Growth spillovers: Do China's trade and investment matter for African growth?

By

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Abstract

This paper uses an endogenous growth model and GMM estimates to investigate the influence of international trade and investment by China in 44 Sub-Saharan African economies. We show that exports to China from Sub-Saharan African countries have a growing impact on their economic growth, although it is yet to overtake the influence of exports to the rest of the world on growth. More importantly, the impact of exports to the rest of the world has become less influential than before. In particular, in Sub-Saharan African countries which received foreign direct investments from China, exports to China have a significant impact on growth. Impact of Chinese FDI on African growth emerges in a sample of selected Sub-Saharan African countries which receive Chinese FDI, while the impact of exports to the rest of the world on African growth still dominate over Chinese.

Variance decomposition in a VAR system indicate that exports to the rest of the world appear to be still dominant in explaining the variation in economic growth than exports to China both in the past and in recent years in the full sample of all Sub-Saharan African countries. However, exports to China appear to have a stronger influence on economic growth in countries which receive Chinese FDI than the rest. Variance decomposition of GDP growth in this group of countries also appears to support the growing influence of Chinese investments and exports to China on the economy than the rest of the world, particularly in the long run.

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Introduction

China's rapid economic growth since it opened up its economy in 1978 to the rest of the world, and in particular since its accession to the World Trade Organization (WTO) at the end of 2000 is phenomenal. The rate of economic growth averaged 9.1 per cent during 1981-1990, 9.9 per cent during 1991-2000 and 10.5 per cent during 2001-2010. It is now the second largest economy in the world behind the United States, not only impacting on the balance of global economic power but also reshaping regional growth dynamics. The surge in demand for production inputs and the rising domestic consumption demand have changed the direction of international trade and pattern of growth.

The robust growth in emerging economies such as China has implications for the rest of the world, including economies in distant regions such as Sub-Saharan Africa (SSA). For example, the share of exports from SSA countries to China in total exports has increased from 5 per cent in 2002 to 19 per cent in 2010 (World Bank 2012). On the other hand, foreign trade between Africa and China has grown ten fold during 1998 and 2006. Interestingly, this is a period when SSA countries on average experienced its highest economic growth in recent history.

Although most of trade with China is concentrated in a few countries endowed with natural resources, the pattern seem to be changing with increasing trade links with other SSA countries as well. Apart from other strategic priorities, the need for ensuring sustainable supply of raw materials has also prompted China to invest heavily in infrastructure in countries with strong trade links but as in trade, China's investments go beyond major suppliers of raw material.

How significant are trade and investment links of SSA countries with China on economic growth of African countries? While spillover effects of China's rapid economic growth on neighboring Asian

countries are well known and documented[2], little is known about its effects on SSA countries. The reason for limited research on the latter could be due to lack of data, particularly on Chinese investments in SSA countries. On the other hand, although China has had trade links with SSA countries historically, its significance was felt only recently. In this study we examine the spillover effects of Chinese growth on SSA countries, through trade and investment channels. The paper contributes to the body of knowledge on the subject by quantitatively analyzing China's trade and investment specifically on SSA countries with latest data and econometric techniques.

The rest of the paper is organized as follows: Section II reviews recent literature on growth spillovers with special reference to SSA countries. The econometric model is described in Section III. After describing the estimation procedure, results are analyzed in Section IV. Policy implications are analyzed in Section V. Section VI concludes.

Section II: Literature Review

Ever since the launch of China's "reform and opening up" strategy in 1978, its emergence as a driver of global economic growth has been unparalleled. This has had important implications not only on the domestic socio-economic structure but also on economies elsewhere. China's per capita income (based on GNI) at US\$ 4,930 in 2011 indicates an eleven fold increase from that prevailed in 1992, doubling its per capita income every 5-6 years. Several hundred million people have risen out of poverty and living conditions have improved considerably.[3] As Arora and Vamvakidis (2010) point out these improvements have occurred at a faster rate than was experienced in Europe during the Industrial revolution or in the United States after the opening up of the American West in the 19th century. With a domestic market of 1.3 billion people and rising income and demand for goods and services, China has not only become a

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[2] See for example Eichengreen and Tong (2006) and Arora and Vamvakidis (2010).
[3] According to China's MDG Report for 2008, China's progress towards the Millennium Development Goals (2008) more than 600 million people have come out of poverty since 1978 (and 300 million since 1990).

