Economic growth and nonrenewable resources:

An empirical investigation

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Abstract

In this paper, we investigate the role of nonrenewable resources in economic growth from 1995–2010. The surprising result is that the share of nonrenewable resource exports in 1996 GDP was positively associated with subsequent economic growth. In fact, for the period under study, we found no strong evidence of the resource curse, after controlling for other important determinants of economic growth. For the period under study, most economies were open and followed policies that enabled large flows of foreign investment between economies. Our finding suggests that public institutions—measured by using an index of government effectiveness—are of paramount importance to economic growth. This suggests that if a resource-rich economy needs a greater contribution from its resources, it should improve its public- and private-sector institutions.

Key words: growth, primary-product exports, nonrenewable resources, institutions

1   Introduction

When discussing the resource curse, most economists tend to cite African and Latin American countries as examples: among others, Nigeria, Angola, the Congo, Venezuela, and Bolivia are mentioned. The resource curse refers to the negative effects of resource dependence on economic growth. The work of Sachs and Warner (1995, 1997) made this phenomenon popular among resource economists. From 1970–1989, countries rich in natural resources tended to grow more slowly than

countries without natural resources. Moreover, resource abundance is associated with a lack of human capital development, which in turn affects aggregate productivity.

Sachs and Warner (1995, 1997) and their followers measured resource dependence as the share of primary-product exports in gross domestic products (GDP). However, the measure of primary-product exports excludes nonrenewable resources such as gold and diamonds, which is a significant omission for resource-rich countries; indeed, these precious stones represent the main exports of most Sub-Saharan African countries. Hence, in this study, we use both measures (primary-product exports and nonrenewable resource exports) simultaneously to test the resource curse hypothesis.

As well as addressing the measurement issue, most researchers have extended the work of Sachs and Warner (1995, 1997) by either including more control variables or extending the sample period to earlier years. Our emphasis is on the period covered and the economic structure of most countries before the 1990s.

For clarification, let us review briefly the economic evolution of Sub-Saharan countries. Their abundance in natural resources has shaped and continues to shape their economies. One cannot discuss these countries without mentioning their endowment of natural resources. Natural resources were the driver of African colonization by European countries in the 19th century. According to the report of the International Study Group (ISG) (2011), mining was the major influence on the development of these colonial states. The institutions developed at that time supported mining investments, which were under the control of colonial firms. The ISG argues that the regulation implemented by Europeans during that time was designed to support colonial firms extracting resources.

A similar argument from different perspective is made by Acemoglu *et al.* (2001, 2012), who provide insights into institutional development over time. They argue that places in which Europeans could not establish settlements developed weak institutions that were merely extractive; that is, they were mainly used for transferring resources to the colonizer. The authors recognize the importance of sound institutions to economic development. However, of primary interest is the authors' analysis of how the quality of the institutions that developed in most countries is connected to the colonial era. Both their studies shed light on the nature of the institutions developed during the colonial era.

After many years of colonial rule, countries gained independence, which most did in the 1960s. The postindependence institutions were inherited from the colonial era. Of note are the policies adopted following independence. State-owned enterprises emerged as key players in the economy, with limited private sectors up to the late 1980s. For example, according to Young (1994, p. 6), "Zambia had 134 parastatal enterprises by 1970, the Ivory Coast nearly a hundred by the late 1970s, Nigeria approximately 250 by 1973; Zaire by 1975 had vested most of its economy in public enterprises. In Tanzania 75 percent of the medium and large enterprises were parastatals in the early 1980s." This implies that for about two decades following independence, most countries were closed, trying to protect their public enterprises.

However, in the early 1980s, most African countries were indebted to the extent that the World Bank had to help them implement reform (ISG, 2011). The World Bank took the central role in reforming the African mining industry. Government responses are described by the ISG (2011, p. 17): "Reduced or eliminated state participation in mining enterprises; Provided a wide range of incentives, causing foreign direct investment (FDI) into the industry to surge; Made tax regimes more competitive relative to those in other developing regions, particularly Latin America; Liberalized exchange controls and exchange rate policy; and Introduced investment-

protection assurances, including those on the stability of the fiscal regime for a specified length of time, dividend repatriation and non-expropriation." As a result of the reform, the mining sector attracts the lion's share of foreign investment in the region. For example, according to the United Nations Conference on Trade and Development (UNCTAD, 2011), in 2010, the mining sector attracted more than 53 percent of the total flow of FDI.

The World Bank's approach reflects the changes that have taken place in the mining policies of most Sub-Saharan countries. The extractive sector is now the engine for change in these countries. In the 1990s, most countries moved from a state-oriented economy to a market-oriented economy.

In this context, van der Ploeg (2008, p. 4) argues, "Many Latin American countries have abandoned misguided state policies, encouraged foreign investment in mining and increased the security of mining investment. Since the 1990s Latin America appears to be the fastest growing mining region."

We use Sub-Saharan Africa and Latin America to describe countries' economic structures prevailing before the 1990s. However, these structures characterized most developing economies at that time. Now, most developing countries are open, and multinational corporations extract and export their resources. Although having the extractive sector under foreign ownership is similar to the colonial era, this time, domestic governments have autonomy on policy formulation. This motivated us to study the period from the 1990s.

