3.383)***	0.089 (0.053)*	-9.564 (3.390)***
Concessionality (1 year lag)	0.000 (0.000)	0.076 (0.027)***	0.000 (0.000)	0.075 (0.027)***	-0.0005 (0.000)	0.083 (0.027)***	-0.0005 (0.000)	0.0842 (0.027)***
GDP p.c ratio (1 year lag)	0.002 (0.001)**	-0.072 (0.058)	0.002 (0.001)**	-0.061 (0.058)	0.001 (0.001)*	-0.014 (0.061)	0.001 (0.001)*	-0.010 (0.062)
ODA	0.002 (0.000)	0.501 (0.019)**	0.003 (0.005)	0.655 (0.304)**	0.003 (0.005)	0.465 (0.310)*	0.003 (0.005)	0.482 (0.312)*
IMF Program (incl. PSI)	-0.001 (0.002)	0.225 (0.108)***	-0.001 (0.002)	0.230 (0.108)**	-0.003 (0.002)*	0.287 (0.102)***	-0.003 (0.002)*	0.291 (0.102)***
Asia	0.009 (0.003)***	0.002 (0.180)	0.009 (0.003)***	0.000 (0.181)	0.008 (0.003)***	0.108 (0.183)	0.008 (0.003)***	0.102 (0.183)
Population	0.000 (0.000)	-0.034 (0.019)**	0.000 (0.000)	-0.022 (0.018)	0.000 (0.000)	-0.040 (0.019)**	0.000 (0.000)	-0.042 (0.019)**
Resource-Scarce Port	-0.001 (0.003)	0.091 (0.197)	0.000 (0.003)	0.171 (0.194)	-0.001 (0.003)	0.041 (0.203)	-0.001 (0.003)	-0.003 (0.210)
Resource-Scarce Landlocked	-0.005 (0.003)*	0.079 (0.208)	-0.005 (0.003)*	0.094 (0.209)	-0.006 (0.003)**	0.141 (0.208)	-0.006 (0.003)*	0.105 (0.208)
Size of Government (1 year lag)	0.016 (0.009)*	-1.279 (0.580)**	0.015 (0.009)**	-1.449 (0.572)***	0.012 (0.009)*	-0.758 (0.569)*	0.012 (0.009)*	-0.767 (0.569)*
CPIA	-0.003 (0.002)**	0.277 (0.096)***	-0.003 (0.001)**	0.301 (0.096)***				
Planning Index					-0.001 (0.001)	0.131 (0.053)***		
Transparency Index							-0.001 (0.001)	0.139 (0.061)***
Exports to BRICs (1 year lag)	-0.021 (0.020)	-2.339 (1.280)**			-0.017 (0.020)	-2.511 (1.278)**	-0.016 (0.020)	-2.659 (1.273)**
Imports from BRICs (1 year lag)			0.004 (0.010)	0.327 (0.641)				
Trend	0.001 (0.000)**	0.007 (0.021)	0.000 (0.000)**	-0.001 (0.022)	0.001 (0.000)**	0.005 (0.021)	0.001 (0.000)**	0.005 (0.021)
Constant	0.008 (0.007)	-0.369 (0.471)	0.005 (0.007)	-0.683 (0.442)**	-0.001 (0.006)	0.271 (0.365)	-0.001 (0.006)	0.320 (0.362)
Dummy Variable (=1, if loan committed)	0.013 (0.002)***	3.185 (0.100)***	0.012 (0.002)***	3.169 (0.100)***	0.012 (0.002)***	3.217 (0.100)***	0.012 (0.002)***	3.223 (0.100)***
Number of Observations	379	379	379	379	379	379	379	379
Adjusted R-squared	0.20	0.75	0.20	0.75	0.20	0.75	0.19	0.75
Sum Sq. Resids	0.07	297.73	0.07	300.22	0.07	299.57	0.07	300.25
S.E. Equation	0.01	0.90	0.01	0.90	0.01	0.90	0.01	0.90

<sup>1/</sup> Robust standard errors are in parentheses; \*: significant at the 10 percent level; \*\*: significant at the 5 percent level; and \*\*\*: significant at the 1 percent level.

There are important caveats. The models may not be fully taking into account heterogeneity across the BRICs. Also, structural changes in development assistance policies could imply different relationships going forward while other factors may be important in driving the cross-country variation in loan commitments and the degree of concessionality.