major market but also a global driver of growth. While China's demand for key inputs in the production channel, be it raw materials or intermediate goods, generate opportunities for other countries in Asia and elsewhere, its low labor costs and economies of scale have made China a fierce competitor in global markets. As such, spillover effects of China's growth on other countries could be either positive or negative depending on the production structure and comparative advantage. For example, Eichengreen, Rhee and Tong (2004), using a gravity model of bilateral trade, find that an increase in Chinese output, and thus in both China's appetite for imports and capacity to export, positively affects the exports of its high-income neighbors but negatively affects the exports of less-developed countries in the region. Using an endogenous growth model Mingyong et al. (2006) show that technology spillovers depend on the country's human capital investment and the degree of openness. On the other hand, Ahearne et al. (2003) in a study of four newly industrialized economies (NIEs-Korea, Singapore, Taiwan and Hong Kong) and four additional ASEAN members (Indonesia, Malaysia, Philippines and Thailand) using panel data for the period 1981-2001 found little evidence that increase in China's exports reduce the exports of other emerging Asian economies.

The impact of China's competitive edge in certain sectors, particularly since joining the WTO, is highlighted in Ianchovichina and Walmsley (2003). They found that China's WTO access, while increasing the country's own exports, reduces the exports of Viet Nam, the Philippines, Thailand, Indonesia and Malaysia due mainly to the negative impact on their textile and apparel exports. They also found that its accession to WTO had had a positive impact on the exports of Japan and the NIEs due to increase in their exports of intermediate goods, in particular textiles and electronics, among others. In their multi-sector and multi-country model with differentiated products, Yang and Vines (2000) found China's export growth to have a slightly negative effect on the exports of ASEAN but had a positive impact on those of Japan and NIEs.

While most studies look at trade links, a very few studies has investigated China's influence on growth of other countries. Studies purely focusing on Africa are very limited. One such study is Baliamoune-lutz (2010) which uses a GMM estimator to explore the growth effects of Africa's trade with China. It finds no empirical evidence that exports to China enhances growth unconditionally. Export concentration enhances the growth effects of exports to China. On the other hand, Roberts and Deichmann (2009), which provides moderate evidence in favor of the existence of heterogeneous growth spillover effects in a sample comprising different regions of the world, fails to find evidence for growth spillovers in Sub-Saharan African countries.

Easterly and Levine (1998) have found similar results. They contend that large neighborhood multiplier effects might have locked SSA into a slow growth pattern, as slow growth in neighboring countries become mutually reinforcing. It should be noted however, that this study is done well before China's economic links with SSA got on hold on a stronger footing. Yet, it highlights SSA countries weak links with the rest of the world at that time. Another study that has a focus on SSA countries is Collier and O'Connel (2007). They contend that cross-country spillover effects are likely to be much weaker between SSA countries than between countries elsewhere as a result of weaker regional integration in SSA. Arora and Vamvakidis (2005), on the other hand, find South Africa's economic growth to have significant spillover effects on the growth in the rest of Africa.

In a study that focuses on exports to China led-growth and imports from China led-growth, Maswana (2009) suggests that Africa might benefit from China's growth through technology embodied capital goods imports. The author tends to support the view that the gains from global trade depend less on the mere effects of trading than on the ability of countries to appropriately position themselves along the global value chain.

Section III: The Model

In order to examine whether China's trade and investment matter for SSA, let us consider the following Cobb-Douglas specification of the aggregate production function

$$Y_t = A_t K_t^\theta L_t^{1-\theta} \qquad\qquad \theta > 0 \qquad\qquad (1)$$

where Y_t, K_t and L_t denote the real output (GDP), stock of capital and labor input, respectively at time t. θ is the share of capital in national output. A_t is total factor productivity (TFP) reflecting technical change and innovation. It is assumed that A_t is exogenously determined and the law of diminishing marginal returns prevails. Taking natural logarithm of equation (1) we obtain:

$$y_t = a_t + \theta k_t + (1 - \theta)l_t \qquad\qquad (2)$$

where small size letters denote the log values of variables. We assume the capital accumulation to be given by

$$k_t = (1 - \delta)k_{t-1} + i_t \qquad\qquad (3)$$

where δ is the rate of depreciation of capital and i_t denotes investments at time t. From equation (2) we obtain:

$$y_t - (1 - \delta)y_{t-1} = a_t - (1 - \delta)a_{t-1} + \theta i_t + (1 - \theta)(l_t - (1 - \delta)l_{t-1}) \qquad\qquad (4)$$