To show that economies opened up in the 1990s, we compare average shares of FDI in GDP in 1970–1989 and 1990–2009. Figures 1 to 4 indicate large flows of FDI in the latter period, which suggests increased openness and improvements in the rule of law. Therefore, we analyze the 1995–2010 period, when most countries were open and practicing the rule of law.

In this paper, we find that openness does not have a statistically significant effect on economic growth in the period under study. Moreover, unlike in previous studies, we find that the share of primary-product exports in GDP does not statistically significantly affect growth. However, we find that the share of nonrenewable resource exports in GDP has a positive and statistically significant effect on economic growth. Unlike Kolstad (2009), we find that, for our sample period, public institutions were of paramount importance to economic growth.

The rest of the paper is organized as follows. In Section 2, we review the literature. In Section 3, we explain the empirical approach and describe the data. In Section 4, we present and discuss the results. Section 5 concludes the paper.

2   Literature review

Nonrenewable resources have unique characteristics: their rate of growth is zero and they are eventually exhausted when extracted and used as a productive input. This implies that their contribution to economic growth is finite. The traditional way of analyzing growth and nonrenewable resources is to include them in the production function as an input. The neoclassical model of growth is compatible with this approach, see, for example, Stiglitz (1974), Dasgupta and Heal (1979), Hamilton and Hartwick (2005), and Romer (2006).

The key assumption is that nonrenewable resources are an essential input into production. That is, there can be no production without the resource in question, such as coal, oil, or gas. Dasgupta and Heal (1979, Ch. 7) provide a detailed explanation of what constitute essential and inessential exhaustible resources. They argue that if the

output of the economy is sufficient in the absence of a resource—in which case, a lack of that resource does not pose a production problem—that resource is inessential.

However, with this theoretical approach to analyzing the economic contribution of nonrenewable resources having been applied for many years, Sachs and Warner (1995, 1997) developed a useful empirical approach to addressing the issue of resource dependence. Building on the Dutch disease literature, they devised the notion of the resource curse. The Dutch disease refers to a situation in which the discovery of natural resources shrinks the economy's manufacturing sector and lowers its international competitiveness by raising the real exchange rate (Corden and Neary, 1982).

The resource curse phenomenon means that resource dependence tends to lower economic growth. Sachs and Warner (1995, 1997) conducted a cross-section empirical study for the period 1970–1989. Their findings suggest that resource-rich economies tend to grow more slowly than resource-poor economies. They measured resource dependence as the share of primary-product exports in the GDP of 1971. Sachs and Warner (2001) found that including or excluding agriculture in primary-product exports does not affect the results. This suggests that using any resource to proxy natural resource dependence should yield similar results. This statement has motivated us to use the share of nonrenewable exports in GDP as an alternative measure of resource dependence.

Boschini *et al.* (2003) used various measures to obtain similar results. They used the share of primary-product exports in 1971 GNP, the value of ores and metals exports as a share of 1975 GDP, the share of mineral production in 1971 GNP, the value of gold, silver, and diamond production as a share of GDP and the value of ore, metals, and fuels exports as a share of 1975 GDP. However, none of their measures comprises all nonrenewable resources, that is, fuels, ores, metals, precious stones, and nonmonetary gold. Their work covered the period 1975–1998. They concluded that institutions and the natural resources a country possesses are key determinants of whether it has a resource curse. They argue that exhaustible resources such as gold, diamonds, and oil are expected to have a negative effect on economic growth in countries with weak institutions.

Institutional quality emerged as the main reason for natural resources having a negative effect on economic growth. In most studies following those of Sachs and Warner (1995, 1997), both empirical and theoretical approaches are used to explain the role of institutions. For instance, Robinson *et al.* (2006) and Mehlum *et al.* (2006) developed theoretical models to explain why institutions may be the cause of the resource curse. In both studies, the importance of institutional quality is emphasized. These researchers argue that the resource curse is dominant in countries with weak institutions. However, they differ on the types of institutions emphasized.

Robinson *et al.* (2006) emphasized public accountability and argued that the resource curse results from politicians' choices. They assumed that the resource is publicly owned and that the government decides how to use the resource rent. In their model, an incumbent politician seeking re-election uses his or her access to the resource rent to secure employment for his or her supporters. This leads to a misallocation of the resources rent, which adversely affects economic growth.

Mehlum *et al.* (2006) emphasized the role of private-sector institutions because they protect the economy's entrepreneurs. They argue that the rule of law shapes the behavior of entrepreneurs in a resource-rich economy. Entrepreneurs are either rent-seeks ("grabbers," to use their term) or productive. Weak institutions yield grabbers whereas strong institutions foster productive entrepreneurs. They concluded that the

resource curse can be eliminated by improving institutions. Mehlum *et al.* (2006) also conducted an empirical study based on extending the Sachs and Warner (1995, 1997) dataset to 1965–1990. They obtained a significant coefficient on the interaction term between resource dependence and institutional quality, which changes the negative resource effect into a positive one.