Table A4.4 Forecast Error Variance Decomposition of Loan Model<sup>1/</sup>

Period	S.E.	Institutions		Donor Interest		Own Factors	Other Factors		
		CPIA	Government Size	Exports	Concessionality	Loan	Program	ODA	Other
1	0.005	8.7	14.3	2.2	0.0	56.2	13.8	2.2	2.7
2	0.037	8.1	13.2	2.0	5.5	52.6	13.8	2.3	2.5
3	0.054	8.1	13.0	2.0	6.1	52.2	13.8	2.3	2.5
4	0.068	8.0	13.0	2.0	6.2	52.1	13.8	2.3	2.5
5	0.081	8.0	13.0	2.0	6.3	52.1	13.8	2.3	2.5
6	0.093	8.0	13.0	2.0	6.3	52.1	13.8	2.3	2.5
7	0.105	8.0	13.0	2.0	6.3	52.1	13.8	2.3	2.5
8	0.117	8.0	13.0	2.0	6.3	52.1	13.8	2.3	2.5
9	0.129	8.0	13.0	2.0	6.4	52.0	13.8	2.3	2.5
10	0.141	8.0	13.0	2.0	6.4	52.0	13.8	2.3	2.5

<sup>1/</sup>Factorization; Structural.Table A4.5 Forecast Error Variance Decomposition of Concessionality Model<sup>1/</sup>

Period	S.E.	Institutions		Donor Interest		Own Factors	Other Factors		
		CPIA	Government Size	Exports	Loan	Concessionality	Program	ODA	Other
1	0.010	2.2	2.2	0.2	14.7	64.9	12.3	3.1	0.4
2	0.014	2.6	2.2	0.2	64.5	14.9	12.3	3.1	0.1
3	0.017	2.3	2.2	0.2	64.5	15.0	12.3	3.1	0.4
4	0.020	2.3	2.2	0.2	64.5	15.0	12.3	3.1	0.4
5	0.022	2.3	2.2	0.2	64.5	14.9	12.3	3.1	0.4
6	0.024	2.3	2.2	0.2	64.5	14.9	12.3	3.1	0.4
7	0.026	2.3	2.2	0.2	64.5	14.9	12.3	3.1	0.4
8	0.028	2.3	2.2	0.2	64.5	14.9	12.3	3.1	0.4
9	0.030	2.3	2.2	0.2	64.5	14.9	12.3	3.1	0.4
10	0.032	2.3	2.2	0.2	64.5	14.9	12.3	3.1	0.4

<sup>1/</sup>Factorization; Structural.

## Appendix V. A Global VAR Analysis of BRIC-to-LIC Spillovers<sup>48</sup>

### Rationale for Employing a Global VAR Model

A key challenge in the business cycle literature is to pin down a consistent and accurate identification technique for modeling international spillovers of shocks. Econometric techniques have focused on panel data analysis, single-country VAR models, large-scale macroeconomic models, dynamic factor models, global models, and factor models. While until recently dynamic factor models have remained the most powerful and widely used econometric tool to analyze business cycles across countries, they have been criticized for being atheoretical and lacking a structural identification scheme. Additionally, even if “common” factors are controlled for there are always important residual interdependencies due to policy and trade spillover effects that remain to be explained.

Against this backdrop, a global vector autoregression (GVAR) modeling approach is utilized to address these issues. GVAR modeling is a recent development by Pesaran, Schuermann, and Weiner (2004), Pesaran and Smith (2006), and Déés, di Mauro, Pesaran, and Smith (2007). The GVAR is a multivariate and multi-country framework that enables investigation of country and regional interdependencies. While it allows for minimizing high parameters and can cover larger geographical areas, the GVAR model typically links individual countries by including foreign-specific fundamentals. Unlike factor models, the GVAR introduces observed country-specific foreign variables in individual country models to deal with pervasive dependencies in the global economy in a flexible manner.

### The Modeling Strategy

**Estimating the direct impact of shocks from BRICs:** A GVAR framework is constructed with (i) individual LIC specific domestic variables, (ii) BRIC sources of spillover variables (e.g., productivity, trade, FDI, exchange rate), and (iii) global factor variables (world oil prices, world commodity prices, world demand, and US Fed rates). The GVAR provides estimates of the direct impact of shocks from BRICs through the generalized impulse response function (GIRF) of identified shocks to LIC fundamentals (GDP, trade, inflation, and real exchange rates). It also provides endogenous responses of LIC variables to shocks to global factors, which enable estimation of the indirect impact of BRIC shocks.

