UNITED NATIONS UNIVERSITY
UNU-WIDER
World Institute for Development Economics Research

Research Paper No. 2008/27

Export Productivity, Finance, and Economic Growth

Are the Southern Engines of Growth Different?

Alessandra Guariglia[1]
and Amelia U. Santos-Paulino[2]

March 2008

Abstract

Using a panel of 139 countries over the period 1992-2003, we analyse the links between export productivity, economic growth and financial development indicators. We then investigate whether the links observed in China, India and Brazil systematically differ from those observed in other countries in the sample. We find that both *GDP* per capita and investment generally exert a positive and significant effect on export productivity. Except for Brazil, financial development is not an important determinant of export productivity. Moreover, except for Brazil, export productivity plays a positive effect on growth, and so does financial development for both China and Brazil, but not for India. Finally, in both India and Brazil, *FDI* is negatively associated with growth.

Keywords: export productivity, financial development, FDI, growth

JEL classification: C23, F1, F23, O16, O40, O5

[1] University of Nottingham, Nottingham, email: alessandra.guariglia@nottingham.ac.uk; [2] UNU-WIDER, Helsinki; email: Amelia@wider.unu.edu

This study has been prepared within the UNU-WIDER project on the Southern Engines of Global Growth.

UNU-WIDER acknowledges the financial contributions to the research programme by the governments of Denmark (Royal Ministry of Foreign Affairs), Finland (Ministry for Foreign Affairs), Norway (Royal Ministry of Foreign Affairs), Sweden (Swedish International Development Cooperation Agency—Sida) and the United Kingdom (Department for International Development).

ISSN 1810-2611 ISBN 978-92-9230-073-9

Acknowledgements

We thank José R. Sánchez-Fung and the participants of the UNU-WIDER conference on Southern Engines of Global Growth: China, India, Brazil and South Africa held in Helsinki in September 2007 for helpful comments.

UNU World Institute for Development Economics Research (UNU-WIDER)
Katajanokanlaituri 6 B, 00160 Helsinki, Finland

Typescript prepared by Liisa Roponen at UNU-WIDER

1 Introduction

A recent branch of the growth literature looks at the extent to which export productivity contributes to growth. The pioneering paper within this branch is Hausmann, Hwang and Rodrik (2007). In this paper, the authors construct an index of export productivity, defined as the income level of a country's export basket. Using a panel of countries, they then analyse the determinants of this index and show that it predicts subsequent economic growth. This means that countries specializing in goods typically produced by rich countries grow faster than countries specializing in other goods.

Focusing on a different perspective, the linkages between financial development and growth have been widely studied in theoretical and empirical macroeconomics. According to Levine (2005), financial systems foster growth as they produce ex ante information about possible investment; monitor investment and exert corporate governance after providing finance; facilitate the trading, diversification and management of risk; mobilize and pool savings; and ease the exchange of goods and services. A number of authors undertake cross-country empirical studies and document the existence of a positive link between financial development and economic growth (see Levine 2005 for a survey).

To the best of our knowledge, no paper has looked at the interrelations between export productivity, financial development and growth. This paper bridges this gap. Using a panel of 139 countries over the period 1993-2003, we first focus on the determinants of export productivity and ask whether financial development is one of those.[1] We then focus on the determinants of economic growth, focusing on the extent to which export productivity and financial development affect growth.

Furthermore, considering that between 1992 and 2003 the southern engines of growth (*SEG*), namely China, India, Brazil and South Africa, were all characterized by relatively high growth rates and export productivity, we look at how the links between export productivity, finance and growth differ for these countries.

China's and India's remarkable economic performance and their noteworthy role in the global economy have generated a large amount of attention and research in recent years. This mostly reflects their active international trade activities, which is echoed in their rapidly growing exports and flows of capital and investment. Particularly in China, exports have grown rapidly over the past twenty years. Although this expansion has been associated with large inflows of *FDI*, exports by domestic enterprises have also grown strongly. Other developing economies such as Brazil and South Africa are also major players in international markets. Although their economic performance has been less dramatic than China's and India's, they represent growth paradigms for developing countries in general and for their particular regions, mostly because of their significant trade and investment activities. For instance, the economy of Brazil outweighs that of all other South American countries and is expanding its presence in world markets. Brazil and South Africa are also closely associated with China and India through the trade and investment nexus and that magnifies their potential impact on developing countries in general and on neighbouring countries in particular.

---

1 Our 139 countries are listed in Appendix 1.

We find that both *GDP* per capita and investment generally exert a positive and significant effect on export productivity. Except for Brazil, financial development is not an important determinant of export productivity. Moreover, except for Brazil, export productivity plays a positive effect on growth and so does financial development for both China and Brazil, but not for India. Finally, in both India and Brazil, *FDI* is negatively associated with growth.

The remainder of the paper is laid out as follows. In section 2, we present a literature review on the links between trade specialization, productivity and growth, on the one hand; and finance and growth, on the other. Section 3 describes our data and presents some descriptive statistics. Section 4 focuses on the determinants of export productivity, illustrating the specifications that we estimate, our estimation methodology and our regression results. Section 5 focuses on the determinants of economic growth. Section 6 concludes.

2 Literature review

2.1 Links between trade specialization, productivity and growth

The relationship between trade and growth has been considered by various growth theories, which have particularly emphasized the linkages between trade specialization and growth. For instance, in the cluster of the new growth theory, Lucas (1988, 1993) and Grossman and Helpman (1991) developed theoretical models in which countries that specialize in technologically progressive (high technology) activities exhibit higher rates of productivity growth compared to other countries. Other studies allow for increasing returns arising from specialization and the creation of new product varieties. Trade raises productivity because producers gain access to new imported varieties and increases in the number of varieties cut down the cost of innovation and result in even more variety creation (Romer 1987; Rivera-Batiz and Romer 1991).

In other models of growth, international trade specialization and growth are inter-related through endogenous technical change (Kaldor 1981; Fagerberg 1988). The pattern of specialization might manifest itself through the values of income and price elasticities of demand for a country's exports and imports, which in turn determine a country's growth performance (Thirlwall 1979).

Understanding the determinants of export patterns and the productivity of exports is paramount to economic performance in general and to development economics in particular. For developing countries, exports are a major source of foreign exchange, a channel to maximize economies of scale and specialization and a channel to new technologies and knowledge spillovers (Lall 2000). Greenaway, Morgan and Wright (1999) study export-growth dynamics and demonstrate that there is not only a strong positive connection between exports and growth, but that the composition of those exports is important in determining the strength of growth.[2]

[2] Also see Falvey et al. (2004) who, using firm-level data, show that exporting has a sizeable impact on industry productivity growth, which is independent of the links between exporting and firm productivity.

The specialization pattern and an increasing higher value added of exports have important implications on productivity and economic growth in developing countries. Existing research shows that knowledge spillovers and specialization have an effect on the range of goods that a country produces and exports and that this, in turn, affects economic growth (Amable 2000; Hausmann, Hwang and Rodrik 2007; Rodrik 2006). This implies that a country's pattern of specialization and exports could be as important as openness in fostering growth. In this regard, Fagerberg (2000) shows that countries that have managed to increase their presence in the technologically most progressive industries (e.g., electronics) have experienced higher productivity growth than other countries (also see Fagerberg, 1994). Malek Mansour (2003) finds that both sector specialization intensity and its pattern are likely to significantly affect the link between trade (openness) and growth. Some authors suggest that high export concentration is mostly determined by a dynamic growth of specialized exports, which tend to grow much faster than other exports (Ng and Yeats 2003).

Michaely (1962) monitors the evolution of export diversification for products and for markets. He shows that a country's specialization pattern should reflect structural phenomena such as factor endowments, economies of scale, relative gap of factor productivity, or specific advantages of firms and industries. Although their degree of specialization decreased marginally over the period analysed, developing countries in general are highly specialized in comparison to higher income (e.g., OECD) economies.