However, because most of the resource-rich developing countries, especially from the 1990s, have adopted policies that attract multinational corporations in the extractive sector and the economy generally, we argue that rent-seeking behavior would have gradually disappeared from these economies to improve the efficiency of resource use. Hence, we test which types of institution matter for the period under study.

Kolstad (2009) conducted an empirical study to determine which of the types of institution advocated by Robinson *et al.* (2006) and Mehlum *et al.* (2006) matter. Using the dataset of Sachs and Warner (1997), he concluded that only private institutions matter. These are the type of institutions that most developing countries have been working toward improving since the 1990s with the help of donors and international organizations. The initiatives aim to encourage private-sector participation in the economy. Kolstad (2009) used the rule of law and democracy as indexes for private- and public-sector institutions, respectively. In this paper, we argue that in most countries, there has been an improvement in the rule of law since the 1990s. This is supported by evidence of increased average flows of FDI as a percentage of GDP among economies in 1990–2009 (see Figures 1 to 4). For more discussion of institutions, see, for example, Kolstad and Soreide (2009), Arezki and van der Ploeg (2007), Petermann *et al.* (2007), and Sala-i-Martin and Subramanian (2003).

3   Empirical approach

3.1   Model

Following Sachs and Warner (1995, 1997), who developed the work of Barro and Sala-i-Martin (1995), we assume that the growth of economy *j* between periods $t = 0$ and $t = T$ (1995 and 2010, respectively) is a negative function of its initial income Y_0^j and a vector of other factors, as follows:

$$\frac{1}{T} \, Log \left[Y_T^j \middle/ Y_0^j \right] = \beta_0 + \beta_1 Log Y_0^j + \beta' \boldsymbol{X^j} + u,$$

where T is a time period, Y_T^j is income at period T, and $\boldsymbol{X^j}$ is a vector of other factors affecting growth in economy *j*.

Having included a measure of resource dependence among the $\boldsymbol{X}$ terms, Sachs and Warner (1995, 1997) found that resource dependence had a negative effect on economic growth from 1970–1989. Subsequent work has shown that this effect predominates in closed economies with weak institutions. However, most developing economies opened their economies in the 1990s and strengthened their institutions in a race to attract foreign investment.

In this paper, we investigate whether resource dependence has a significantly negative effect on economic growth. We use two measures of resource dependence: the ratio of primary-product exports to 1996 GDP (prim96), and the ratio of

nonrenewable resource exports to 1996 GDP (nonrenew96). The former is a similar measure to that used by Sachs and Warner (1995, 1997). Primary-product exports exclude exports of precious stones, nonmonetary gold, and other metals and ore. Because many economies export precious stones such as diamonds, we use the second measure to determine the effect of resources on economic growth.

UNCTAD uses the Standard International Trade Classification (SITC) to classify exports of commodities. Primary-product exports include agriculture products (SITC 0, 1, 2, 4), fuels, which comprise mineral fuels, lubricants, and related material (SITC 3) and SITC 68, which comprises minerals such as copper, silver, platinum, aluminum, lead, zinc, tin, and uranium. Our measure of nonrenewable resource exports excludes agriculture products, but includes SITC 27 (industrial diamonds, fertilizer, stone, sand, and other crude minerals), SITC 28 (iron ore and concentrates, scrap metal of made iron or steel, ores and concentrates of uranium and thorium, ores and concentrates of base metals, and ores and concentrates of precious metals, and waste and scrap), SITC 667 (pearls, precious, and semi-precious stones) and SITC 971 (nonmonetary gold). An examination of these components reveals differences between the two measures of resource dependence.

We are also interested in which types of institution matter, particularly from the 1990s, when most countries opened their economies to outside investors. To attract foreign investment, most economies, particularly developing countries, implemented policies designed to increase private-sector participation in the economy. Thus, most countries have shifted from state domination to market economies. Moreover, they provide security to private companies, especially foreign ones. In our empirical approach, we use indicators of both private and public institutions.

Following Arezki and van der Ploeg (2007), who analyzed the role of openness as well as institutions, we use an indicator of law and order from the 2005 International Country Risk Guide to represent institutional quality.

3.2 Data

Unlike previous researchers, we have obtained a range of data for many economies from different sources. Our sample includes 145 economies. Data on the values of primary-product exports and nonrenewable exports were obtained from UNCTAD under the merchandise trade matrix category. The categories are detailed in Table 1.

Following Sachs and Warner (1995, 1997), researchers emphasized the role of institutions in eliminating the resource curse. Many organizations have developed indicators of countries' institutional quality. We use those reported by Kaufmann *et al.* (2009). The advantage of using this dataset is that it covers many economies and the indicators comprise many factors. The authors have developed several indicators of governance and institutional quality. Following previous researchers, we use the rule of law and government effectiveness as indicators of institutional quality. However, these two indicators capture different aspects of institutional quality.