Following Blundell and MaCardy (1999) and Klevmarken (2004) and with some minor modifications, we assume the labor supply to respond to the hourly wage rate and the national output as per the following relationship:

$$l_t = \beta_0 + \beta_1 w_t + \beta_2 y_t + \varepsilon_t \qquad\qquad (5)$$

where w_t is the log of hourly wage rate and ε_t a random error term. The wage rate is assumed to be composed of a fixed component (w_0) and a variable component, the latter being determined by the rate of inflation (π_t). The relationship is given by:

$$w_t = w_0 + \beta_3 \pi_t + \epsilon_t \tag{6}$$

where ϵ_t is a random error term. Substituting (5) and (6) in (4) we have:

$$y_t - \gamma a_t - \gamma \theta k_t - \gamma(1-\theta)\beta_1\beta_3\pi_t = (1-\delta)y_{t-1} - \gamma(1-\delta)a_{t-1} - \gamma(1-\theta)(1-\delta)\beta_1\beta_3\pi_{t-1} +$$

$$\gamma\theta i_t + \gamma(1-\theta)(\delta\beta_0 + \delta\beta_0 w_0 + \beta_1(\epsilon_t - (1-\delta)\epsilon_{t-1}) + \varepsilon_t - (1-\delta)\varepsilon_{t-1})$$

$$\tag{7}$$

Where $\gamma = (1 - (1-\theta)\beta_2)^{-1}$

TFP captures variables that strengthen competiveness and affect the output other than capital and labor. As in Akinlo (2006) and with some modification, we assume TFP to be determined by macroeconomic stability and external sector developments. The evolution of institutions and policy frameworks over the years will also be captured by these variables. The function is given by:

$$a_t = a_t(dis_t, x_t) \tag{8}$$

where DIS is the central bank discount (policy) rate. This together with rate of inflation (CPI) is used as proxy variables for macroeconomic stability. External sector developments are represented by exports (X). We assume gross domestic investments (GDI) to be comprised of domestic investments net of foreign investments (GDINET) and foreign direct investments (FDI).

$$i_t = i_t(gdinet_t, fdi_t) \tag{9}$$

Rearranging equation (7) and taken together with (8) and (9), and applying for all cross-sections will yield the following:

$$Y_{i,t} = \delta_i d_t + \sum_{s=1}^{p} \alpha_{i,s} Y_{i,t-s} + \sum_{s=0}^{p} \beta_{i,s} i_{i,t-s} + u_t \tag{10}$$

$$i = 1,2,3 \ldots \ldots \ldots \ldots N$$

$$t = 1,2,3 \ldots \ldots \ldots \ldots T$$

where the vector of interest for cross section i in period t is given by:

$$Y_{i,t} = [gdp_{it}, gdi_{it}, x_{it}, h_{it}, dis_{it}, cpi_t] \tag{11}$$

α_i, β_i and δ_i are matrices of coefficients to be estimated and d_t is an $N \times 1$ vector of ones. N is the number of cross sections and T is the time. $u_t \sim Normal\ (0, \Omega)$ where the covariance matrix $\Omega = E(u_t u_t{}')$.

Limitations

One of the key limitations of the study is the limited data on Chinese FDI flows to Sub Saharan Africa. While data on FDI flows from China to some countries of SSA are not available[4], for those with FDI flows the data are available only for most recent years. As a result we are constrained in our estimation strategy. Thus our main focus is on exports to China. We do so by separating those countries with FDI and investigate the relationship between exports to China by SSA countries and their impact on growth. Yet, with the limited data, we examine the impact of Chinese FDI on African growth in a selected group of SSA countries which receive Chinese FDI. We supplement this by computing variance decompositions in a VAR regression. However, limited data on Chinese FDI flows means results of our estimates with Chinese investments (FDI) and their impact of African growth should be taken cautiously, perhaps looking only at the direction of its influence rather than the magnitudes.

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[4] This could be due to lack of data rather than no FDI flows from China to those countries.

Section IV: Estimation procedure and results

We use the GMM estimator to estimate the above model using a set of unbalanced panel data for 44 Sub-Saharan African countries covering the period 1970-2009.[5] In GMM estimates we experiment with fixed effects and also allow the error term to follow an autoregressive process.[6] Variance decomposition based on a VAR system is used to assess the relative importance of each innovation in affecting the variables concerned on growth. The data used for this estimation are from the African Development Indicators of the World Bank except for the central bank policy rate, which is from the International Financial Statistics of the International Monetary Fund and exports which are from the United Nations Conference on Trade and Development (UNCTAD). FDI data for the selected countries are from Pairault (2011). We use growth rates (indicated by the pre-fix 'GR'), instead of log values, for some of the variables, to avoid loss of information due to the existence of negative numbers. For inflation we use the percentage change in CPI.

The use of a panel substantially increases the efficiency and power of the analysis as the degrees of freedom increases in a panel of several countries (Goodhart and Hofmann (2008)). This is particularly so for Sub-Saharan African countries where availability of data is an issue. A panel approach also helps uncover common dynamic relationships which might otherwise be obscured by idiosyncratic effects at the individual country level (Gavin and Theodorou (2005)).