Lall (2000) argues that East Asia (including China, which is the dominant exporter in the developing world) leads the developing-country sample with 70 per cent of total manufactured exports and its role is rising over time. In addition, Brazil, India, Mexico and Korea are amongst the largest developing countries exporters. He then identifies export sectors that promote dynamic comparative advantage, where the processes are classified based on technology-intensity, skills and capability-building criteria. Specifically, low technology products, which are characterized by least beneficial learning and spillover effects, tend to be associated with lower rates of growth in comparison to technology-intensive exports.

Moving one step forward, Hausmann, Hwang and Rodrik (2007) construct an index of export productivity, defined as the income level of a country's export basket. Using a panel of countries, they then show that this index predicts subsequent economic growth. This means that countries specializing in goods typically produced by rich countries grow faster than countries specializing in other goods. Rodrik (2006) focuses on the case of China and explains its impressive growth considering that it is characterized by an export basket significantly more sophisticated than would be normally expected for a country at its income level. Xu (2006) constructs an alternative measure of China's exports productivity, which takes the quality of the products into account, and finds that using this new measure, China's exports productivity is not out of line with the level of its development. In contrast, using different measures of exports productivity, Schott (2006) notes that China's exports are relatively more sophisticated than those of countries with similar income levels. Schott (2006) further shows that Chinese exports also sell at a substantial discount relative to its level of GDP and the exports originating from the OECD and questions whether these trends might be influenced by quality upgrading.

The technological specialization of different regions varies significantly, as well as the specific country strategies to attain competitiveness. Export growth and competitiveness

have not only been based on exploiting existing advantages (i.e., natural resources and factors endowments), but have also been influenced by the development of capabilities and inflows of FDI (Lall 1996, 2000). As far as the promotion of exports is concerned, such schemes are used in conjunction with an ample set of trade and industrial policies including credit allocation and subsidies, infrastructures and development, skill formation, technology promotion, exchange rate adjustments, etc.[3]

2.2 Links between finance and growth

Studying the linkages between financial development and growth is a popular topic both in theoretical and empirical macroeconomics. According to Levine (2005), financial systems foster growth as they produce ex ante information about possible investment; monitor investment and exert corporate governance after providing finance; facilitate the trading, diversification and management of risk; mobilize and pool savings; and ease the exchange of goods and services.

The theoretical foundations of this relationship can be found in Shumpeter (1911) and, more recently, in McKinnon (1973), Shaw (1973), Fry (1978, 1989), Mathieson (1980) and others. The main policy implication of these studies is that government restrictions on the banking system (such as interest rate ceilings, high reserve requirements and directed credit programmes) may have a detrimental effect on financial development and, therefore, reduce economic growth. Similar conclusions are also reached by the endogenous growth literature, which suggests that financial intermediation has a positive effect on steady-state growth (Bencivenga and Smith 1991) and that government intervention in the financial system has a negative effect on the growth rate (King and Levine 1993).

As early as 1969, Goldsmith (1969) provided the first cross-country empirical study documenting the existence of a link between finance and growth. A number of studies followed, mainly focusing on cross-country panel data and making use of several measures of financial development, as well as of different econometric techniques. These studies generally confirmed the existence of a strong positive link between the functioning of the financial system and growth (see Levine 2005 for a survey).

Other authors used industry-level or firm-level data, across a broad cross-section of countries. For instance, Rajan and Zingales (1998) and Demirgüç-Kunt and Maksimovic (1998) respectively find that in countries with better functioning financial systems, industries that are naturally heavy users of external finance grow faster than industries that are not, and a larger proportion of firms grows at rates that cannot be self-financed, but require access to external financing.

Finally, other papers look at the finance-growth nexus using a variety of time-series techniques, such as Granger causality tests and vector autoregressive procedures. Like the panel studies, most of these also note a positive link between various measure of financial development and growth (Levine 2005).

---

3 Santos-Paulino (2002) reviews trade and export promotion policies in outward oriented developing countries.

To the best of our knowledge, these two sets of literatures are largely disjoint. Our paper attempts to bridge the gap between them by focusing on the interrelations between export productivity, financial development and growth. In addition, we investigate whether the *SEG*, which are all characterized by higher than average export productivity, display different links between these variables than other countries.

3 Data and descriptive statistics

3.1 Data sources and definitions

All our data, except the measures of export productivity and *FDI* stock to *GDP*, are taken from the World Bank *Development Indicators* 2005 and refer to the period 1992-2003, which is the period for which we have information on exports productivity.

Our measure of export productivity is taken from Hausmann, Hwang and Rodrik (2007).[4] Specifically, $EXPY_{it}$ denotes the productivity level associated with country *i*'s export basket at time *t* and is given by the following formula: $EXPY_{it} = \sum_l \left(\frac{x_{itl}}{X_{it}} \right) PROD_l$, where, denoting products with the subscript *l*, $X_{jt} = \sum_l x_{jlt}$ denotes total exports of country *j* at time *t;* and $PROD_k$ denotes the productivity level associated with product *k* and is given by: $PROD_k = \sum_j \frac{\left(x_{jk} / X_j \right)}{\sum_j \left(x_{jk} / X_j \right)} Y_j$, where Y_j indicates per-capita *GDP* of country *j*.[5]

Our measure of the stock of *FDI* over *GDP* is taken from various issues of the United Nations' *World Investment Report*.

We focus on two main indicators of financial development. The first one is the ratio of liquid liabilities to *GDP*, where liquid liabilities consist of currency held outside the banking system plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries and are proxied by *M3*. This indicator can be seen as a measure of the depth of the financial system. Our second indicator of financial development is given by the ratio of claims on the non-financial private sector to *GDP*. This measure improves on the previous one as it excludes credit directed to the government or state-owned enterprises. Both indicators have been widely used in the literature on financial development and growth (see, for instance, King and Levine 1993; Levine, Loayza and Beck 2000).

---

4 We thank D. Rodrik for kindly giving us access to the data that he and his co-authors constructed for export productivity.

5 See Hausmann, Hwang and Rodrik (2007) for details about the data they used to construct their export productivity measure.

3.2 Descriptive statistics

Table 1 shows median values of the main variables that we use in the remaining part of the paper. Column 1 refers to the full sample, column 2 to the *SEG* pooled together, and columns 3 to 6, respectively to China, India, Brazil and South Africa.[6] We can see that, taken together, the southern engines display higher median *GDP* per capita growth rates (3.52 per cent) than the full sample (2.18 per cent). However, this conceals large disparities among the four *SEG*. Specifically, China and India display the highest average growth rates (8.04 per cent and 4.09 per cent, respectively), while Brazil and South Africa display the lowest rates (1.16 per cent and 1.73, respectively). In terms of real *GDP* per capita (measured in 2000 US dollars), taken together, the *SEG* display a lower median value than the full sample (948.2 versus 2864.6). Yet, China and India, which are classified as lower and low middle-income economies, display particularly low values of *GDP* per capita, namely 827.3 and 421.6, while Brazil and South Africa, both classified as upper middle-income countries, register very high values (3388.5 and 3083.5, respectively). In terms of openness, which is measured as the ratio of exports to *GDP*, China and South Africa are the most open of the *SEG*, with median ratios of 23.1 and 28.9, respectively. Yet, the median openness rate for the entire economy is even higher: 32.6. India's and Brazil's openness ratios, on the other hand, are respectively 11.1 and 10.3, suggesting that these are relatively closed economies. As for export productivity, all *SEG* display values higher than the sample median (10110.5). Specifically, the values for China, India, Brazil and South Africa are respectively 12818.1, 10308.4, 11679.5 and 13691.2. As noted by Hausmann, Hwang and Rodrik (2007), considering the explosion in India's software exports, India's export productivity would be even higher if service exports were used in addition to commodity exports to compute the index. In the case of Brazil, the relatively lower level of export productivity might be influenced by the high ratio of resource based and

