

Which Reforms Work and under What Institutional Environment: Evidence from a New Dataset on Structural Reforms*

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Abstract

Are structural reforms growth enhancing? Is the effectiveness of reforms constrained by a country's distance from the technology frontier or by its institutional environment? This paper takes a new and comprehensive look at these questions by employing a novel dataset that includes several kinds of real (trade, agriculture and networks) and financial (domestic finance, banking, securities, and capital account) reforms for an extensive list of developed and developing countries, going back to the early 1970s. First pass evidence based on growth breaks analysis and on panel growth regressions suggests that on average both real- and financial-sector reforms are positively associated with higher growth. However, in several occasions botched reforms resulted in growth disasters. More importantly, the positive reform-growth relationship is shown to be highly heterogeneous and to be influenced by a country's constraints on the authority of the executive power and by its distance from the technology frontier. Finally, there is some evidence that crises (defined as severe growth downturns) are associated with subsequent reform upticks.

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1 Introduction

Over the last few decades many countries have experienced remarkable progress in their economic performance. This coincided with an unprecedented wave of structural reforms including trade and financial liberalization. Although there are many possible driving forces underlying this phenomenon,¹ the apparent co-movement between growth and a broad range of structural reforms deserves renewed attention.

Do reforms promote growth? Which reforms really work? Do institutions supersede policies to explain economic performance? Or does the institutional environment play a role in how effective reforms are? These questions have been fiercely debated among academics and policy makers for a long time with not much progress in arriving at a conclusive answer.² Testimony to how contentious and divisive discussions have been about the success and failure of certain reforms or packages of reforms is a voluminous literature that emerged by advocates and critiques of the “Washington Consensus”, a list of policies originally proposed by John Williamson in 1990.³

Economic theory suggests that structural reforms should remove obstacles to an efficient allocation of resources, thereby increasing average income levels. At the same time, a perennial challenge for policymakers is finding ways to improve economic performance. This is a difficult and complex task, but there is a general agreement that structural reforms – such as reducing rigidities in product and factor markets, liberalizing capital flows, and freeing international trade – are an important part of an overall strategy for raising incomes and sustaining economic growth. Despite the importance of the issue, the analysis of the relevance of such policies in terms of economic performance has been limited by the lack of consistent historical data on reforms in many non-OECD economies.

While much is still to be learned about the connection between structural reforms and economic performance, several insights emerge from existing research. First, a wide body of empirical evidence documents that trade liberalization raises the level of real income in an economy, as a result of improvements in efficiency.⁴ Furthermore, there seems to be a presumption that trade liberalization also raises an economy’s

¹A reasonable concern is that the observed recent growth in resource-rich developing countries is primarily due to hikes in oil and other commodities prices. However, it is still remarkable that growth has been so spectacular in most regions and countries of the world including also non resource-rich countries.

²Easterly (2005), for instance, studies the association between a large set of economic policies and economic growth. Even though baseline estimates suggest that better policies lead to a substantial increase in per capita income growth, once “extreme” cases of bad policies are removed from the sample policy variables no longer display any relevant association with growth. Rodrik (2005) discusses how policies aimed at promoting economic growth can be highly context specific. Recent literature investigates whether institutions are more important than policies to explain country-wide differences in economic performance. The evidence Easterly and Levine (2003) provide suggests that macroeconomic policies do not play a big role to explain current levels of economic development, once the effect of institutions is taken into account. They argue that bad policies might be “symptoms” of a deeper institutional weakness. Acemoglu, Johnson, Robinson, and Thaicharoen (2008) reach a similar conclusion.

³Williamson (2000) originally coined the phrase in 1990 “. . .to refer to the lowest common denominator of policy advice being addressed by the Washington-based institutions to Latin American countries as of 1989.”