Results of GMM estimates of equation (10) for SSA countries and SSA countries excluding those which have not received (or lack data on Chinese FDI flows) FDI from China are given in Table A2 in the appendix. The first three columns of Table A2 give estimates for three different periods. Exports seem to

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[5] For all countries in the sample the data range is 1970-2008 except for Angola (1985-2008), Cape Verde (1986-2008), Comoros, Djibouti, Guinea, Mozambique (1980-2008), Eritrea (1992-2008), Ethiopia (1976-2008), Namibia (1980-2007), Sao Tome and Principe (1979-2007), Somalia and Zimbabwe (1970-2007). It should be noted however, that there are still missing data within these respective data ranges.

[6] Random effects have no impact on the results, while we are constrained in allowing the error term to follow a moving average process in panel GMM estimation.

have an increasing impact on African growth over time. Estimates of equation (10) with exports to China and the rest of the world enter as separate variable are given in columns 4 and 5. Results show that exports to China from Sub-Saharan African countries have a growing impact on their economic growth, although it is yet to overtake the influence of exports to the rest of the world on growth. For example, exports to China, which have been insignificant during the period 1999-2008 becomes significant at 10% level of significance in more recent years. More importantly, the impact of exports to the rest of the world becomes less influential than before.

The last three columns of Table A2 give estimates for the selected set of countries excluding those with no FDI flows from China. Results in the last column in particular show that both Chinese and non-Chinese FDI have a significant positive effect on African growth-the former gaining ground over non-Chinese FDI in recent years. But this is a new phenomenon. Exports to the rest of the world are still significant and dominate the effects of international trade on African growth.

Variance decomposition based on a VAR system for the full sample and a selected group of SSA countries are given in Tables A3-A7. In the full sample of all Sub-Saharan African countries, exports to the rest of the world appear to be still dominant in explaining the variation in economic growth than exports to China both in the past and in recent years. But the influence of Chinese exports seems to have increased over time. Exports to China appear to have a stronger influence on economic growth in countries which receive Chinese FDI than the rest. Variance decomposition of GDP growth in this group of countries appears to support the growing influence of Chinese investments and exports to China on the economy than the rest of the world, particularly in the long run. For example, in this group of countries, Chinese exports explain 3 per cent of the variation in growth rate in the long run against 2.8 per cent by exports to the rest of the world.

Section V: Policy implications

Although China's trade and investment are yet to have a greater impact on African growth, the initial indications of what is to come in the coming decade or so make it a point for Africa to be prepared to gain the most out of the new growth dynamics. Africa could also revisit its trade and investment relations with the rest of the world in a similar fashion. Africa needs to take this as an opportunity rather than a threat and prepare the ground work necessary for it to maximize the benefits. Based on results of the present study and related ones we highlight some of the key issues Africa may need to consider. According to Mingyong et al. (2006) technology and growth spillovers depends on the host country's human capital investment and the degree of openness. In addition, physical infrastructure and institutional arrangements that facilitates functioning of the economy are also driving forces of economic transformation through growth and technology spillovers. Most African countries are lagging behind in developing its human capital thereby losing the most from potential gains from trade and investment linkages with emerging economies such as China. Africa needs to gradually build up a strong human resource base through improved quality of education, vocational and technical training. Its infrastructure gap of over $2 billion over the next decade amply indicates the efforts needed in addressing the issue. Policy directions in promoting and facilitating foreign investments in key infrastructures could be a clear winner. The emerging China-Africa development cooperation could be a stepping stone in that direction.

Africa also needs to go a step further by setting the stage not only for safe guarding from being exploited and left out but also in taking full advantage of emerging growth links to realize its latent growth potential. One such are is ensuring technology transfer to domestic entrepreneurs. Promotion of joint ventures, use of domestic labor in FDI related foreign investment companies, human capital development and the use of information and communication technology could help transfer technology to domestic firms. Although trade has a greater impact on domestic growth in Africa, exports are mostly

primary products with little value added. Linking up with Chinese (and other trading partner) supply chains, as done by the East Asian and South East Asian countries, would be critical for Africa to gain from trade.