Kaufmann *et al.* (2009, p. 6) define the rule of law as "capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence." Government effectiveness is defined as "capturing perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies." Therefore, we consider the former to reflect private-sector institutions and the latter to reflect public-sector institutions. For discussion of

private and public institutions, see Mehlum, *et al.* (2006) and Robinson *et al.* (2006).

The inclusion of other factors that affect economic growth is based on the literature on economic growth, notably the work of Sala-i-Martin *et al.* (2004), who use a regression containing 67 variables to identify the determinants of long-run economic growth. Of these 67 variables, eighteen variables had a strong effect on economic growth, with initial income and primary school enrollment being among the strongest. Table 1 details information on each variable.

To eliminate or reduce the risk of reverse causality, we use the initial value of most control variables. Table 2 reports correlations among the control variables and independent variables for the entire sample. From this table, three facts are apparent. First, initial income per capita is quite correlated with resource dependence.

Second, the moderately negative correlation between institutional quality and resource dependence suggests that the former is not determined by the latter.

Third, initial income is highly correlated with the institutional measures (rule05 and goef05), life expectancy at birth (life95), and average years of primary schooling (school95). Because our sample comprises both developing and developed economies, we run two separate regressions: one for the whole sample and one for developing economies only. This is done to determine the extent to which these correlations influence our results. In this study, developed economies are defined as members of the Organization for Economic Cooperation and Development (OECD) in 1996.

Table 2 also shows that the correlation between growth and openness is negligible. This affirms our suggestion that by the 1990s, most countries had largely open economies. In fact, our openness variable exhibits little variation between economies.

4   Results and discussion

We start our analysis by following the empirical approach of Arezki and van der Ploeg (2007), whose analysis covered the period 1965–1990. Our analysis covers the period 1995–2010. The results summarized in Table 3 suggest that for the period 1995–2010, neither openness nor the interaction term had a statistically significant effect. Institutional quality had a statistically significant positive effect on economic growth, whereas primary-product exports had an insignificantly negative effect. This contrasts with the findings of Arezki and van der Ploeg (2007) for the period 1965–1990.

According to the findings of Arezki and van der Ploeg (2007, p. 8), after controlling for all variables as in regression 3 of Table 3, openness had a significantly positive effect on economic growth and the effect of institutional quality was insignificant. In the period studied by Arezki and van der Ploeg (2007), most countries were closed; for example, most Latin American and Sub-Saharan countries were state-dominated economies. By the 1990s, most countries had opened their economies and become market economies. This may explain why openness was not a key determinant of economic growth in the 1995–2010 period. In fact, Table 1 shows little variation in openness among countries for this period.

The results of excluding openness and adding other variables are summarized in Table 4. Regressions 1 to 3 use the share of primary-product exports in 1996 GDP as a control variable. Holding all other variables constant, although an increase in the share of primary-product exports is associated with a decrease in growth, the effect is statistically insignificant. Indeed, the results for regression 2 show that the coefficient is even more insignificant when we control for government effectiveness. However, in regression 3, in which we control for both institutional measures (the rule of law

and government effectiveness), government effectiveness is statistically significant. This suggests that having public-sector institutions (government effectiveness) was important for economic growth in 1995–2010.

Our finding contrasts with that of Kolstad (2009) who, using the Sachs and Warner (1997) dataset, found that only private-sector institutions (the rule of law) matter. This contrast may highlight differences in economic structures between the periods 1970–1989 and 1995–2010. In 1970–1989, many countries were closed and dominated by the state sector, whereas in 1995–2010, more countries were open market economies. In this period, most countries improved the rule of law to attract foreign capital. Hence, the results from regression 3 suggest that once an economy has the rule of law in practice, government effectiveness is of paramount importance to economic growth. This implies that once countries have strong institutions that smooth the operation of the private sector, sound public institutions are needed to spur economic growth.

Regressions 4 to 6 in Table 4 summarize the results based on using the share of nonrenewable resource exports in 1996 GDP to measure resource dependence. Similar to the results described already, government effectiveness has, on average, a positive effect on economic growth, even after controlling for the rule of law. However, the effect of the share of nonrenewable resource exports in GDP is surprising. Our results suggest that an increase in the share of nonrenewable resource exports is associated with statistically significantly increased growth. That is, for the period 1995–2010, countries benefitted from the extraction of nonrenewable resources. To our knowledge, ours is the first study to obtain evidence of a natural resource blessing (rather than curse). This result motivated us to limit our sample to developing economies to see if this finding applies to them.

We excluded from the sample all countries that were members of the OECD in 1996. Table 5 summarizes the results. They are similar to those described so far. Regressions 1 to 3 use the share of primary-product exports in 1996 GDP as a measure of resource dependence. They show that in 1995–2010, an increase in primary-product exports negatively affected economic growth but not significantly. The effect is even more statistically insignificant when we control for government effectiveness.

Regressions 4 to 6 in Table 5 use the share of nonrenewable exports in 1996 GDP to measure resource dependence. They show that, on average, an increase in nonrenewable resources is associated with an increase in economic growth. This means that resource-rich developing countries experienced economic growth in 1995–2010.