⁴Frankel and Romer (1999) use country geographical characteristics as instruments for trade shares. Their results suggest that a rise of one percentage point in the ratio of trade to GDP increases per capita income by one-half percent. Anderson,

long-run growth rate. Sachs and Warner (1995), for instance, construct a composite index of openness to international trade and find that in the period from 1970 to 1989 open economies experience an average growth 2.45 percentage points higher than closed ones.⁵ Dollar and Kraay (2004) use decade-over-decade variations in volume of trade as a proxy for change in trade policy. Openness to international trade appears to sustain higher income growth rates. Nevertheless, empirical research has not established a conclusive relationship between trade liberalization and economic performance (see Berg and Krueger, 2003, for a survey).⁶

A large body of literature suggests that a well-developed financial sector promotes economic growth (Levine, 1997, 2005). However, relatively few studies try to assess the impact of financial sector reforms on economic growth. Bekaert, Harvey, and Lundblad's (2005) main measure of financial liberalization is a dummy variable equal to one for the years when foreign investors can own equities of a particular market. Equity market liberalization increases annual real per capita GDP growth by almost 1 percent. Quinn and Toyoda (2008) provide detailed de jure measures of capital account and financial current account openness and document that capital account liberalization is positively associated with growth. Finally, recent empirical work provides evidence that structural reforms improve economic performance in advanced economies. Nicoletti and Scarpetta (2003) use an original dataset on product market regulation in eighteen OECD countries. They find that product market reforms raise productivity growth. Evidence on the impact of these kinds of structural reforms in emerging and developing economies does not exist.

Motivated by this literature, we take a broad look at the association between a wide range of structural reforms and economic growth. Specifically, we employ a newly constructed dataset that includes information about several kinds of structural reforms in both the real and financial sectors of the economy for both industrialized and developing countries over roughly the past thirty years. Indices of structural reforms in the real sector of the economy measure, respectively, the extent of openness to international trade, the reduction of public intervention in the agricultural market, and the degree of liberalization in the telecommunication and electricity markets. Indicators of structural reforms in the financial sector encompass the overall domestic financial sector and two more specific sub-sectors – the banking and securities markets, respectively. A last set of indicators of financial sector reforms captures the extent of the external capital account openness. The

Martin, and van Mensbrugge (2006) estimate the removal of all trade barriers would raise real income of the world by about US\$ 287 billion in 2015. However, Tokarick (2008) points out that all countries may not benefit as some may face adverse movements in their terms of trade as a result of trade liberalization.

⁵Sachs and Warner (1995) define a country open to international trade if none of the following conditions holds: a) nontariff barriers covering 40% or more of trade; b) average tariff rates of 40% or more; c) a black market exchange rate depreciated by 20% or more relative to the official exchange rate; d) a socialist economic system and e) a state monopoly on major exports. Rodriguez and Rodrik (2000) discuss in depth whether the Sachs and Warner' index provides an appropriate measure of openness to international trade.

⁶Rodrik, Subramanian, and Trebbi (2004), following Frankel and Romer (1999) instrument actual trade/GDP shares with those estimated on the basis of gravity equations for bilateral trade flows. Settlers' mortality rates from Acemoglu, Johnson and Robinson (2001) are used as an instrument for the quality of institutions. Their results suggest that institutions are the main determinants of current differences in economic development.

richness of our data, both in terms of the sectors of the economy they refer to and of their time and country coverage, is essential to empirically investigating different hypotheses about the relationship between reforms and growth that have been suggested by recent literature.

We rely on two approaches. First, we investigate the relationship between reforms and growth breaks. The hypothesis that reforms cause growth accelerations is based on the observation that the output path in the advanced countries tends to be fairly steady while it is often characterized by “mountains, cliffs, and plains” in developing economies (Pritchett, 2000). Growth breaks are broadly defined as extended periods of markedly high or slow growth. Recent work by Hausmann, Pritchett, and Rodrik (2005); Berg, Ostry, and Zettelmeyer (forthcoming); and Jones and Olken (2008) uses this approach to understand the differential growth experiences of rich and poor countries. A related question is whether economic crises initiate the processes of structural reforms. An extensive literature tries to test this hypothesis (see, for instance, Drazen and Easterly, 2001, and OECD, 2009). One of our aims is to look at these issues by using the growth breaks approach.

Second, we present estimates about the association between the reform indicators and economic growth based on panel data analysis that controls for country and time fixed effects. We, then, move to an empirical assessment of the extent to which country-wide “key variables” like the distance to the technological frontier⁷ and the broad institutional environment⁸ influence the impact of structural reforms on economic performance. Finally, we provide an extensive analysis of the robustness of our main results to the inclusion of additional covariates, to different time periods and income groups, and to the use of lower frequency data.