Table 1
Medians of the main variables

	Full sample	Southern engines of growth (*SEG*)	China	India	Brazil	South Africa
	(1)	(2)	(3)	(4)	(5)	(6)
GDP per capita	2864.57	949.18	827.35	421.64	3388.47	3083.95
GDP per capita growth (in %)	2.18	3.52	8.04	4.09	1.16	1.73
% of population in labour force	43.97	46.58	58.29	38.97	46.91	42.23
Investment/GDP	21.94	21.47	33.39	22.79	19.47	15.10
Exports/GDP	32.15	14.51	23.07	11.22	10.28	28.93
M3/GDP	40.22	50.75	125.07	49.78	25.89	48.68
Private credit/GDP	32.57	36.18	106.18	24.30	35.27	135.23
Export productivity	10110.46	11685.83	12818.1	10308.38	11671.53	13691.17
FDI flows/GDP	2.15	2.00	4.29	0.64	2.43	0.70
FDI stock/GDP	17.60	16.50	28.25	3.43	10.40	27.26

Notes: Column 1 is based on 1,147 observations for 139 countries over the period 1992-2003. Column 2 is based on 37 observations for the *SEG*, namely China, India, Brazil and South Africa. Columns 3, 4 and 5 are based on 11 observations, while column 6 is only based on 4 observations.

6 Note that for South Africa, no data are available prior to 2000.

primary product manufactures in the country's exports. For South Africa, export productivity might be upward biased by the high value of commodities such as precious stones (e.g., diamonds).

Focusing on flows of *FDI* relative to *GDP*, China records a very high median value, namely 4.3, compared to the relatively low values of India (0.6) and South Africa (0.7), and to the median value of the full sample (2.1).[7] In terms of *FDI* stock to *GDP*, China once again records the highest value among the *SEG*, namely 28.2, while India records the lowest value of 3.4.

Looking at *M3/GDP*, we can see that China displays, by far, the highest value, namely 125.1, compared to a sample median of 40.22. Brazil, on the other hand, displays a relatively low value: 25.7. Coming to the ratio of private credit to *GDP*, once again, we observe a wide disparity across the *SEG*: South Africa records the highest value (135.2), followed by China (106.2), Brazil (35.3) and India, which records the lowest figure (24.3). Considering both indicators of financial development, China seems to exhibit the highest levels of financial development, while Brazil records the lowest values. It should be noted, however, that these measures of financial development are just quantity indicators and do not focus on the quality of financial intermediation. If one were to focus on the latter, China would certainly not rank among the most financially developed economies. The Chinese banking system is in fact largely dominated by state-owned banks which tend to lend essentially to relatively inefficient state-owned enterprises rather than to dynamic private enterprises (Guariglia and Poncet 2006). The high ratios of *M3* and private credit to *GDP* in China mainly reflect the country's high level of savings, but also the relative absence of alternatives to the formal banking system in gathering most savings.

All in all, we can say that, considering real per capita *GDP* growth, openness, *FDI*, and financial development, the *SEG* are quite different from each other and different from the average country in the sample. However, a common characteristic of these four countries is their export productivity, which is relatively high for all of them.

In Table 2, we divide our observations into quartiles, based on export productivity and for each quartile, we focus on the medians of the main variables used in the subsequent analysis. We can see that higher values of export productivity are associated with higher values of *GDP* per capita. In particular, observations in the lowest export productivity quartile display a value of *GDP* per capita of 388.56, while observations in the highest quartile display a value of 20580. As for *GDP* per capita growth, the highest median rate (3.44 per cent) is observed in the third export productivity quartile. Investment and *FDI* variables do not seem to differ significantly across export productivity quartiles. As for openness, it is relatively low in the first export productivity quartile (24.23 per cent), but then does not differ too much in the remaining three quartiles (the values for each of these quartiles are respectively 35.56, 37.97 and 36.56). This suggests that a certain degree of openness must be achieved to ensure export productivity in the upper three quartiles of the distribution. Interestingly, our financial variables increase monotonically across export productivity quartiles. Specifically, the ratio of *M3* to *GDP* rises from 25.20 in the first quartile, to 41.31 in the second, 48.77 in the third and 70.93 in the

---

7 In the case of China, it should be noted that part of the *FDI* inflows reflect other forms of capital disguised as *FDI* to avoid capital controls (Bekaert, Harvey and Lundblad 2006).

fourth. Corresponding values for the ratio of private credit to *GDP* are 16.27, 28.68, 37.34 and 92.22 in the last. This finding suggests that financial factors might play an important role as determinants of export productivity.

Table 3 divides the sample into quartiles based on economic growth. We can see that *GDP* per capita and the ratio of investment to *GDP* increase monotonically, as we move from the first to the last quartile. Export productivity increases across the first three quartiles, but is lower in the highest quartile. A similar pattern is observed for the ratios of *M3* and private credit to *GDP*. The ratio of exports to *GDP* does not change too much across the first three quartiles and is highest in the last one. Finally, the ratios of *FDI* flows or *FDI* stock to *GDP* do not vary too much across quartiles.

In the next sections, we undertake a formal analysis, focusing on export productivity and looking first of all at its determinants, and next at the extent to which it affects growth. We include measures of financial development as determinants of both export productivity and growth and will focus both on the full sample and on whether the *SEG* exhibit a differential behaviour in terms of determinants of both export productivity and growth.

Table 2
Medians of the main variables by export productivity quartiles

	First quartile	Second quartile	Third quartile	Fourth quartile
	(1)	(2)	(3)	(4)
Export productivity	5739.51	8716.35	11834.7	16027.92
GDP per capita	367.34	1732.04	3335.28	20756.4
GDP per capita growth (in %)	1.40	2.02	3.55	2.40
% of population in labour force	42.59	41.02	46.49	49.16
Investment/GDP	18.24	21.16	21.12	21.09
Exports/GDP	23.25	34.39	35.30	37.32
M3/GDP	24.10	39.67	44.19	69.50
Private credit/GDP	15.07	26.98	33.34	91.87
FDI flows/GDP	1.88	2.24	2.14	2.32
FDI stock/GDP	16.43	18.46	15.31	19.30

Note: This Table is based on 1,147 observations for 139 countries over the period 1992-2003.

Table 3
Medians of the main variables by growth quartiles

	First quartile	Second quartile	Third quartile	Fourth quartile
	(1)	(2)	(3)	(4)
Export productivity	8600.34	9490.93	10824.04	11500.41
GDP per capita	1794.12	3046.31	3922.75	2868.97
GDP per capita growth (in %)	-1.64	1.38	2.98	5.67
% of population in labour force	43.44	43.21	44.07	45.15
Investment/GDP	19.58	19.74	20.75	22.73
Exports/GDP	31.16	29.77	31.20	38.42
M3/GDP	35.07	41.40	48.01	39.59
Private credit/GDP	26.29	40.60	41.69	26.35
FDI flows/GDP	1.88	1.98	2.06	2.73
FDI stock/GDP	17.45	18.11	17.07	17.64

Note: As in Table 2.

4 What determines export productivity?

4.1 Baseline specifications

Based on the descriptive statistics in Table 1, we initially estimate an equation of the following type, aimed at analysing the determinants of export productivity:

$$EXPY_{it} = \alpha + \beta_1 GDPPC_{it} + \beta_2 INV_{it} + \beta_3 LABRATIO_{it} + \beta_4 OPENNESS_{it} + \beta_5 FDISTOCK_{it} + \beta_6 M3_{it}/PRIVCRED_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where *i* indexes countries and *t*, time. All variables are expressed in logarithms.