The weak multiplier effects also reduce spillover effects, directly and indirectly through regional integration. Intra-regional trade, for example, accounts for less than 10 per cent of African trade against 60 per cent, 45 per cent and almost 30 per cent for the European Union (EU), North Atlantic Free Trade Agreement (NAFTA) and Common Market of the South (MERCOSUR), respectively. Promoting regional integration, in particular through regional economic communities such as Easy African Community (EAC), Southern African Development Community (SADC), Common Market for Eastern and Southern Africa (COMESA), and the Economic Community of West African States (ECOWAS) and the regional economic block, African Economic Community (AEC), would be helpful even to exploit the spillover effects of emerging economies on particular economies in a region with the rest of African countries, particularly neighboring ones.

More open economic environments bring in greater benefits. But sound macroeconomic conditions become a fundamental requirement for those benefits to be fully realized. Institutions, rules and regulations are equally important in promoting trade and investments and there by integration. Going beyond exporting mostly primary products to value addition and value chain development would be needed if Africa is to fully benefit from its international trade and investment.

 Section VI: Conclusion

Historically, gross domestic investments and exports have had significant impacts on the economic growth of Sub-Saharan African countries. The influence of gross domestic investment and exports in national economies seem to have strengthened over the years. The rate economic growth has increased substantially from an average of 3.6 per cent per annum during 1970-2000 to 5.9 per cent during 2000-

2009, a period during which exports to China from Sub-Saharan African economies grew by several folds while Chinese investments in Sub-Saharan countries became visible. Sub-Saharan African economies which received Chinese FDI experienced an improvement in economic growth from 3.4 per cent to 3.9 per cent during the same period. Are trade with China and Chinese investments growth enhancing in the African context? This paper uses an endogenous growth model and GMM estimates to investigate the influence of international trade and investment by China in 44 Sub-Saharan African economies. We show that exports to China from Sub-Saharan African countries have a growing impact on their economic growth, although it is yet to overtake the influence of exports to the rest of the world on growth. For example, exports to China, which have been insignificant during the period 1999-2008 becomes significant at 10% level of significance in more recent years. More importantly, the impact of exports to the rest of the world becomes less influential than before. Although limited data on FDI flows from China to Sub-Saharan African countries do not allow us to properly investigate the impact of Chinese foreign direct investments on economic growth of these countries, surge in exports to China during a period of investment flows from China is indicative of its influence on these economies. We also carry out our analysis separately for those Sub-Saharan African countries which received foreign direct investments from China. In these countries, exports to China have a significant impact on growth at 1% level of significance

Variance decomposition in a VAR system provides information on the relative importance of each innovation in affecting the variables in the VAR system. Exploiting this technique and using inferences we drew from GMM estimates earlier, we examine as to what extent exports to China and the rest of the world in particular and other variables explain the variation in growth in Sub-Saharan African countries. In the full sample of all Sub-Saharan African countries, exports to the rest of the world appear to be still dominant in explaining the variation in economic growth than exports to China both in the past and in recent years. However, exports to China appear to have a stronger influence on economic

growth in countries which receive Chinese FDI than the rest. Variance decomposition of GDP growth in this group of countries also appears to support the growing influence of Chinese investments and exports to China on the economy than the rest of the world, particularly in the long run.

The spillover effects of Chinese growth to the rest of the world in general and Asia in particular is well known. Yet, its influence on Sub-Saharan African economies is a recent phenomenon. Looking at the turn around in economic growth in Sub-Saharan African economies in the past decade or so and its potential in reducing poverty and improving social welfare, African countries are now have the potential to exploit further the growing and competing growth poles such as China and India to their advantage. Its investments in particular in infrastructure could be broadened to cover the whole economy with an increasing focus on international trade as a driver of growth.

References

(1) Ahearne, A. G. Fernald, J.G. Loungani, P. and Schhindler, J.W. (2003). China and Emerging Asia: Comrades or Competitors? International Finance Discussion Paper no 789, Board of Governors, Federal Reserve System (December).

http://www.federalreserve.gov/pubs/ifdp/2003/789/ifdp789.pdf. 16.08.2012

(2) Arora, V. and Vamvakidis, T. (2010). China's Economic Growth: International Spillovers, International Monetary Fund Working Paper no WP/10/165.

(3) ------------- (2005), The Implications of South African Economic Growth for Rest of Africa, International Monetary Fund Working Paper no WP/05/58.

(4) Baliamoune-Lutz, M. (2010). Growth by Destination (where you export matters): Trade with China and Growth in African Countries, paper presented at the African Economic Conference, 27-29 October 2010, Tunis.

(5) Blundell, R. and MaCardy, T. (1999). Labor Supply: A Review of Alternative Approaches. In O.C. Ashenfelter and D. Cards (eds), *Handbook of Labor Economics*, 3 A, Amsterdam: North-Holland.