Our main findings are as follows: growth breaks and growth regression analysis provide evidence that both real and financial sector reforms are on average positively associated with growth. Among real sector reforms, openness to international trade and a lesser public intervention in the agricultural market have a significant positive association with growth, while reforms in the network industries (electricity and telecommunications) are not significant. Among financial sector reforms, both domestic financial reforms and capital

⁷A line of research in economics, building upon the Schumpeterian growth paradigm (see, for instance, Aghion and Howitt, 2006), emphasizes that the design of policies aimed at fostering economic growth is context-specific and depends on a country’s distance to the world technological frontier. According to this theoretical framework, a proper empirical assessment of the relevance of different pro-growth policies requires taking into account the possibility for non-linear effects arising from a country’s distance to the technological frontier.

⁸Acemoglu, Johnson, Querubin, and Robinson (2008) also point to the possibility that policy reforms may have non-linear effects which, in their view, are determined by the degree of the institutional constraints imposed on politicians’ behavior. More specifically, their theoretical analysis predicts that reforms have a less relevant impact on economic outcomes in countries with high or low levels of constraints on executive power. In the first case, politicians, who are highly accountable and constrained in their power, are less likely to implement, in the first instance, *de facto* distortionary policies. Therefore, *de jure* reforms should have a less dramatic impact on economic outcomes. On the other hand, in contexts characterized by weak mechanisms of political accountability, *de jure* reforms can be easily (*de facto*) undermined and, consequently, be of more limited impact. In countries with intermediate levels of constraints on politicians, the institutions are not sound enough to make bad economic policies rare, but at the same time they are not so weak that *de jure* reforms can be easily disregarded. Under such circumstances, the authors expect that policy reforms should be more effective at achieving the goals they are designed for.

account liberalization are significantly correlated with higher growth. These conditional correlations exhibit substantial variation across reforms influenced by the distance to the technological frontier and by the level of a country's constraint on executive power, and are heterogeneous across different time periods and country income groups. It is also shown that in several occasions botched reforms resulted in growth disasters. Finally, there is some evidence that severe growth downturns are associated with subsequent reform upticks. Numerous robustness checks show that the baseline results hold quite well to alternative specifications, estimation method, and data frequency.

The remainder of the paper is organized as follows. Section 2 describes the newly constructed structural reform indices. Section 3 reports and discusses our main findings concerning growth breaks and baseline regression analysis as well as the extent to which the distance to the technological frontier and the quality of the institutions influence the association between reforms and growth. Section 4 presents an extensive robustness analysis of the baseline results, and Section 5 concludes.

2 A First Look at the Data

This section provides an introduction to the indices of structural reforms we consider in the analysis and describes their time patterns at aggregate and regional level and by grouping countries according to institutional quality.

The key advantage of our structural reform data over those used in previous work is that they have a long time series dimension (around 30 years) and comprise a large number of countries (over ninety countries), including advanced and developing economies.⁹ The indicators of reforms in the real sector of the economy regard openness to *international trade* and *product market* liberalization. Openness to international trade is measured along two dimensions: average tariff rates and restrictions on current account transactions (including payments and receipts on exports and imports of goods and services), respectively. Two different indices capture the degree of structural reforms undertaken in the product markets. The first one refers to the *agricultural sector*. It measures the extent of public intervention in the market of each country's main agricultural export commodity. It includes the presence of export marketing boards and the incidence of administered prices. The second one measures the degree of liberalization in the *telecommunications and electricity* markets, including the extent of competition in the provision of these services and the existence of an independent regulator.

Among the indicators of financial-sector reforms, the index of *domestic financial liberalization* is derived

⁹For some reforms (i.e. trade, agriculture, networks and current account) the data go back to 1960 and cover more than 100 countries. The complete list of the countries included in the sample and detailed information about the methodology used to construct the different indicators, their time and country coverage are reported in Appendix 1 and Appendix 2, respectively.

from the database of Abiad, Detragiache and Tressel (2008). It is an average of six sub-indices. Five of them refer to the *banking system* and cover: (i) credit controls, such as subsidized lending and directed credit; (ii) interest rate controls, such as floors or ceilings; (iii) competition restrictions, such as entry barriers and limits on branches; (iv) the degree of state ownership; and (v) the quality of banking supervision and regulation. The sixth dimension relates to the *securities markets* and captures the degree of legal restrictions on the development of domestic bonds and equity markets as well as the existence of independent regulators. When investigating the association between reforms in the domestic financial sector and economic growth, we use both the overall index of domestic financial liberalization and the two different sub-indices that relate to the banking and securities sectors.