EXPY denotes export productivity;

GDPPC, real per capita *GDP* (evaluated in 2000 constant US dollars);

INV, the gross fixed capital formation to *GDP* ratio;

LABRATIO, the proportion of the country's population who is in the labour force;

OPENNESS, the ratio of exports to *GDP*;

FDISTOCK, the ratio of the stock of *FDI* to *GDP*;

PRIVCRED, the ratio of private credit to *GDP*; and *M3*, the ratio of *M3* to *GDP*.[8]

Country fixed effects and time fixed effects are denoted by η_i and λ_t respectively and, ε_{it} is an idiosyncratic error term. We take into account the time fixed effects by including time dummies in all our specifications.

We then focus on the extent to which the estimated coefficients differ for the *SEG* compared to the other countries in the sample. In order to do so, we estimate an Equation of the following type:

$$\begin{aligned} EXPY_{it} = {} & \alpha + \beta_{11} GDPPC_{it} + \beta_{12} GDPPC_{it}*SEG + \beta_{21} INV_{it} + \beta_{22} INV_{it}*SEG \\ & + \beta_{31} LABRATIO_{it} + \beta_{32} LABRATIO_{it}*SEG + \beta_{41} OPENNESS_{it} \\ & + \beta_{42} OPENNESS_{it}*SEG + + \beta_{51} FDISTOCK_{it} + \beta_{51} FDISTOCK_{it}*SEG \\ & + \beta_{61} M3_{it}/PRIVCRED_{it} + \beta_{62} M3_{it}/PRIVCRED_{it}*SEG + \eta_i + \lambda_t + \varepsilon_{it} \end{aligned} \quad (2)$$

where *SEG* denotes a dummy variable equal to 1 in turn for China, India and Brazil and 0 otherwise.[9] Focusing for instance on the effects of *PRIVCRED* on *EXPY*, β_{61}

---

8 Our results were generally robust to using lagged instead of contemporaneous values of all the right-hand side variables. They were also robust to including the *FDI* flows to GDP ratio, instead of the *FDI* stock to *GDP* ratio among the regressors.

9 Although South Africa is also a *SEG*, we were unable to include it in our regression analysis as export productivity is only available after 2000 for this country.

measures the average impact for the full sample of countries, while the impact for the *SEG* is measured by ($\beta_{61} + \beta_{62}$). β_{62} measures therefore the incremental impact observed for the *SEG.*[10]

4.2 Estimation methodology

Equations (1) and (2) confront us with some econometric issues. First, given the presence of the country fixed effects, *OLS* estimates would be biased and inconsistent. One could use a within-groups estimator instead. Yet, in all specifications, most of the explanatory variables are likely to be endogenously determined and the within-groups estimator does not take that into account. We therefore use the system generalized method of moments (GMM) panel estimator, proposed by Arellano and Bond (1991) and Blundell and Bond (1998).[11] The GMM system estimator relies on a system combining the estimating equation in levels and in first-differences. First-differencing allows to control for the fixed effects. In order to control for the possible endogeneity of the regressors, once lagged first-differences of the regressors are used as instruments in the level equation and twice or more lagged levels of the regressors are used as instruments in the first-differenced equation. The inclusion of the regression in levels in addition to that in first-differences helps to cope with weak-instrument biases.[12]

The consistency of the GMM estimator depends on the validity of the assumption that ε_{it} does not display serial correlation and on the validity of the instruments. We use two tests proposed by Arellano and Bond (1991) to test for these assumptions: the *J* statistic and the test for second-order serial correlation of the residuals (*m2*). The former is the Sargan test for over-identifying restrictions, asymptotically distributed as a chi-square with degrees of freedom equal to the number of instruments less the number of parameters, under the null of instrument validity.[13] The *m2* test is asymptotically distributed as a standard normal under the null of no second-order serial correlation and provides a further check on the specification of the model and on the legitimacy of variables dated *t*-2 as instruments. Failure to reject the null hypotheses of both tests gives support to our model.

---

10 Our results were generally robust to also including the *SEG* dummy variable on its own among the regressors. Yet, this variable was generally poorly determined. For this reason, we do not include it in our tables.

11 See Beck, Levine and Loayza. (2000) for a complete discussion of the advantages and limitations of GMM estimators.

12 Specifically, Blundell and Bond (1998) show that the instruments used with the standard first-differenced GMM estimator (i.e., the endogenous variables lagged two or more periods) become less informative in autoregressive models with persistent series, and in models where the variance of the fixed effects is particularly high relative to the variance of the transitory shocks. All our results were robust to using the simple first-difference GMM estimator rather than the system-GMM.

13 It should be noted that when panels with a short cross-sectional dimension are used, the Sargan test has low power.

4.3 Regression results

Our regression results are reported in Tables 4 and 5. The former includes the ratio of *M3* to *GDP*, and the latter, the ratio of private credit to *GDP*. In both Tables, column 1 reports the estimates of Equation (1) and column 2 to 4, those of Equation (2), which focuses on the extent to which the estimated coefficients differ for each of the *SEG* compared to the other countries in the sample. Looking at column 1, we can see that *GDP* per capita, the investment to *GDP* ratio, the proportion of the country's population who is in the labour force and trade openness exert a positive impact on export productivity. The stock of *FDI* to *GDP* exerts a negative effect on export productivity, which is, however, marginally significant. Yet, both the ratio of *M3* to *GDP* and the ratio of private credit to *GDP*, display insignificant coefficients. Looking at the entire sample, it seems therefore that finance is not related to export productivity.

Focusing now on column 2 of both Tables, which assesses the extent to which the effect of the regressors on export productivity differs for China compared to the other countries in the sample, we can see that only two variables exert a different effect on the export productivity of China, compared to that of the other countries: the proportion of the population in the labour force and the degree of openness. For China, the overall impact of the former variable on export productivity is given by $\beta_{31} + \beta_{32}$, which, considering that β_{32} is negative and larger in absolute value than β_{31}, is negative. This effect can be explained considering that export productivity in China is not linked to labour-intensive products. Similarly, the degree of openness plays a negative impact on China's export productivity, while exerting a positive impact on that of the other countries. This differential effect could be explained considering that China exports a number of labour-intensive and low technology manufactures, which do not contribute to improving export productivity. Like for the full sample, financial variables do not affect export productivity in China.

Column 3 of Tables 4 and 5 assesses whether the effects of our regressors on export productivity are different for our second *SEG*, India. With reference to what determines its export productivity, this country does not seem to differ significantly from the other countries in our sample. In fact, in Table 4, we can see that the only regressor interacted with the India dummy, which is statistically significant is *OPENNESS*. Like in the case of China, the effect of *OPENNESS* on export productivity appears to be negative for India, while it is positive for the other countries. Like for China, this can be due to the fact that India also exports numerous labour-intensive, low productivity goods. This effect is however weaker than the corresponding effect for China, as it disappears in Table 5. Table 5, on the other hand, shows that in the case of India, the investment to *GDP* ratio affects export productivity growth negatively. This effect is marginally significant and is not observed in Table 4. It could be explained by overinvestment in low-tech sectors. Financial variables do not affect India's export productivity.

Column 4 of Tables 4 and 5 refers to Brazil. Interestingly, we can observe that contrary to the other *SEG* analysed so far, both *M3* and *PRIVCRED* exert a positive effect on export productivity in Brazil. This can be due to the fact that the financial system is more efficient in Brazil and helps channelling resources towards productive export-oriented sectors. Furthermore, unlike China and India, the stock of *FDI* to *GDP* also exerts a positive effect on export productivity in Brazil: it is possible that it is the highly productive multinationals that make up the bulk of exports in the country. Yet, like in

the case of China and India, the degree of openness is negatively associated with export productivity, possibly for the same reasons discussed for the other *SEG*.

In summary, China, India and Brazil appear to be different from the other countries in our sample, not only because they are characterized by higher growth rates (in the cases of China and India) and high export productivity, but also because, contrary to the other countries, openness is systematically negatively associated with their export productivity. In terms of financial variables, a link with export development only appears for Brazil. Both for the full sample and the *SEG*, the driving forces of export productivity appear to be *GDP* per capita and the investment to *GDP* ratio. We now turn to analyse the extent to which export productivity and other variables, including our indicators of financial development, affect economic growth.