This finding suggests that, before a country opens its economy, there is a resource curse, as found by Sachs and Warner (1995, 1997). However, opening the economy eliminates the resource curse, which stimulates economic growth. In fact, when a resource-rich country opens its economy, its resource sector becomes an engine of growth.

Intuitively, in most resource-rich economies, most changes in the economy begin with changes in the resources sector. As already mentioned, from the 1990s, most developing economies opened their extractive sectors by changing their mining policies. Because resources—especially nonrenewable resources—are considered as the wealth of a nation, they tend to attract the attention of policymakers. Because opening an economy's extractive sector automatically opens its other sectors, change in the extractive sector changes the whole economy. In brief, most changes in Sub-Saharan African and Latin American countries have followed changes in extractive-sector policies. This sector attracts the most foreign investment in these countries.

However, we are cautious about emphasizing these findings. More work needs to be done on the 1990s to confirm our results.

Despite initial appearances, this finding does not contradict existing studies, particularly those focused on resource-rich African countries. In notable studies by the South African Resources Watch (2009), Gajigo *et al*. (2012), Ibrahim-Shwilima and Konishi (2014), the authors advocate sound public-sector institutions because governments obtain insufficient revenue through their contracts with multinational corporations. This supports our finding that government effectiveness makes a positive contribution to economic growth. Resource-rich developing countries that want to benefit from the resource blessing should improve their public institutions and develop the rule of law. In Tables 4 and 5, regression 7 includes an interaction term between nonrenewable resources and institutions. Although the coefficient on this interaction term between government effectiveness and natural resources is not statistically significant, it is positive, which suggests that it might have a positive effect on economic growth.

In addition, all other variables in our regression equations have the expected sign and they are significant in most cases. Of particular interest is the coefficient of the logarithm of initial income, which, throughout our analysis, is negative and statistically significant. This implies that poor nations are improving. Similarly, the natural logarithm of investment, measured as a share of GDP, and averaged over the period under study, has a positive and statistically significant effect on economic growth.

The average years of primary schooling (school95) and life expectancy at birth (life95) have, on average, positive, and statistically significant effects on economic growth. These two measures reflect the economy's stock of human capital. Intuitively, economies with more educated individuals should grow faster. Primary education is important because it reflects the proportion of people who can read and write. Therefore, it is expected to have a positive effect on economic growth. In the context of life expectancy, one can argue that individuals who expect to live longer will tend to save more and work harder. Thus, life expectancy is expected to contribute to economic growth.

5   Conclusion

In this study, we found that the share of nonrenewable resource exports was associated with positive economic growth for the period 1995–2010. We also found that public institutions—measured by an index of government effectiveness—were important for economic growth in this period. To our knowledge, ours is the first study to apply the analytical techniques of Sachs and Warner (1995, 1997) to the post-1980s period. More studies covering this period should be done to provide sound and timely policy recommendations to policymakers. The prevailing economic structures of most countries differ from those of the 1960s, 1970s, and 1980s. In addition, more research needs to be done on how nonrenewable resources can benefit individuals in the economy. This is of particular interest to policymakers in developing countries.

Table 1. Data and sources

Variable	Description and source	Mean	Standard deviation
lgdppc95	Natural logarithm of real GDP per capita in 1995 (in 2005 constant prices), from UNCTAD.	7.896	1.655
lgdppc10	Same variable for 2010.	8.212	1.633
growth	Average annual growth rate of real GPD per capita for 1995–2010: growth = [lgdppc10 – lgdppc95]*100/16.	1.969	1.666
prim96	Share of primary-product exports in 1996 GDP. Both denominator and numerator are measured in nominal dollars. Primary-product exports are the sum of nonfuel and fuel products. Theses are reported as SITC 0, 1, 2, 3, 4, and 68 by UNCTAD.	0.134	0.131
nonrenew96	Share of nonrenewable resource exports in 1996 GDP. Both numerator and denominator are measured in nominal dollars. Nonrenewable resources include fuels, ores, minerals, precious stones, and nonmonetary gold. These are reported as fuels (SITC 3), ores, metals, and precious stones (SITC 27 + 28 + 68 + 667 + 971) by UNCTAD.	0.089	0.153
school95	Average years of primary schooling in the total population over age 25, from Barro and Lee (2013).	4.006	1.699
rule05	Rule of law index relates to 2005 and approximates current institutional quality, from Kaufmann *et al*. (2009).	–0.000137	1.029
goef05	Government effectiveness index relates to 2005 and approximates 1990s improvement in government institutions, from Kaufmann *et al*. (2009).	0.055	1.035
logainv	Natural logarithm of average investment share of real GDP per capita, 1995–2010, from Heston *et al.,* Penn World Table, version 7.1.	3.082	0.408
revcoup	Number of revolutions and coups per year, averaged over the period 1970–1985, from Sachs and Warner (1997),	0.196	0.239
life95	Life expectancy at birth in 1995 from World Development Indicator.	65.153	10.907
tropicar	Percentage of land area in geographical tropics, from Gallup *et al.* (2001).	0.545	0.472
logopenc	Natural logarithm of average openness, 1995–2010, from Heston *et al*., Penn World Table, version 7.1, reported as openc.	4.299	0.58

inst05	An index of institutional quality for the period under study. We have compiled this index from monthly pdf file reports by the International Country Risk Guide, which were made available via the Waseda library. The variable relates to 2005, is categorized as Law and Order, and range from 0 to 6. Also described by Sachs and Warner (1995).	3.857	1.323