(6) Collier, P. and O'Connel, S.A. (2007). Growth and Opportunities, in Benno J. Ndulu, Robert H. Bates, Paul Collier and Charles C. Soludo (eds), *The Political Economy of Economic Growth in Africa, 1960 2000*, Cambridge: Cambridge University Press

(7) Easterly, V. and Levine, R. (1998). Troubles with Neighbors: Africa's Problem, Africa's Opportunity, *Journal of African Economies*, 7(1):120-142.

(8) Eichengreen, B. and Tong, H. (2006). How China is Reorganizing the World Economy, Asian Economic Policy Review, 73-97.

(9) Eichengreen, B. Rhee, Y. and Tong, H. (2004). The Impact of China on the Exports of other Asian Countries, NBER Working Paper No 10768, National Bureau of Economic Research, Cambridge,

MA. http://emlab.berkeley.edu/~eichengr/research/kiep-claremont8sep7sep28-04.pdf

16.08.2012

(10)Goodhart, C. E. and Hofmann, B. (2008). House Prices, Money, Credit and the Macroeconomy. *Oxford Review of Economic Policy*, 24(1), 180-205.

(11)Gavin, W. and Theodorou, A. (2005). A common model approach to macroeconomics: using panel data to reduce sampling error. *Journal of Forecasting*, 24,203-209.

(12)Ianchovichina, E. and Walmsley, T. (2003). Impact of China's WTO Accession on East Asia, unpublished manuscript, the World Bank.

http://siteresources.worldbank.org/INTDEBTDEPT/Resources/468980-1206974166266/4833916-1206974192224/PRWP3109.pdf 16.08.2012

(13)Klevmarken, N.A. (2004). Estimates of a Labor Supply Function Using Alternative Measures of Hours of Work, IZA Discussion Paper No. 1035. http://ftp.iza.org/dp1035.pdf. accessed 16.08.2012

(14)Maswana, J. (2009). Can China Trigger Economic Growth in Africa? An Empirical Investigation Based on the Economic Independence Hypothesis. *Chinese Economy*, 42,91-105

(15)Pairault, T. (2011), Chiffres du Commerce et de L'investissement Sino-Africain, http://www.cairn.info/revue-outre-terre-2011-4-page-115.htm, 27.12.2012

(16)Roberts, M. and Deichmann, U. (2009). International Growth Spillovers, Geography and Infrastructure, World Bank Policy Research Working paper No 5153.

http://elibrary.worldbank.org/docserver/download/5153.pdf?expires=1345098060&id=id&accname=guest&checksum=41C6F14B7A073311058B62F6E8EEE976. 16.08.2012

(17)World Bank (2012), Global Economic Prospects 2012, the World Bank, Washington D.C.

(18)Yang, T. and Vines, D. (2000). The Fallacy of Composition and the Terms of Trade of Newly Industrialized Economies, unpublished manuscript, Oxford University.

Appendix

Table A1: Panel unit root tests: Summary				
	Statistic (Prob)**			
Series	Null: Unit root (assumes common unit root process)	Null: Unit root (assumes individual unit root process)		
	Levin, Lin & Chu t*	Im, Pesaran and Shin W-stat	ADF - Fisher Chi-square	PP - Fisher Chi-square
INF	-9.236 (0.000)	-10.128 (0.000)	264.494 (0.000)	328.858 (0.000)
DIS	-10.135 (0.000)	-3.799 (0.000)	108.829 (0.017)	120.647 (0.002)
GRGDP	-14.913 (0.000)	-17.622 (0.000)	492.459 (0.000)	820.890 (0.000)
GDI	-1.982 (0.023)	-1.924 (0.027)	111.171 (0.025)	140.181 (0.000)
GRGDI	-15.669 (0.000)	-19.420 (0.000)	530.914 (0.000)	1004.09 (0.000)
GRX	-13.113 (0.000)	-20.359 (0.000)	572.109 (0.000)	985.885 (0.000)
GRXCHI	40.634 (1.000)	-34.152 (0.000)	226.136 (0.000)	328.535 (0.000)
GRXROW	-12.621 (0.000)	-20.557 (0.000)	578.443 (0.000)	1000.19 (0.000)