Table 4
Determinants of export productivity (including *M3*)

		SEG = China	SEG = India	SEG = Brazil
	(1)	(2)	(3)	(4)
$GDPPC_{it}$	0.232 (0.03)***	0.239 (0.03) ***	0.233 (0.03) ***	0.228 (0.03) ***
$GDPPC_{it}$*SEG		-0.034 (0.18)	0.341 (0.30)	-0.005 (0.08)
INV_{it}	0.319 (0.10)**	0.293 (0.10) ***	0.293 (0.09) ***	0.321 (0.10) ***
INV_{it}*SEG		0.022 (0.31)	-0.252 (0.23)	-0.012 (0.15)
$LABRATIO_{it}$	0.502 (0.22)**	0.482 (0.23)**	0.477 (0.21)**	0.482 (0.22) **
$LABRATIO_{it}$*SEG		-3.140 (1.18)***	-0.308 (1.02)	-0.372 (0.67)
$OPENNESS_{it}$	0.126 (0.06)**	0.136 (0.06) **	0.142 (0.06) **	0.151 (0.06) **
$OPENNESS_{it}$*SEG		-0.195 (0.10)**	-0.233 (0.13) *	-0.262 (0.07) ***
$FDISTOCK_{it}$	-0.075 (0.04)*	-0.076 (0.04)*	-0.073 (0.04)*	-0.078 (0.04)*
$FDISTOCK_{it}$*SEG		0.248 (0.17)	-0.015 (0.06)	0.111 (0.04)***
$M3_{it}$	-0.021 (0.02)	-0.021 (0.02)	-0.023 (0.02)	-0.019 (0.018)
$M3_{it}$*SEG		-0.286 (0.18)	-0.110 (0.16)	0.109 (0.04) ***
m2	-1.02	-1.00	-1.00	-1.05
Sargan (p-value)	0.99	0.99	0.99	0.999
No. of observations	1036	1036	1036	1036

Note: All variables are expressed in logarithms. *GDPPC* denotes real per capita *GDP* (evaluated in 2000 constant US dollars); *INV*, the gross fixed capital formation to *GDP* ratio; *LABRATIO*, the proportion of the country's population who is in the labour force; *OPENNESS*, the ratio of exports to *GDP*; *FDISTOCK*, the ratio of *FDI* stock to *GDP;* and *M3*, the ratio of *M3* to *GDP*. *SEG* denotes a dummy variable equal to 1 in turn for China, India and Brazil and 0 otherwise. All regressions were estimated using a system-GMM estimator. The sample used in estimation consists of 124 countries between 1992 and 2003. All right hand-side variables were instrumented using two or more lags of themselves in the first-differenced equation and their first-difference lagged once in the levels equation. Test statistics and standard errors (in parentheses) are asymptotically robust to heteroscedasticity. *m2* is a test for second- order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. The *Sargan* statistic is a test of the over-identifying restrictions, distributed as chi-square under the null of instrument validity. *, **, *** indicate significance at the 10%, 5% and 1%, respectively.

Table 5
Determinants of export productivity (including *PRIVCRED*)

		SEG = China	SEG = India	SEG = Brazil
	(1)	(2)	(3)	(4)
$GDPPC_{it}$	0.238 (0.03)***	0.238 (0.03)***	0.237 (0.03)***	0.234 (0.03) ***
$GDPPC_{it}$*SEG		0.003 (0.17)	0.393 (0.21)**	0.05 (0.08)
INV_{it}	0.304 (0.10)***	0.272 (0.10)**	0.279 (0.09) ***	0.304 (0.10) ***
INV_{it}*SEG		-0.187 (0.29)	-0.327 (0.19)*	-0.109 (0.16)
$LABRATIO_{it}$	0.482 (0.20)**	0.459 (0.21)**	0.462 (0.20)**	0.467 (0.20) **
$LABRATIO_{it}$*SEG		-3.515 (1.11)***	-1.556 (0.94)	-0.144 (0.66)
$OPENNESS_{it}$	0.154 (0.06)***	0.163 (0.06)***	0.171 (0.06) ***	0.174 (0.06) ***
$OPENNESS_{it}$*SEG		-0.201 (0.09)**	-0.017 (0.16)	-0.310 (0.07) ***
$FDISTOCK_{it}$	-0.089 (0.04)**	-0.092 (0.04)**	-0.086 (0.04)**	-0.091 (0.04)**
$FDISTOCK_{it}$*SEG		0.116 (0.16)	-0.029 (0.06)	0.112 (0.04)***
$PRIVCRED_{it}$	-0.044 (0.03)	-0.045 (0.03)*	-0.043 (0.03)*	-0.043 (0.03)
$PRIVCRED_{it}$*SEG		-0.123 (0.11)	-0.271 (0.16)	0.132 (0.04) ***
m2	-0.66	-0.62	-0.65	-0.69
Sargan (p-value)	0.99	0.99	0.99	0.99
No. of observations	1134	1134	1134	1134

Note: All variables are expressed in logarithms. *GDPPC* denotes real per capita *GDP* (evaluated in 2000 constant US dollars); *INV*, the gross fixed capital formation to *GDP* ratio; *LABRATIO*, the proportion of the country's population who is in the labour force; *OPENNESS*, the ratio of exports to *GDP*; *FDISTOCK*, the ratio of *FDI* stock to *GDP;* and *PRIVCRED*, the ratio of private credit to *GDP*. *SEG* denotes a dummy variable equal to 1 in turn for China, India and Brazil and 0 otherwise. All regressions were estimated using a system-*GMM* estimator. The sample used in estimation consists of 132 countries between 1992 and 2003. All right hand-side variables were instrumented using two or more lags of themselves in the first-differenced equation and their first-difference lagged once in the levels equation. Test statistics and standard errors (in parentheses) are asymptotically robust to heteroskedasticity. *m2* is a test for second- order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. The *Sargan* statistic is a test of the over-identifying restrictions, distributed as chi-square under the null of instrument validity. *, **, *** indicate significance at the 10%,5% and 1% level, respectively.

5 Exports productivity, financial development and economic growth

5.1 Baseline specification

We next estimate an equation for the determinants of countries' economic growth, augmented with exports productivity and financial development indicators. This equation takes the following form:

$$\Delta GDPPC_{it} = \alpha + \beta_1 GDPPC_{i(t-1)} + \beta_2 EXPY_{it} + \beta_3 INV_{it} + \beta_4 LABRATIO_{it} + \beta_5 OPENNESS_{it} + \beta_6 M3_{it}/PRIVCRED_{it} + \beta_7 FDI_{it} + \eta_i + \lambda_t + \varepsilon_{it} \quad (3)$$

where $\Delta GDPPC$ indicates real *GDP* per capita growth; and *FDI* indicates the ratio of *FDI* flows to *GDP*.[14] Lagged per capita *GDP* is included to control for convergence.[15] In this type of specification, introducing the lagged dependent variable among the regressors together with fixed country effects renders the within-groups estimator biased and inconsistent even if ε_{it} is not serially correlated. This happens because the lagged dependent variable is correlated with the error term.[16] Also considering the econometric problems highlighted in section 4.2, once again, we use the GMM-system estimator.