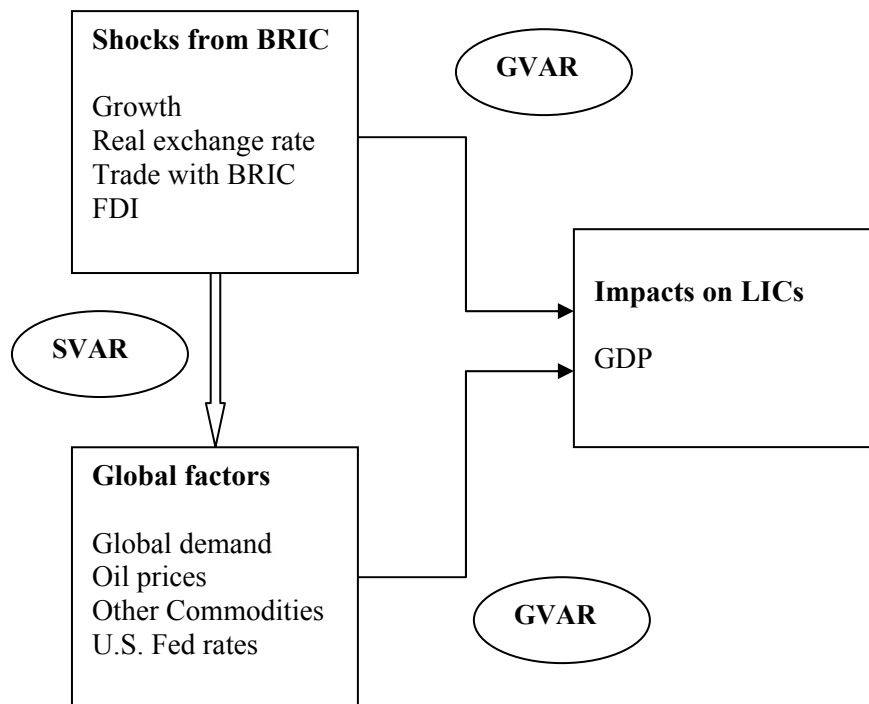
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<sup>48</sup> Fuller detail on this analysis will be included in a working paper on international spillovers from BRICs to LICs.

**Estimating the indirect and total impact of shocks from BRICs:** A two-step approach is used in order to fully capture the spillovers from BRICs to LICs that could potentially transmit through global factors. The above GIRF results (response of LICs growth to shocks to global factors) are complimented by estimating the response of the latter to shocks to BRICs. Next, a simple Structural VAR (SVAR) is estimated to identify unexpected shocks from BRICs to global factors. For simplicity, the set of endogenous variables is limited to (in order) growth, trade, real exchange rate, global demand, oil prices, and US Fed rates. Impulse responses from the SVAR model provide estimates of response of global factor variables (e.g., world oil price) to shocks to productivity and demand in BRICs. This result, combined with the LICs growth response to shocks to global factors (e.g., oil price, from the GVAR) produces the indirect impact of shocks from BRICs (say productivity) to LICs through any identified global factor. Note that this estimate is merely indicative as it is not associated with a standard error since it is obtained from two different estimates. The total effect is obtained by summing up the direct and indirect effects.

**Examining the role of the BRIC/LIC ties during the global financial crisis:** A generalized variance decomposition output is estimated for the GVAR both in-sample (1972–2009, i.e., considering the global financial crisis period dummy) and out-of-sample (1972–2007, i.e., excluding the crisis). This allows calculation of the relative contributions to the change in LIC’s output from (i) domestic variables, (ii) BRIC source of spillover variables, and (iii) global factor variables. A comparison of the two sets of results enables one to gauge the role of BRICs in alleviating the impact of the global financial crisis.

Figure A5.1 Assessing the Direct and Indirect Impact of Shocks from BRICs to LICs



The GVAR is estimated for 29 countries (Sub-Saharan Africa [12], Asia [10], Middle East and Europe [4], Latin America [3]) using annual data covering 1970 through 2009. Data are from the IMF World Economic Outlook, International Financial Statistics, UNCTAD, and OECD databases. The following variables were included:

*Individual LIC variables*

1. Growth: log of real GDP, PPP-based, 2000=100
2. Trade: log of trade (sum of imports and exports) volume with BRICs
3. FDI: FDI from BRICs proxied by the time-varying share of FDI from BRICs to LICs multiplied by total FDI received by each country. FDI inflows from BRICs to individual LICs at the end of each year is thus computed as follows:

$$FDI \text{ inflows to LIC } X_{it} = \left( \frac{\text{Total BRIC FDI to LIC at } t}{\text{Total World FDI to LIC at } t} \right) * (\text{Total FDI received by LIC } X_{it})$$