Table 2. Correlation matrix for the whole sample

	growth	lrgdpp95	prim96	nonrenew96	rule05	goef05	school95	logainv	revcoup	logopenc	life95
lrgdpp95	−0.200										
prim96	−0.335	−0.027									
nonrenew96	−0.023	−0.085	0.629								
rule05	0.010	0.838	−0.233	−0.213							
goef05	0.029	0.864	−0.266	−0.229	0.973						
school95	0.097	0.726	−0.169	−0.169	0.665	0.708					
logainv	0.259	0.43	−0.013	−0.023	0.473	0.464	0.329				
revcoup	0.154	−0.385	−0.023	0.019	−0.453	−0.442	−0.316	−0.262			
logopenc	−0.001	0.204	0.352	0.23	0.165	0.159	0.228	0.247	−0.158		
life95	0.066	0.841	−0.139	−0.162	0.699	0.733	0.684	0.526	−0.218	0.203	
tropicar	−0.137	−0.661	0.275	0.187	−0.683	−0.669	−0.49	−0.386	0.232	−0.084	0.644

Source: Author computations

Table 3. OLS regressions for growth in real income per capita for the period 1995–2010			
	1	2	3
lrgdpp95	−0.503	−0.503	−0.504
	(4.19)***	(4.18)***	(4.20)***
prim96	−1.655	−7.122	−1.864
	(1.44)	(0.56)	(0.14)
logopenc	0.432	0.309	0.313
	(1.60)	(0.78)	(0.80)
logainv	0.861	0.840	0.871
	(2.19)**	(2.11)**	(2.19)**
inst05	0.389	0.389	0.551
	(2.56)**	(2.55)**	(2.85)***
interact logopenc		1.197	0.986
		(0.43)	(0.36)
interact inst05			−1.210
			(1.36)
constant	0.272	0.889	0.170
	(0.20)	(0.45)	(0.08)
Obs.	119	119	119
R-squared	0.17	0.17	0.13

Absolute t statistics in parentheses

*** significant at 1 percent, ** significant at 5 percent, * significant at 10 percent

Table 4. OLS regressions for growth in real income per capita for the period 1995–2010

	1	2	3	4	5	6	7
lrgdpp95	−1.224	−1.365	−1.365	−1.457	−1.588	−1.576	−1.438
	−6.05	(6.53)***	(6.52)***	(7.74)***	(8.55)***	(8.48)***	(6.92)***
prim96	−1.499	−0.704	−0.553				
	(1.17)	(0.53)	(0.42)				
nonrenew96				1.746	2.128	2.146	0.669
				(1.90)*	(2.37)**	(2.40)**	(0.54)
logainv	1.267	1.202	1.240	1.077	1.036	1.092	1.274
	(2.93)***	(2.85)***	(2.92)***	(2.54)**	(2.55)**	(2.67)***	(3.02)***
apys95	0.386	0.355	0.346	0.412	0.363	0.35	0.338
	(3.39)***	(3.15)***	(3.06)***	(3.68)***	(3.31)***	(3.18)***	(3.08)***
revcoup	0.941	1.032	0.994	0.944	1.025	0.968	1.046
	(1.58)	(1.77)*	(1.70)*	(1.59)	(1.80)*	(1.70)*	(1.82)*
lif95	0.058	0.060	0.057	0.073	0.732	0.069	0.059
	(2.42)**	(2.56)**	(2.43)**	(3.09)***	(3.22)***	(3.04)***	(2.55)**
tropicar	−0.726	−0.764	−0.843	−0.971	−0.969	−1.058	−0.999
	(1.91)*	(2.76)**	(2.24)**	(2.58)***	(2.74)***	(2.92)***	(2.74)***
rule05	0.497		−0.467	0.709		−0.554	−0.288
	(1.93)*		(0.90)	(2.88)***		−1.11	(0.43)
goef05		0.761	1.204		0.996	1.506	1.231
		(2.76)***	(2.14)**		(4.00)***	(2.89)***	(1.67)*
goef05*nonrenew							0.705
							(0.14)
rule05*nonrenew							−2.327
							(0.49)
constant	2.772	3.949	4.026	3.933	5.18	5.206	4.282
	(1.62)	(2.23)**	(2.27)**	(2.38)**	(3.14)***	(3.16)***	(2.47)**
Obs.	103	103	103	102	102	102	102
R-squared	0.48	0.50	0.50	0.50	0.53	0.54	0.55

Absolute t statistics in parentheses

*** significant at 1 percent, ** significant at 5 percent, * significant at 10 percent

	1	2	3	4	5	6	7

Table 5. Developing economies: OLS regressions for growth in real income per capita for the period 1995–2010