Table A2: GMM Estimates								
	SSA countries					SSA Selected countries		
Variable	Coefficients							
	(Std. Error)							
	1973-2008	2000-2008	2002-2008	1999-2008	2004-2008	1973 - 2008	2002 - 2008	2006-2009
C	2.5743	1.5903	-0.6882	1.3446	1.3947	4.6587	0.5521	5.790
	(4.080)	(1.327)	(1.7343)	(3.9853)	(3.6360)	(6.0059)	(2.3470)	(7.192)
GRGDP(-1)	-0.1638	-0.2458	-0.1257	0.0364	-0.1304	0.0399	-0.2495	0.040
	(0.224)	(0.286)	(0.1339)	(0.3148)	(0.4047)	(0.1938)	(0.1753)	(0.337)
INF	-0.0040	-0.0171***	-0.0311***	-0.0384	-0.1351	-0.0040		
	(0.004)	(0.005)	(0.0054)	(0.0473)	(0.4073)	(0.0051)		
INF(-1)	9.95E-05	0.0074	0.0179***	-0.0097	-0.0118	0.0002	-0.1312	0.001
	(0.0003)	(0.0089)	(0.0048)	(0.0218)	(0.0133)	(0.0003)	(0.2416)	(0.172)
DIS	0.1681	-0.0227	-0.0112	0.1921	0.2042	0.1770		
	(0.151)	(0.0245)	(0.0418)	(0.2593)	(0.1900)	(0.1511)		
DIS(-1)	-0.1280	-0.0529**	-0.0570***	-0.1093	-0.0912	-0.1213	-0.1276*	-0.214
	(0.095)	(0.0236)	(0.0191)	(0.1760)	(0.1229)	(0.0944)	(0.0698)	(0.434)
GRX	-0.0169	0.0499***	0.0478***			-0.1765		
	(0.142)	(0.0106)	(0.0099)			(0.1151)		
GRX(-1)	0.0279**	0.0389**	0.0403***			0.0264		
	(0.011)	(0.0164)	(0.0150)			(0.0199)		
GRXCHI				-0.0001	0.0021		0.0009***	
				(0.0001)	(0.0017)		(0.0001)	
GRXCHI(-1)				1.75E-05	0.0010*		0.0012***	0.004**
				(7.60E-05)	(0.0005)		(0.0002)	(0.001)
GRXROW				0.1387***	0.1130**		0.0859*	0.084***
				(0.0434)	(0.0534)		(0.0438)	(0.023)
GRXROW(-1)				0.0399	0.0516		0.0619**	-0.030
				(0.0268)	(0.0675)		(0.0225)	(0.033)
GDI	-0.7017	0.0804	0.1247**			-0.9305		
	(0.690)	(0.0570)	(0.0594)			(0.8790)		
GDI(-1)	0.8051	0.1026	0.1340			0.9671		
	(0.527)	(0.1032)	(0.0950)			(0.6623)		
GRGDI				0.0656	0.1511*		0.0801***	
				(0.0472)	(0.0759)		(0.0244)	
GRGDI(-1)				0.0854**	0.0538**		0.0460**	
				(0.0395)	(0.0228)		(0.0182)	

GRFDICHI							-4.08E-06 (2.66E-05)
GRFDICHI(-1)							0.001*** (0.0001)
GRFDIROW(-1)							0.0002*** (7.13E-05)
GRGDINET(-1)							0.002 (0.003)
Ar(1)	0.2056 (0.2451)	0.0168 (0.0781)	-0.1595 (0.4864)	-0.1038 (0.1119)		0.3631*** (0.1052)	
R-squared	-0.0046	0.6696	0.7174	0.5560	0.6792	-1.7515	0.9122	0.824
Adj R-Squared	-0.0655	0.6005	0.6366	0.4422	0.4917	-1.9378	0.7883	0.654
DW Stat	2.110	2.392	2.372	2.2162	2.0761	1.8985	2.3919	2.556
J-Statistic	0.928	20.3437	12.6169	1.1661	0.0021	0.0001	6.9082	1.876
Instrument Rank	46	45	45	42	41	36	33	34

Note: ***, **, * denote 1%, 5% and 10% level of significance, respectively.

Table A3: Variance decomposition of GDP Growth, SSA Countries, 1998-2008

Period	S.E.	GRGDP	INF	DIS	GRXCHI	GRXROW	GRGDI
1	4.2243	100.000	0.0000	0.000	0.000	0.000	0.000
2	4.6919	87.112	0.838	0.050	0.019	5.256	6.722
3	4.9044	85.801	1.061	1.309	0.133	4.947	6.745
4	4.9981	84.571	1.226	1.907	0.132	4.823	7.338
5	5.0495	83.741	1.258	2.915	0.130	4.731	7.221
6	5.0816	83.065	1.247	3.747	0.134	4.672	7.131
7	5.1040	82.473	1.236	4.438	0.141	4.636	7.073
8	5.1208	81.979	1.231	4.971	0.148	4.617	7.051
9	5.1331	81.599	1.232	5.355	0.154	4.608	7.050
10	5.1421	81.316	1.234	5.623	0.160	4.605	7.060