In order to gauge the incremental effect that the various regressors have on the economic growth of the *SEG*, we estimate the following equation:[17]

$$\begin{aligned}\Delta GDPPC_{it} = {} & \alpha + \beta_{11} GDPPC_{i(t-1)} + \beta_{12} GDPPC_{i(t-1)} * SEG \\ & + \beta_{21} EXPY_{it} + \beta_{22} EXPY_{it} * SEG + \beta_{31} INV_{it} + \beta_{32} INV_{it} * SEG \\ & + \beta_{41} LABRATIO_{it} + \beta_{42} LABRATIO_{it} * SEG \\ & + \beta_{51} OPENNESS_{it} + \beta_{52} OPENNESS_{it} * SEG \\ & + \beta_{61} M3_{it}/PRIVCRED_{it} + \beta_{62} (M3_{it}/PRIVCRED_{it}) * SEG \\ & + \beta_{71} FDI_{it} + \beta_{72} FDI_{it} * SEG + \eta_i + \lambda_t + \varepsilon_{it} \qquad (4)\end{aligned}$$

5.2 Regression results

Tables 6 and 7 report the estimates of Equations (3) and (4), when $M3_{it}$ is used as our measure of financial development and when $PRIVCRED_{it}$ is used, respectively. Column 1 of both tables reports the estimates of Equation (3) and column 2 to 4, those of Equation (4), which focuses on the extent to which the estimated coefficients differ for each of the *SEG* compared to the other countries in the sample. From column 1 of Table 6, we can see that the coefficient associated with lagged *GDP* per capita is negative but insignificant: there is therefore no evidence of convergence. This could be due to the short time dimension of our panel. Table 7, however, shows a small evidence of convergence. In both tables, exports productivity is positively related to growth,

---

14 While we included the ratio of the stock of *FDI* to *GDP* in the regressions for export productivity, we include *FDI* flows relative to *GDP* in our *GDP* growth regressions. This choice is motivated by our belief that export productivity is more likely to be affected by the overall *FDI* presence in each country, while *GDP* growth is more likely to be affected by the *FDI* flowing in each country in each year, through technological spillovers (De Mello 1999).

15 Our results were robust to the inclusion of additional regressors such as inflation, the ratio of government expenditure to *GDP*, or the percentage of population with secondary education. However, since these variables were missing for a large number of observations, we decided to omit them from our chosen specification. Our results were also robust to using lagged instead of contemporaneous values of the regressors.

16 This bias is generally referred to as the Nickell (1981) bias. Nickell (1981) derives a formula for this bias (when there are no exogenous regressors), showing that it approaches 0 as the sample size tends to infinity. The within-groups estimator is thus likely to perform well only when the time dimension of the panel is large.

17 Once again, our results were generally robust to also including the *SEG* dummy variable on its own among the regressors. Yet, this variable was generally poorly determined. For this reason, we do not include it in our tables.

which confirms the findings in Hausmann, Hwang and Rodrik (2007). The investment to *GDP* ratio and the ratio of the labour force to the total population are also positively associated with growth. Table 6 shows a small positive effect of *FDI* flows on growth, and Table 7, a small negative effect of openness on growth. Both the financial variables display insignificant coefficients, indicating that financial development does not affect the *GDP* growth of our sample of countries. We now focus on whether these patterns also hold for the *SEG*.

Table 6
Export productivity and growth (including *M3*)

		SEG = China	SEG = India	SEG = Brazil
	(1)	(2)	(3)	(4)
$GDPPC_{i(t-1)}$	-0.009 (0.06)	-0.007 (0.006)	-0.008 (0.006)	-0.008 (0.006)
$GDPPC_{i(t-1)}$*SEG		-0.267 (0.11)**	0.210 (0.04)***	0.152 (0.11)
$EXPY_{it}$	0.031 (0.01)**	0.028 (0.13)**	0.301 (0.01)**	0.029 (0.01)**
$EXPY_{it}$*SEG		0.314 (0.19)*	-0.057 (0.10)	-0.280 (0.13)**
INV_{it}	0.040 (0.10)***	0.037 (0.01)***	0.041 (0.01)***	0.040 (0.01)***
INV_{it}*SEG		-0.029 (0.09)	0.254 (0.06)***	0.248 0.06)***
$LABRATIO_{it}$	0.053 (0.03)*	0.037 (0.027)	0.054 (0.03)**	0.056 (0.03)**
$LABRATIO_{it}$*SEG		3.444 (1.90)*	0.969 (0.66)	-0.507 (0.018)***
$OPENNESS_{it}$	-0.008 (0.10)	-0.008 (0.01)	-0.008 (0.01)	-0.009 (0.01)
$OPENNESS_{it}$*SEG		0.015 (0.03)	-0.244 (0.04)***	0.052 (0.02)***
FDI_{it}	0.004 (0.002)*	0.004 (0.002)	0.004 (0.002)*	0.005 (0.002)*
FDI_{it}*SEG		0.017 (0.02)	-0.026 (0.006)***	-0.006 (0.003)*
$M3_{it}$	-0.001 (0.002)	-0.002 (0.002)	-0.001 (0.002)	-0.001 (0.002)
$M3_{it}$*SEG		0.143 (0.06)**	-0.006 (0.09)	0.037 (0.01)***
m2	0.84	0.83	0.84	0.83
Sargan (p-value)	0.99	0.99	0.99	0.99
No. of observations	962	962	962	962

Note: The dependent variable is real per capita GDP growth. All variables are expressed in logarithms. *GDPPC* denotes real per capita *GDP* (evaluated in 2000 constant US dollars); *EXPY*, export productivity; *INV*, the gross fixed capital formation to *GDP* ratio; *LABRATIO*, the proportion of the country's population who is in the labour force; *OPENNESS*, the ratio of exports to *GDP*; *FDI*, the ratio of *FDI* flows to GDP; and *M3*, the ratio of *M3* to *GDP. SEG* denotes a dummy variable equal to 1 in turn for China, India and Brazil and 0 otherwise. All regressions were estimated using a system-*GMM* estimator. The sample used in estimation consists of 123 countries between 1993 and 2003. All right hand-side variables were instrumented using two or more lags of themselves in the first-differenced equation and their first-difference lagged once in the levels equation. Test statistics and standard errors (in parentheses) are asymptotically robust to heteroskedasticity. *m2* is a test for second- order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. The *Sargan* statistic is a test of the over-identifying restrictions, distributed as chi-square under the null of instrument validity. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

Table 7
Export productivity and growth (including *PRIVCRED*)

		SEG = China	SEG = India	SEG = Brazil
	(1)	(2)	(3)	(4)
$GDPPC_{i(t-1)}$	-0.008 (0.005)*	-0.005 (0.005)	-0.008 (0.005)	-0.008 (0.005)
$GDPPC_{i(t-1)}$*SEG		-0.256 (0.09)***	0.148 (0.04)***	-0.004 (0.13)
$EXPY_{it}$	0.039 (0.01)***	0.034 (0.01)***	0.386 (0.01)***	0.037 (0.01)***
$EXPY_{it}$*SEG		0.401 (0.17)**	0.141 (0.06)**	-0.120 (0.15)
INV_{it}	0.044 (0.01)***	0.040 (0.01)***	0.045 (0.01)***	0.044 (0.11)***
INV_{it}*SEG		0.0005 (0.08)	0.158 (0.04)***	0.159 (0.06)***
$LABRATIO_{it}$	0.043 (0.02)**	0.287 (0.02)	0.043 (0.02)*	0.044 (0.02)*
$LABRATIO_{it}$*SEG		4.738 (1.81)***	2.042 (0.35)***	-0.630 (0.16)***
$OPENNESS_{it}$	-0.014 (0.008)*	-0.013 (0.008)	-0.014 (0.008)*	-0.014 (0.008)*
$OPENNESS_{it}$*SEG		0.006 (0.02)	-0.127 (0.04)***	0.062 (0.02)***
FDI_{it}	0.003 (0.002)	0.002 (0.002)	0.003 (0.002)	0.003 (0.002)
FDI_{it}*SEG		0.022 (0.02)	-0.023 (0.005)***	-0.006 (0.002)**
$PRIVCRED_{it}$	-0.003 (0.003)	-0.005 (0.003)	-0.003 (0.003)	-0.003 (0.002)
$PRIVCRED_{it}$*SEG		0.090 (0.04)**	-0.144 (0.04)***	0.012 (0.02)
m2	0.91	0.90	0.91	0.89
Sargan (p-value)	0.99	0.99	0.99	0.99
No. of observations	1063	1063	1063	1o63