4. Inflation: change in log of the consumer price index (CPI, 2000=100)

*Country-specific foreign variables for BRICs*

5. BRICs aggregate GDP per capita (log)—proxy for productivity—weighted average (PPP-based), 2000=100
6. BRICs aggregate demand (log), weighted average of import volumes (PPP-based), 2000=100
7. BRICs real effective exchange rate index (log), 2000=100

*Identified global factors*

8. International crude oil price (US\$ per barrel)
9. World commodity price index (2000=100)
10. US Federal Reserve interest rate (percent), and an alternative variable
11. World total imports volume (log), excluding BRIC imports, 2000=100<sup>49</sup>

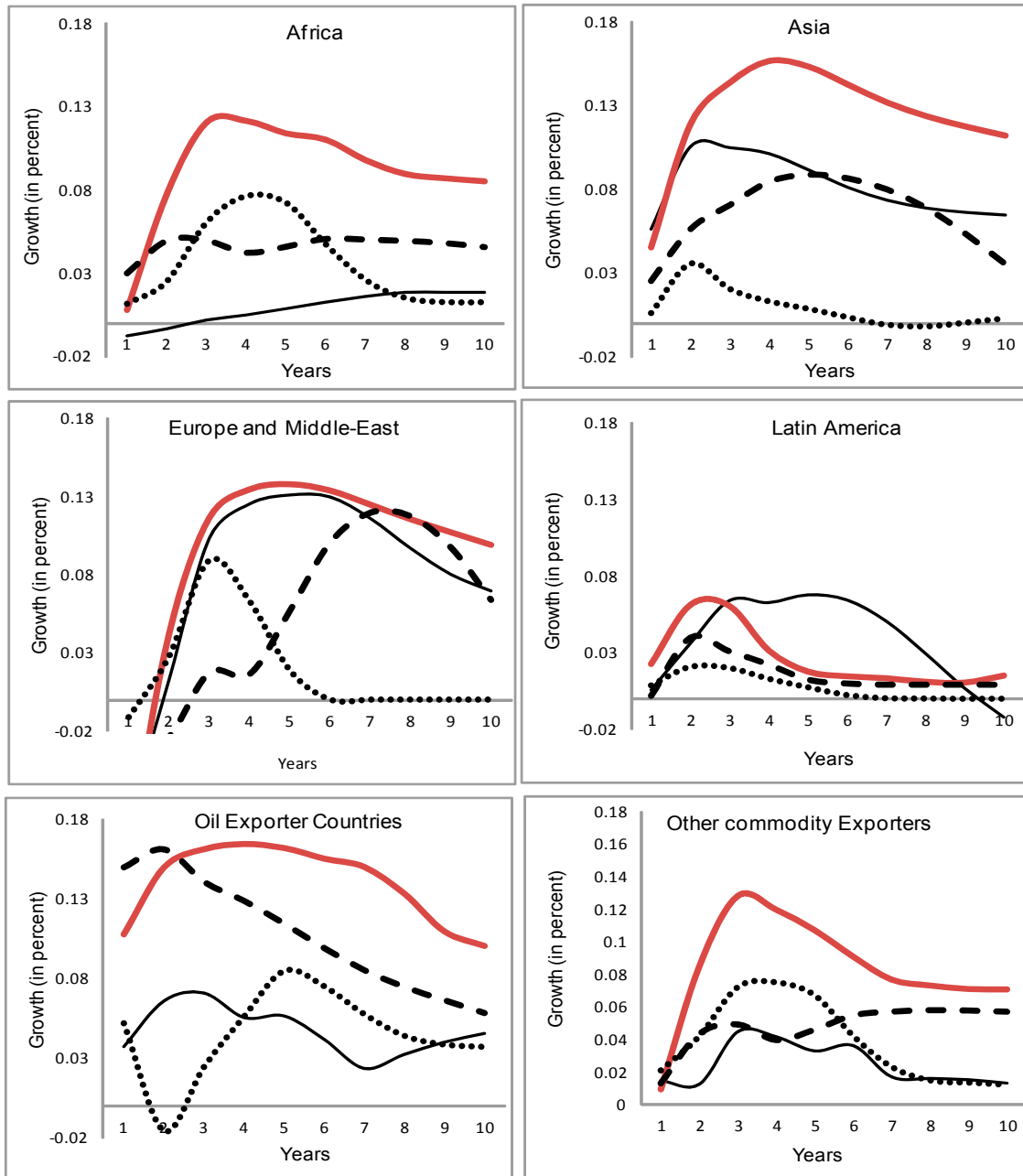
**The impact of productivity and demand shocks from advanced economies (AEs) on LICs growth.** A different methodology from the GVAR described above is utilized to estimate the response of LICs growth to shocks to AEs productivity and demand. The impulse response function of a simple VAR comprised of five endogenous variables (AE's real GDP per capita growth rate, change in the volume of AE's imports from LICs, BRIC's real GDP per capita growth rate, percent changes in international oil prices, and LICs' real GDP growth rate) was simulated on data covering the period 1972–2009. (All variables follow a I(0) process, the five variable VAR optimal lag according to Schwartz and Hannan-Quin criteria was 2, and the VAR passed the stability test.)