	1	2	3	4	5	6	7
lrgdppc95	−1.275	−1.422	−1.429	−1.566	−1.667	−1.659	−1.457
	(4.76)***	(5.12)***	(5.13)***	(6.78)	(7.36)***	(7.31)***	(4.93)***
prim96	−1.338	−0.384	−0.197				
	(0.79)	(0.22)	(0.11)				
nonrenew96				2.052	2.414	2.425	0.674
				(1.91)*	(2.29)**	(2.30)**	(0.36)
logainv	1.409	1.228	1.287	1.240	1.064	1.147	1.230
	(2.53)**	(2.25)**	(2.33)**	(2.29)**	(2.05)**	(2.18)**	(2.29)**
apys95	0.393	0.364	0.353	0.439	0.383	0.367	0.335
	(2.58)**	(2.42)**	(2.23)**	(3.00)***	(2.67)***	(2.54)**	(2.26)**
revcoup	0.886	0.989	0.932	0.874	0.968	0.889	1.012
	(1.24)	(1.42)	(1.33)	(1.25)	(1.44)	−1.31	(1.44)
lif95	0.063	0.647	0.063	0.080	0.079	0.076	0.062
	(2.19)**	(2.28)**	(2.21)**	(2.87)***	(2.91)***	(2.80)***	(2.06)**
tropics	−0.657	−0.753	−0.784	−0.843	−0.855	−0.942	−0.944
	(1.44)	(1.58)	(1.72)*	(1.87)*	(1.99)**	(2.15)**	(2.13)**
rule05	0.361		−0.521	0.558		−0.598	−0.275
	(0.96)		−0.83	(1.56)		(0.99)	(0.32)
goef05		0.753	1.226		0.984	1.504	1.319
		(1.81)*	(1.73)*		(2.67)***	(2.35)**	(1.43)
goef05*nonrenew							0.372
							(0.06)
rule05*nonrenew							−2.112
							(0.37)
constant	2.239	3.861	3.872	3.483	5.126	5.041	4.442
	(1.02)	(1.65)	(1.65)	(1.69)*	(2.44)**	(2.40)**	(2.03)**
Obs.	75	75	75	74	74	74	74
R-squared	0.48	0.50	0.51	0.51	0.54	0.55	0.56

Absolute t statistics in parentheses

*** significant at 1 percent, ** significant at 5 percent, * significant at 10 percent

We include all developing economies defined as non-OECD members in 1996. The following countries were members of the OECD in 1996: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxemburg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, UK, and US.
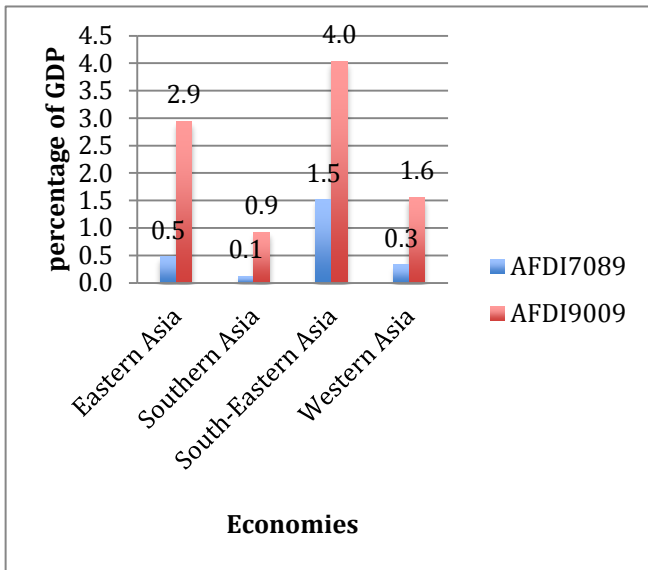
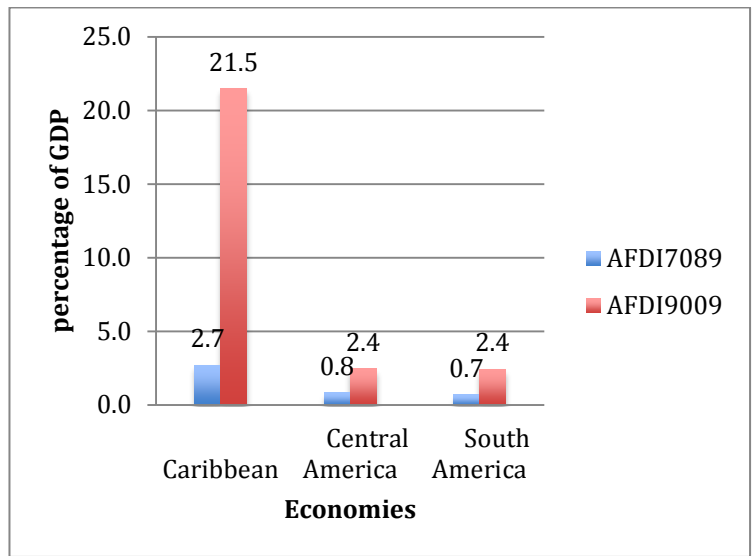**Fig. 1. Asian Economies**