Note: The dependent variable is real per capita GDP growth. All variables are expressed in logarithms. *GDPPC* denotes real per capita *GDP* (evaluated in 2000 constant US dollars); *EXPY*, export productivity; *INV*, the gross fixed capital formation to *GDP* ratio; *LABRATIO*, the proportion of the country's population who is in the labour force; *OPENNESS*, the ratio of exports to *GDP*; *FDI*, the ratio of *FDI* flows to GDP; and *PRIVCRED*, the ratio of private credit to *GDP*. *SEG* denotes a dummy variable equal to 1 in turn for China, India and Brazil and 0 otherwise. All regressions were estimated using a system-*GMM* estimator. The sample used in estimation consists of 133 countries between 1993 and 2003. All right hand-side variables were instrumented using two or more lags of themselves in the first-differenced equation and their first-difference lagged once in the levels equation. Test statistics and standard errors (in parentheses) are asymptotically robust to heteroskedasticity. *m2* is a test for second- order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. The *Sargan* statistic is a test of the over-identifying restrictions, distributed as chi-square under the null of instrument validity. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

Column 2 in both tables focuses on China. Both tables show a much stronger evidence of convergence for China, which can be explained by the very strong growth rates experienced by this country, which started off with a very low level of *GDP* per capita. Furthermore, export productivity seems to play a much stronger effect on growth in China, compared to the other countries in our sample, suggesting that the very strong

growth that characterized the country in recent years was pretty much export-led. Although it affects export productivity negatively, the percentage of population in the labour force has a stronger effect on Chinese growth compared to other countries, suggesting that the production of labour-intensive goods exerts a positive effect on growth. Finally, in the case of China, both financial variables positively affect growth. This indicates that in spite of an inefficient financial system (Allen, Qian and Qian 2005), the sheer volume of financial resources available is positively associated with growth.[18]

Coming to India, column 3 of Tables 6 and 7 shows that there is no evidence of convergence. Like in the case of China, export productivity affects growth more in India than in the average country making up our sample. Yet, this effect does not appear in Table 6. Furthermore, investment exerts a particularly strong positive effect on growth in India. Surprisingly, contrary to the other countries in the sample, openness, *FDI*, as well as private credit, are negatively associated with Indian growth. It could be that multinationals operating in India are mainly oriented at exporting their products, without benefiting the local economy. As for private credit, its negative association with growth could be a consequence of the small size of this variable (24.3 compared to an average for the entire sample of 32.6).[19]

Coming to Brazil, column 4 of Tables 6 and 7 show no evidence of convergence. Moreover, surprisingly, in the Brazilian case, export productivity seems to be negatively (Table 6) or insignificantly (Table 7) linked with growth. Considering that Brazil is highly specialized and has a strong comparative advantage in resource-based low tech manufactures, the sophistication of exports does not seem to be a driving force in the economy. Like in the case of India, investment exerts a particularly strong effect on growth in Brazil and *FDI*, a negative (although much smaller) effect. Contrary to India and China, however, the proportion of the population in the labour force is negatively associated with Brazilian growth and openness is positively related with it. Finally, like in China, but contrary to India, *M3* and growth are positively related in Brazil.

In summary, the determinants of growth seem to be particularly heterogeneous, not only across countries, but also across *SEG*. Variables such as export productivity and financial development indicators seem to positively affect growth in some countries and to negatively affect it in others. Only the investment to *GDP* ratio seems to be unambiguously positively associated with growth. This suggests that policymakers who aim at promoting growth in a country should not necessarily focus on other countries' experiences to inform their policies.

---

18 This finding contradicts Guariglia and Poncet (2006), who, using data for 30 Chinese provinces over the period 1989-2003 found a negative association between financial development and growth. This difference between our results and theirs may be due to an aggregation bias.

19 Allen at al. (2006) document that both India's stock market and banking sector are small relative to the size of its economy, and that the financial system is dominated by an efficient, but under-utilized, in terms of lending to non-state sectors, banking sector.

6 Conclusions

Using a panel of 139 countries over the period 1992-2003, we have analysed the links between export productivity, economic growth and financial development indicators. We have also investigated whether the links observed in China, India and Brazil systematically differ from those observed in other countries in the sample. We have found that per capita *GDP* and investment generally exert a strong effect on export productivity. Moreover, only for Brazil, indicators of financial development also strongly affect export productivity. In line with Hausmann, Hwang and Rodrik (2007), we have also found that, except for Brazil, export productivity generally plays a strong effect on growth. The results highlight the importance of not just the volume of exports on a country's growth and productivity, but the type of specialization patterns, which seem to be favoured by products with higher value-added and more technologically developed products. On the other hand, *FDI* flows generally do not affect growth and actually affect it negatively in both India and Brazil. Finally, *M3* affects China's and Brazil's growth positively and significantly; and private credit affects China's growth positively, but Indian's growth, negatively.

Our analysis suggests that there exists considerable heterogeneity across countries, in terms of the links between export specialization, financial development and growth. In order to device policies aimed at promoting growth, the individual characteristics of each country should therefore be carefully considered, as the effects of a given variable on growth may be positive for one country and negative for another. More work needs to be undertaken, possibly at the firm-level, within each county of interest, to understand the dynamics between export productivity, finance and growth within each of the four *SEG*.

References

Allen, F., R. Chakrabarti, S, De, J. Qian, J., and M. Qian (2006). 'Financing firms in India'. Philadelphia: The Wharton School, University of Pennsylvania. Mimeo.

Allen, F., J. Qian, and M. Qian (2005). 'Law, Finance, and Economic Growth in China'. *Journal of Financial Economics*, 77 (1): 57-116.

Amable, B. (2000). 'International Specialization and Growth'. *Structural Change and Economic Dynamics*, 11 (2): 413-31.

Arellano, M., and S. Bond (1991). 'Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations'. *Review of Economic Studies,* 58 (2): 277-97.

Beck T., R. Levine, and N. Loayza (2000). 'Finance and the Sources of Growth'. *Journal of Financial Economics*, 58 (1-2): 261-300.

Bekaert, G., C. Harvey, and C. Lundblad (2006). 'Financial Openness and the Chinese Growth Experience'. New York: Columbia University. Mimeo.

Bencivenga, V., and B. Smith (1991). 'Financial Intermediation and Endogenous Growth'. *Review of Economic Studies*, 58 (2): 195–209.

Bensidoun, I., G. Gaulier and D. Unal-Kesenci (2001). 'The Nature of Specialization Matters for Growth: an Empirical Investigation'. CEPII Document de travail, No. 13. Paris:

Blundell, R., and S. Bond (1998). 'Initial Conditions and Moment Restrictions in Dynamic Panel Data Models'. *Journal of Econometrics*, 87 (1):115-43.

De Mello, L. R. Jr. (1999). 'Foreign Direct Investment-led Growth: Evidence from Time Series and Panel Data'. *Oxford Economic Papers*, 51 (1): 133-51.

Demirgüç-Kunt, A., and V. Maksimovic (1998). 'Law, Finance, and Firm Growth'. *Journal of Finance*, 53 (6): 2107-37.

Fagerberg. J. (1988). 'International Competitiveness'. *The Economic Journal*, 98 (391): 355-74.

Fagerberg, J. (1994). 'Technology and International Differences in Growth Rates'. *Journal of Economic Literature*, 32 (3): 1147-75.

Fagerberg, J. (2000). 'Technological Progress, Structural Change and Productivity Growth: A Comparative Study'. *Structural Change and Economic Dynamics*, 11 (4): 393-411.