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<sup>49</sup> The last variable (world global demand proxied by world imports) is used to run another VARX\*(1,1) in which the US Fed rate is replaced by the global demand variable. Doing so safeguards the minimumdegrees of freedom and the realization of various empirical model parameter estimates.

**Counterfactual Scenario based on lower BRIC growth:** BRICs growth generally held up well (at 6.3 percent in 2008–09) during the global financial crisis, compared to advanced economies (where growth declined to about 1.5 percent on average in 2008–09). Paragraph 39 and Figure 10 assess the implication for LICs growth in the counterfactual scenario in which BRICs’ growth were to slow as much as advanced economies during the crisis. The scenario made use of a panel growth regression of growth in LICs on a number of its short run determinants, including external demand, measured as the trade-weighted growth of trading partners (Berg et al, 2010). The difference in BRICs growth under the counterfactual scenario was multiplied by the coefficient on partner country growth, and this result was subtracted from the baseline growth forecast. As pointed out in Berg et al, 2010, some limitations of this approach are that it considers only the impact of slower growth in BRICs and does not take into account possible associated changes, such as changes in commodity prices, interest rates, capital flows.

Figure A5.2 Responses of LICs' Real GDP Growth to Shocks Originating from BRICs<sup>1/</sup>  
(In percent)



— Technology    — Trade    - - Exchange Rate    ..... FDI

Source: IMF staff estimates.

<sup>1/</sup> Generalized impulse responses of Real GDP Growth to identified (+1 s.e.) shocks to BRICs' trade, FDI, technology, and real effective exchange rate.



Table A5.1 List of LICs and Selected Economic Indicators<sup>1/</sup>

Country	Oil Exporters	Commodity Exporters	FDI Inflows from BRIC <sup>2/</sup>	Trade with BRIC <sup>3/</sup>	Real GDP Growth
Angola	1		1.5	22.4	11.8
Burkina Faso		1	0.4	9.3	5.2
Cameroon			0.5	6.4	3.6
Congo, Republic of	1		1.2	20.8	4.1
Cote D'Ivoire			0.4	5.6	-0.3
Ethiopia			0.8	17.2	7.1
Ghana			0.6	13.5	5.2
Kenya			0.1	10.0	4.0
Nigeria	1		1.2	16.0	9.3
Senegal			0.1	10.2	4.2
Tanzania			0.7	15.0	6.8
Uganda			0.7	9.1	7.3
Zambia		1	1.4	5.3	5.0
Bangladesh			0.2	16.9	5.8
Cambodia			1.1	7.4	9.6
Mongolia		1	1.6	58.4	6.6
Myanmar			0.5	24.7	12.9
Nepal			0.0	57.6	3.8
Pakistan			0.4	9.6	5.1
Sri Lanka			0.3	16.3	5.1
Vanuatu			1.4	7.7	2.8
Vietnam			1.0	14.4	7.6
Yemen, Republic of	1		0.4	29.3	4.2
Azerbaijan	1		2.9	14.0	15.0
Kyrgyz Republic			0.9	33.8	4.5
Sudan	1		1.5	41.7	7.5
Uzbekistan		1	0.2	30.6	6.0
Bolivia			0.6	30.5	3.4
Papua New Guinea		1	0.2	6.0	1.8
St. Lucia			3.5	18.4	1.9

Sources: International Monetary Fund, WEO database; OECD database; and IMF staff estimates.

<sup>1/</sup> Unweighted average in 2000–07.

<sup>2/</sup> Inward FDI flows to GDP ratio (in percent).

<sup>3/</sup> LIC's trade (export plus import values) with BRICs to its total trade in percent.