Fig. 2. Latin-American Economies
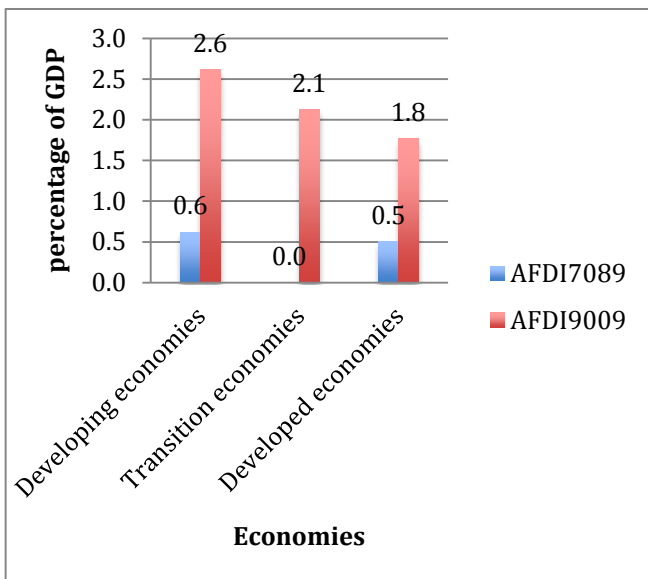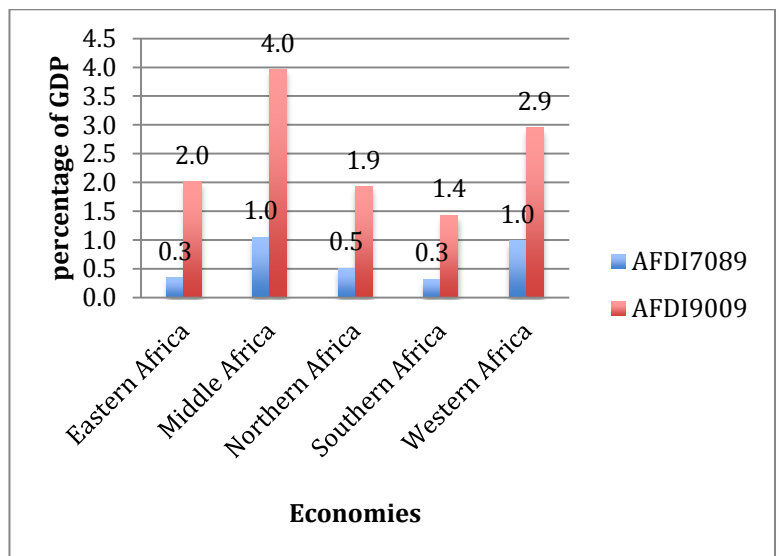

Fig. 3. All Economies

Fig. 4. African Economies

Source: UNCTAD
Note: AFDI7089 and AFDI9009 are average flows of inward FDI as a percentage of GDP for the periods 1970–1989 and 1990–2009, respectively.

Appendix: Countries in our sample

Algeria	Togo	Bangladesh	Italy
Angola	Tunisia	Bhutan	Luxembourg
Benin	Uganda	China	Malta
Botswana	Zaire	Hong Kong	Netherland
Burkina Faso	Zambia	India	Norway
Burundi	Zimbabwe	Indonesia	Poland
Cameroon	Bahamas	Iran	Portugal
Cape Verde	Barbados	Iraq	Romania
Central Afr. Rep.	Belize	Israel	Spain
Chad	Canada	Japan	Sweden
Comoros	Costa Rica	Jordan	Switzerland
Congo	Dominica	Korea, Rep.	Turkey
Egypt	Dominican Republic	Kuwait	UK
Ethiopia	El Salvador	Laos	Russia
Gabon	Grenada	Malaysia	Australia
Gambia	Guatemala	Mongolia	Fiji
Ghana	Haiti	Nepal	New Zealand
Guinea	Honduras	Oman	Papua N. Guinea
Guinea-Bissau	Jamaica	Pakistan	Solomon Is.
Cote d'Ivoire	Mexico	Philippines	Tonga
Kenya	Nicaragua	Qatar	Vanuatu
Lesotho	Panama	Saudi Arabia	Cuba
Liberia	Puerto Rico	Singapore	Slovak Republic
Madagascar	St. Kitts and Nevis	Sri Lanka	
Malawi	St. Lucia	Syria	
Mali	St. Vincent & Grenadines	Taiwan	
Mauritania	Trinidad and Tobago	Thailand	
Mauritius	US	United Arab Emirates	
Morocco	Argentina	Yemen	
Mozambique	Bolivia	Austria	
Namibia	Brazil	Belgium	
Niger	Chile	Bulgaria	
Nigeria	Colombia	Cyprus	
Rwanda	Ecuador	Denmark	
Senegal	Guyana	Finland	
Seychelles	Paraguay	France	
Sierra Leone	Peru	Germany	
Somalia	Suriname	Greece	
South Africa	Uruguay	Hungary	
Swaziland	Venezuela	Iceland	
Tanzania	Bahrain	Ireland	

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