Falvey, R., D. Greenaway, Z. Yu, and J. Gullstrand (2004). 'Exports, Restructuring and Industry Productivity Growth'. Research Paper 2004/40. Nottingham: University of Nottingham

Fry, M. (1978). 'Money and Capital or Financial Deepening in Economic Development'. *Journal of Money, Credit and Banking*, 10 (4): 464-75.

Fry, M. (1989). 'Financial Development: Theories and Recent Experience'. *Oxford Review of Economic Policy*, 5 (4): 13–28.

Greenaway, D., C. W. Morgan, and P. W. Wright (1999). 'Export Composition, Exports and Growth'. *Journal of International Trade and Economic Development*, 8: 41-52.

Grossman, G. M., and E. Helpman (1991). *Innovation and Growth in the Global Economy.* Cambridge, MA: MIT Press.

Guariglia, A., and S. Poncet (2006). 'Could Financial Distortions be no Impediment to Economic Growth after all? Evidence from China' Research Paper 06/36. Nottingham: Leverhulme Centre for Research on Globalization and Economic Policy,. Forthcoming in the *Journal of Comparative Economics*.

Hausmann, R., J. Hwang, and D. Rodrik (2007). 'What You Export Matters'. *Journal of Economic Growth*, 12 (1): 1-25.

Kaldor, N. (1981). 'The Role of Increasing Returns, Technical Progress and Cumulative Causation in the Theory of International Trade and Economic Growth'. *Economie Apliquée*, 34: 633-48.

King, R., and R. Levine (1993). 'Finance and Growth: Schumpeter Might Be Right'. *Quarterly Journal of Economics*, 108 (3): 717-38.

Lall, S. (1996). *Learning from the Asian Tigers*. London: Macmillan.

Lall, S. (2000). 'The Technological Structure and Performance of Developing Country Manufactured Exports, 1995-1998'. *Oxford Development Studies*, 28 (2): 337-69.

Levine, R. (2005). 'Finance and Growth: Theory and Evidence'. In P. Aghion and S. Durlauf (eds), *Handbook of Economic Growth*. Amsterdam: Elsevier Science.

Levine, R., N. Loayza, and T. Beck (2000). 'Financial Intermediation and Growth: Causality and Causes'. *Journal of Monetary Economics*, 46 (1): 31-77.

Lucas, R. E. (1988). 'On the Mechanics of Economic Development'. *Journal of Monetary Economics*, 22 (1): 3-42.

Lucas, R. E. (1993). 'Making a Miracle'. *Econometrica*, 61 (2): 251-72.

Malek Mansour, J. (2003). 'Trade Openness and Growth: Does Sector Specialization Matter?'. Brussels: Université Libre de Bruxelles. Mimeo.

Mathieson, D. (1980). 'Financial Reform and Stabilization Policy in a Developing Economy'. *Journal of Development Economics*, 7 (3): 359-95.

McKinnon, R. (1973). *Money and Capital in Economic Development*. Washington, DC: Brookings Institution.

Michaely, M. (1962). *Concentration in International Trade, Contributions to Economic Analysis.* Amsterdam: North-Holland.

Nickell, S. (1981). 'Biases in Dynamic Models with Fixed Effects'. *Econometrica*, 49 (6): 1417-26.

Ng, F., and A. Yeats (2003). 'Major Trade Trends in East Asia: What Are their Implications for Regional Cooperation and Growth?'. WB Policy Research Working Paper 3084. Washington, DC: World Bank.

Rajan, R. G., and L. Zingales (1998). 'Financial Dependence and Growth'. *American Economic Review*, 88 (3): 559-86.

Rivera-Batiz, L. A., and P. M. Romer (1991). 'International Trade with Endogenous Technological Change'. *European Economic Review*, 35 (4): 971-1001.

Rodrik, D. (2006). 'What's so Special about China Exports?'. NBER Research Paper 11947. Cambridge, MA: National Bureau of Economic Research.

Romer, P. M. (1987). 'Growth Based on Increasing Returns due to Specialization'. *American Economic Review*, 77 (2): 56-62.

Santos-Paulino, A. U. (2002). 'Trade Liberalization and Export Performance in Selected Developing Countries'. *Journal of Development Studies*, 39: 140-64.

Schott, P. (2006). 'The Relative Sophistication of Chinese Exports'. NBER Research Paper 12173. Cambridge, MA: National Bureau of Economic Research.

Schumpeter, J. (1911). *The Theory of Economic Development*. Cambridge, MA: Harvard University Press.

Shaw, E. (1973). *Financial Deepening in Economic Development*. New York: Oxford University Press.

Thirlwall, A. P. (1979). 'The Balance of Payments Constraint as an Explanation of International Growth Rate Differences'. *Banca Nazionale del Lavoro Quarterly Review*, 32: 45-53.

United Nations **(**various years). *World Investment Report*. New York: UN

World Bank (2005). *World Development Indicators*. Washington, DC: World Bank.

Xu, B. (2006). 'Measuring the Technology Content of China's Exports'. Beijing: China Europe International Business School. Mimeo.

Appendix 1: List of countries used (the *SEG* are in italics)

1. Albania
2. Algeria
3. Argentina
4. Armenia
5. Australia
6. Austria
7. Azerbaijan
8. Bahrain
9. Bangladesh
10. Belarus
11. Belgium
12. Belize
13. Benin
14. Bolivia
15. Bosnia and Herzegovina
16. Botswana
17. *Brazil*
18. Bulgaria
19. Burkina Faso
20. Burundi
21. Cameroon
22. Canada
23. Cape Verde
24. Central African Republic
25. Chile
26. *China*
27. Colombia
28. Comoros
29. Congo, Rep.
30. Costa Rica
31. Cote d'Ivoire
32. Croatia
33. Cyprus
34. Czech Rep.
35. Denmark
36. Dominican Rep.
37. Ecuador
38. Egypt, Arab Rep.
39. El Salvador
40. Estonia
41. Ethiopia (ex. Eritrea)
42. Fiji
43. Finland
44. France
45. Gabon
46. Gambia, The
47. Georgia
48. Germany
49. Ghana
50. Greece
51. Guatemala
52. Guinea
53. Guyana
54. Haiti
55. Honduras
56. Hong Kong, China
57. Hungary
58. Iceland
59. *India*
60. Indonesia
61. Iran, Islamic Rep.
62. Ireland
63. Israel
64. Italy
65. Jamaica
66. Japan
67. Jordan
68. Kazakhstan
69. Kenya
70. Korea, Rep.
71. Kyrgyz Rep.
72. Latvia
73. Lebanon
74. Lesotho
75. Lithuania
76. Luxembourg
77. Macao
78. Macedonia, FYR
79. Madagascar
80. Malawi
81. Malaysia
82. Mali
83. Malta
84. Mauritius
85. Mexico
86. Moldova
87. Mongolia
88. Morocco
89. Mozambique
90. Namibia
91. Nepal
92. Netherlands
93. New Zealand
94. Nicaragua
95. Niger
96. Nigeria
97. Norway
98. Oman
99. Pakistan
100. Panama
101. Papua New Guinea
102. Paraguay
103. Peru
104. Philippines
105. Poland
106. Portugal
107. Romania
108. Russian Federation
109. Rwanda
110. Saudi Arabia
111. Senegal
112. Sierra Leone
113. Slovak Rep.
114. Slovenia
115. *South Africa*
116. Spain
117. Sri Lanka
118. St Lucia
119. St Vincent and the Grenadines
120. Sudan
121. Swaziland
122. Sweden
123. Switzerland
124. Syrian Arab Rep.
125. Tanzania
126. Thailand
127. Togo
128. Trinidad and Tobago
129. Turkey
130. Turkmenistan
131. Uganda
132. Ukraine
133. United Kingdom
134. United States
135. Uruguay
136. Vanuatu
137. Venezuela
138. Zambia
139. Zimbabwe