## Appendix VI. Modeling Global Rebalancing Using the GTAP Model

The Global Trade Analysis Project (GTAP) model used in this analysis is a comparative-static global general equilibrium model based on neoclassical trade theory (Hertel, 1997). Firms are assumed to maximize profits. Production exhibits constant returns to scale, and both product and factor markets are perfectly competitive. Each industry produces a single commodity using intermediate inputs and a primary factor composite, which is a constant elasticity of substitution (CES) function of land (used in agriculture only), unskilled labor, skilled labor, capital, and natural resources (confined to mining). Intermediate inputs are CES blends of home products and imports, which are sourced from all regions in a CES manner (the Armington approach).

Expenditure in each region consists of household and government consumption, and the remaining national income goes to savings. Households maximize their utility based on a non-homothetic constant difference in elasticity (CDE) function. Public consumption claims a fixed proportion of national income, as do savings, unless determined otherwise. All goods and services purchased by households and the government are CES combinations of home products and imports.

All regions contribute their savings to a global savings pool managed by a global bank, which purchases capital goods in each of the regions on behalf of world savers. The allocation of investment among regions is based on regional expected rates of return, which in turn reflect projected productivity growth and factor accumulation. While capital (i.e., savings) is mobile across regions, the capital stock is not—although it is perfectly mobile within a region, as is labor. Land and natural resources are sector specific.

In simulating the impact of global rebalancing, we first undertake a benchmark projection for the global economy in 2015 based on forecasts of key macroeconomic variables broadly consistent with those of the IMF *World Economic Outlook* (April 2010) (GDP and current accounts), World Bank (factors of production), and United Nations (population). The GTAP database version 7, as documented by Narayanan and Walmsley (2008) was used as the starting point for projection. A counterfactual experiment is then conducted to assess the impact of global rebalancing. In these experiments, trade balances of individual countries and regions are eliminated to create different scenarios of a more balanced global economy through changes in the saving-investment balance in the capital account. All simulations employ standard GTAP values for all elasticities, available in the free-download version of the model at <https://www.gtap.agecon.purdue.edu/>.

To keep the model manageable, a 10-region, 10-sector aggregation of the model was chosen. The selection of regions was based largely on the role of each country and region in global rebalancing in line with discussions in the literature. LIC regions are separately identified to enable us to evaluate the impact of global rebalancing. The sectors identified in the model are largely based on factor intensity, with a view to highlighting the movement of resources between tradable and non-tradable sectors and structural changes at the industry level as the global economy rebalances.

## References

- ACET, 2009, “Looking East: A Guide to Engaging China for Africa’s Policymakers African Center for Economic Transformation,” Vol. 2, November.
- Ademola, O. T., A. S. Bankole, and A. O. Adewuyi, 2009, “China–Africa Trade Relations: Insights from AERC Scoping Studies,” *European Journal of Development Research*, Vol. 21, No. 4, pp. 485–505.
- Aiello, F., and P. Cardamone (2010), “Analyzing the Impact of the EBA Initiative Using a Gravity Model,” *PUE-PIEC Scientific Research Programs of National Working Paper No. 10/7*, Italian Ministry of Education, University and Research, Italy.
- Agénor, P., and B. Moreno-Dobsen, 2006, “Public Infrastructure and Growth: New Channels and Policy Implications,” World Bank Policy Research Working Paper 4064 (Washington: World Bank).
- Alesina, A., and Dollar, D., 2000, “Who Gives Foreign Aid to Whom and Why?” *Journal of Economic Growth*, Vol. 5, No.1, pp. 33–63.
- Anshan, L., 2007, “China and Africa: Policy and Challenges,” *China Security*, Vol. 3, pp. 69–93.
- Arora, V. and A. Vamvakidis, 2010, “China’s Economic Growth: International Spillovers,” IMF Working Paper 10/165 (Washington: International Monetary Fund).
- Baah, A.Y., and H. Jauch (eds.), 2009, *Chinese Investments in Africa: A Labour Perspective*, African Labour Research Network.
- Berg, A., C. Papageorgiou, C. Pattillo, M. Schindler, N. Spatafora, and H. Weisfeld, 2010, “Global Shocks and their Impact on Low-Income Countries: Lessons for the Global Financial Crisis,” IMF Working Paper 11/27 (Washington: International Monetary Fund).
- Blanchard, O. and G. M. Milesi-Ferretti, 2009, “Global Imbalances: In Midstream?” IMF Staff Position Note 09/29, December 22 (Washington: International Monetary Fund).
- Brautigam, D., 2010, *The Dragon’s Gift: The Real Story of China in Africa* (New York: Oxford University Press).
- Broadman, H., 2006, *Africa’s Silk Road—China and India’s New Economic Frontier*, (Washington: The World Bank).
- Brazil, 2010, Instituto de Pesquisa Economica Aplicada (IPEA), *Cooperação Brasileira para o Desenvolvimento Internacional: 2005-2009* (Brasilia). Available via the internet: <http://www.ipea.gov.br>
- Cai, F. and D.W. Wang, 2008, “Employment Growth, Labor Scarcity and the Nature of China’s Trade Expansion,” in R. Garnaut and L. Song (eds.), *The Turning Point in China’s Economic Development*, ANU Press, Canberra, Australia. pp. 143–71.