Cholesky Ordering: GRGDP INF DIS GRXCHI GRXROW GRGDI

Table A4: Variance decomposition of GDP Growth, SSA Countries, 2002-2008

Period	S.E.	GRGDP	INF	DIS	GRXCHI	GRXROW	GRGDI
1	3.202	100.00	0.000	0.000	0.000	0.000	0.000
2	3.440	95.406	0.097	1.062	0.055	3.181	0.196
3	3.498	94.827	0.366	1.113	0.205	3.098	0.388
4	3.603	92.199	0.618	1.125	0.198	3.417	2.440
5	3.712	91.677	0.583	1.528	0.190	3.643	2.377
6	3.756	89.797	1.070	2.260	0.216	3.693	2.962
7	3.783	88.756	1.054	2.231	0.221	4.190	3.544
8	3.809	87.936	1.094	2.444	0.219	4.709	3.595
9	3.854	87.605	1.071	2.919	0.216	4.619	3.568
10	3.886	86.547	2.195	2.976	0.221	4.547	3.511

Cholesky Ordering: GRGDP INF DIS GRXCHI GRXROW GRGDI

Table A5: Variance decomposition of GDP Growth, SSA Selected Countries, 1998-2008

Period	S.E.	GRGDP	INF	DIS	GRXCHI	GRXROW	GRGDI
1	4.187	100.00	0.000	0.000	0.000	0.000	0.000
2	4.496	90.312	1.783	0.171	2.6E-05	1.368	6.363
3	4.886	84.906	2.554	1.733	0.162	5.138	5.504
4	4.949	83.998	2.598	2.606	0.168	5.121	5.507
5	5.026	82.569	2.735	3.951	0.201	5.180	5.361
6	5.066	81.503	2.729	5.141	0.202	5.098	5.324
7	5.098	80.645	2.708	6.108	0.200	5.036	5.299
8	5.122	79.923	2.683	6.856	0.203	5.027	5.305
9	5.141	79.350	2.664	7.415	0.208	5.030	5.331
10	5.155	78.912	2.651	7.807	0.215	5.052	5.360

Cholesky Ordering: GRGDP INF DIS GRXCHI GRXROW GRGDI

Table A6: Variance decomposition of GDP Growth, SSA Selected Countries, 2002-2008

Period	S.E.	GRGDP	INF	DIS	GRXCHI	GRXROW	GRGDI
1	4.236	100.00	0.000	0.000	0.000	0.000	0.000
2	4.658	93.819	0.635	0.048	0.197	0.001	5.298
3	5.154	85.860	1.098	1.679	3.253	3.345	4.762
4	5.336	85.101	1.040	3.135	3.040	3.182	4.499
5	5.447	83.885	1.424	4.057	3.160	3.103	4.368
6	5.542	82.247	1.863	5.379	3.226	3.033	4.249
7	5.609	81.076	2.239	6.410	3.158	2.965	4.149
8	5.662	80.005	2.683	7.184	3.119	2.918	4.087
9	5.704	79.115	3.056	7.828	3.086	2.880	4.031
10	5.736	78.444	3.341	8.303	3.055	2.858	3.995

Cholesky Ordering: GRGDP INF DIS GRXCHI GRXROW GRGDI

Table A7: Variance decomposition of GDP Growth, SSA Selected Countries, 2006-2009

Period	S.E.	GRGDP	INF	DIS	GRXCHI	GRXROW	GRFDICHI	GRFDIROW	GRGDINET
1	4.6633	100.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	5.5044	88.0443	5.9853	1.9938	0.1209	0.0275	0.6714	1.8115	1.3450
3	8.1396	90.5021	4.0354	0.9601	0.0653	1.5993	0.3151	1.1621	1.3601
4	9.1674	88.3930	3.9959	1.8026	0.2547	1.3761	2.0819	1.0222	1.0733
5	11.698	91.3646	3.3571	1.3104	0.1566	0.9938	1.2807	0.8765	0.6599
6	13.740	91.8016	3.1407	1.5317	0.1812	0.8904	0.9585	0.6407	0.8547
7	17.453	93.4701	2.6763	1.2510	0.1124	0.8253	0.6722	0.4605	0.5318
8	20.660	93.0299	3.1739	1.4227	0.1153	0.7679	0.5634	0.3317	0.5947
9	25.608	93.7381	3.1186	1.2402	0.0788	0.7745	0.3670	0.2744	0.4080
10	30.339	93.3491	3.4433	1.3620	0.0905	0.6961	0.3984	0.2133	0.4468

Cholesky Ordering: GRGDP INF DIS GRXCHI GRXROW GRFDICHI GRFDIROW
GRGDINET