- Chanana, D. I., 2009, "India as an Emerging Donor," *Economic & Political Weekly*, March 21, Vol. 44, No. 12.
- Chaturvedi, S., 2008, "Emerging Patterns in Architecture for Management of Economic Assistance and Development Cooperation: Implications and Challenges for India," RIS Discussion Paper 139 (New Delhi).
- Christensen, B. V., 2010, "China in Africa: A Macroeconomic Perspective," CGD Working Paper No. 230 (Washington: Center for Global Development). Available via the internet: <http://www.cgdev.org/content/publications/detail/1424567>.
- Collier, P., 2007, *The Bottom Billion: Why the Poorest Countries are Failing and What Can Be Done About It* (New York: Oxford University Press).
- Collier, P., 2010, *The Plundered Planet: Why We Must--and How We Can--Manage Nature for Global Prosperity* (New York: Oxford University Press).
- Dabla-Norris, E., J. Honda, A. Lahreche, and G. Verdier, 2010, "FDI Flows to Low-Income Countries: Global Drivers and Growth Implications," IMF Working Paper 10/132 (Washington: International Monetary Fund).
- Davies, M. J., 2008, "Special Economic Zones: China's Developmental Model Comes to Africa." In *China into Africa: Trade, Aid, and Influence*, ed. Robert I. Rotberg. Washington, DC: Brookings Institution Press.
- Dées, S., F. di Mauro, M. H. Pesaran, L. V. Smith, 2007, "Exploring the International Linkages of the Euro Area: a Global VAR Analysis," *Journal of Applied Econometrics*, Vol. 22, pp. 1–38.
- Doemeland, D., C. Briceno-Garmendia, A. Farah and J. Herderschee, 2010, "Mining Concessions-for-Infrastructure: Chinese investment in the Democratic Republic of Congo (DRC)," unpublished (Washington: World Bank).
- Elborgh-Woytek, K., R. Gregory and B. McDonald, 2010, "Reaching the MDGs: An Action Plan for Trade," *IMF Staff Position Note 10/14* (Washington: International Monetary Fund).
- Finger, J. M. and M. E. Kreinin, 1979, "A Measure of 'Export Similarity' and Its Possible Uses," *The Economic Journal*, Vol. 90, No. 356, pp. 905–912).
- Foster, V. B., W. Butterfield, C. Chen, and N. Pushak, 2009, *Building Bridges: China's Growing Role as Infrastructure Financier for Sub-Saharan Africa* (Washington: World Bank).
- Garnaut, R., 2010, "The Turning Period in China's Economic Development: a Conceptual Framework and New Empirical Evidence," in R. Garnaut, J. Golley and L. Song (eds), *China: The Next Twenty Years of Reform and Development* (Canberra: ANU Press).

- Goldstein, A., N. Pinaud, H. Reisen, and X. Chen, 2007, "The Rise of China and India: What's in it for Africa?" Development Centre (Paris: OECD).
- Gu, J., 2009, "China's Private Enterprises in Africa and the Implications for African Development," *European Journal of Development Research*, Vol. 21, No. 4, pp. 570–87.
- Hertel, T. W. (ed.), 1997, *Global Trade Analysis: Modeling and Applications* (New York: Cambridge University Press).
- International Monetary Fund, 2010a, *World Economic Outlook*, April (Washington: International Monetary Fund).
- International Monetary Fund, 2010b, "Emerging from the Global Crisis—Macroeconomic Challenges Facing Low-Income Countries." Available via the internet: <http://www.imf.org/external/np/pp/eng/2010/100510.pdf>
- International Monetary Fund, 2010c, *G20 Mutual Assessment Process—Alternative Policy Scenario*, Report prepared by Staff of the IMF for *G20 Growth Framework and Mutual Assessment Process*, G20 Summit, Toronto, June 26-27, 2010.
- International Monetary Fund, 2007, *World Economic Outlook*, April (Washington: International Monetary Fund).
- Kamwanga, J., and G. Koyi, 2009, "Impact of China—Africa Investment Relations: the Case of Zambia," African Economic Research Consortium.
- Kaplinsky, R. and M. Farooki, 2010a, "What Are the Implications for Global Value Chains When the Market Shifts from the North to the South?" World Bank Policy Research Working Paper 5205 (Washington: World Bank).
- Kaplinsky, R. A. Terheggen, and J. Tijaja, 2010b, "What Happens When the Market Shifts to China? The Gabon Timber and Thai Cassava Value Chains," World Bank Policy Research Working Paper 5206 (Washington: World Bank).
- Kaplinsky, R., and M. Morris, 2009, "Chinese FDI in Sub-Saharan Africa: Engaging with Large Dragons," *European Journal of Development Research*, Vol. 21, No. 4, pp. 551–59.
- Kee, H. L., A. Nicita, and M. Olerreaga, 2009, "Estimating Trade Restrictiveness Indices," *The Economic Journal*, Vol. 119, pp. 172–199.
- Kragelund, P., 2009, "Part of the Disease or Part of the Cure?" Chinese Investments in the Zambian Mining and Construction Sectors, *European Journal of Development Research*, Vol. 21, No. 4, pp. 644–61.
- Mlachila, M. and M. Takebe, 2011, "FDI from BRICs to LICs", IMF Working Paper, forthcoming (Washington: International Monetary Fund).
- Mwase, N., 2011, "Determinants of development financing flows from BRICs to LICs," IMF Working Paper, forthcoming (Washington: International Monetary Fund).

- Mwase, N. and Y. Yang, 2011 “Philosophies of BRIC Development Flows and Implications for LICs,” IMF Working Paper, forthcoming, (Washington: International Monetary Fund).
- Narayanan, B. G., and T. L. Walmsley, 2008, Global Trade, Assistance, and Production: The GTAP 7 Data Base, Center for Global Trade Analysis, Purdue University.
- Ng, F. and A. Yeats, 2003, “Major Trade Trends in East Asia: What Are Their Implications for Regional Cooperation and Growth,” World Bank Policy Research Working Paper 3084 (Washington: World Bank).
- Onjala, J., 2008, “A Scoping Study on China-Africa Economic Relations: The Case of Kenya,” report prepared for African Economic Research Consortium (5 March). See at [www.aercafrica.org/documents/china\\_africa\\_relations/Kenya.pdf](http://www.aercafrica.org/documents/china_africa_relations/Kenya.pdf)
- Pesaran, M. H., T. Schuermann, and S. M. Weiner, 2004, "Modeling Regional Interdependencies Using a Global Error-Correcting Macroeconometric Model," *Journal of Business and Economics Statistics*, Vol. 22, pp. 129–162.
- Pesaran, M. H. and R. P. Smith, 2006, "Macroeconomic Modeling with a Global Perspective," Manchester School, University of Manchester, Vol. 74, No.1, pp. 24–49.
- Riad, N. and Y. Yang, 2011, “LIC-BRIC Trade Linkages: Trends and Implications for Growth,” IMF Working Paper, forthcoming (Washington: International Monetary Fund).
- Rose, A., 2004, “Do We Really Know That the WTO Increases Trade?” *American Economic Review*, 94, No. 1, pp. 98–114.
- Samake, I. and Y. Yang, 2011, “BRIC Spillovers to LICs,” IMF Working Paper, forthcoming (Washington: International Monetary Fund).
- Sebastian, R., 2008, “China-Africa Investments: An Analysis of China’s Investments in Africa,” *China Vest* (September 17), pp. 1–7.
- Straub, S., 2008, “Infrastructure and Development: a Critical Appraisal of the Macro Level Literature,” World Bank Policy Research Working Paper Series 4590 (Washington: World Bank).
- Subramanian, A., 2010, “It Is the Poor Who Pay for the Weak Renminbi,” Op-ed in the *Financial Times*, February 3.
- Subramanian, A. and S. Wei, 2006, “The WTO Promotes Trade, Strongly But Unevenly,” *Journal of International Economics*, 72, pp. 151–175.
- Svensson, J., 1999, “Aid, Growth and Democracy,” *Economics and Politics*, Blackwell Publishing, Vol. 11(3), (November), Tajoli (1999), pp. 275–297.
- The Economist, June 12, 2010, “Is China’s Labour Market at a Turning-point?”

UNCTAD, 2009, 2010, *World Investment Report*, (Geneva: United Nations).

UNDP/UNCTAD, 2007, *Asian Foreign Direct Investment in Africa* (New York and Geneva: United Nations).

Wang, J. Y., 2007, "What Drives China's Growing Role in Africa?" IMF Working Paper 07/211 (Washington: International Monetary Fund).