Another indicator of financial-sector reforms is the index of external capital account liberalization which measures a broad set of restrictions on financial transactions for residents and non residents, as well as the use of multiple exchange rates. In the empirical analysis we use both this aggregate measure and the two separate indicators of external capital account openness for *resident* and *non resident*. The last two sub-indices measure, respectively, the intensity of legal restrictions on residents' versus non residents' ability to move capital in and out the country.

All indicators are rescaled to range between zero and one, with higher values corresponding to a greater degree of liberalization. Differences in values of each index across countries and over time provide useful information on the variation in the absolute degree of economic liberalization within each sector. Instead, differences in the value of the indices across sectors do not provide a precise quantitative measure of whether one sector is more liberalized than another because of the different methodology used to construct each index. For instance, a positive difference between the trade index and the financial index does not necessarily mean that trade is more liberalized than the financial sector.

As shown in Figure 1, all six indices we consider (international trade, current account, network, agriculture, capital account, and domestic finance) trend upwards over time towards a high degree of liberalization. The liberalization of international trade, capital movements, and the domestic financial sector has been fairly steady and gradual over the last three decades, whereas product market reforms (agriculture, electricity and telecommunications) started only around 1990. There have been no global setbacks in the reforming process, in any sector. Structural reform indicators display significant differences across regions (Figure 2), pointing to a process of catching-up with the levels of sectorial reforms that characterize the industrial economies.

Panels in Figure 3 depict, instead, the evolution over time of our indices for countries grouped according to a specific measure of quality of political institutions: the degree of constraints on the executive power. This variable, taken from the Polity IV project, ranges from 1, denoting no regular limitations on the

executive’s power, to 7, denoting countries where political bodies, such as legislatures, have equal or even larger authority than the executive (see, Marshall, Gurr, and Jagers, 2010). Following Acemoglu, Johnson, Querubin, and Robinson (2008), we classify the countries into three categories of high, medium, and low constraints on the executive.¹⁰

All measures of reforms show a broad upward trend over time in the three groups of countries we consider; the only less clear-cut cases being current and capital account openness in countries with low constraints on the executive. Notwithstanding substantial country-specific heterogeneity, economies with better political institutions are generally characterized by higher values of the reform indicators.

3 Estimation and Results

The empirical analysis is organized around two related parts. In Section 3.1 we present a graphical analysis that investigates the correlation between the reform indices and growth spells, motivated by the recent literature on growth accelerations (see, for instance, Hausmann, Pritchett, and Rodrik, 2005). In Section 3.2 we present our findings about the association between reforms and growth based on OLS estimates that control for country and time fixed effects. We also empirically investigate – in Sections 3.3 and 3.4 – to what extent the reforms-growth relationship is influenced by a country’s distance from the technological frontier and by the institutional environment. Finally, extensive robustness checks are presented in the Section 4 of the paper.

3.1 Reforms and growth spells

In this subsection we present evidence from graphical analysis about the association between different types of real and financial structural reforms and growth spells. Growth spells, broadly defined as extended periods of very rapid or markedly slow growth, are a striking feature of the development process in many countries. Recent work by Hausmann, Pritchett, and Rodrik (2005), Berg, Ostry, and Zettelmeyer (forthcoming), and Jones and Olken (2008) relies on this new approach to the data analysis to understand the different growth experiences of rich and poor countries.¹¹ This subsection uses a set of growth spells identified by using the econometric methodology of Berg, Ostry, and Zettelmeyer (forthcoming) to examine whether structural reforms accompany growth accelerations and whether reform reversals or the absence of reforms are associated with growth decelerations. Berg et al.’ (forthcoming) methodology modifies the procedure first developed

¹⁰For each country we compute the sample mean of the variable constraints on the executive. Countries above, within and below one-standard deviation from the sample mean are assigned, respectively, to the categories of high, middle, and low constraints on the executive.

¹¹Two early precursors of the current work on growth spells are Ben-David and Papell (1998), and Pritchett (2000), both of which employ novel econometric methods to identify shifts in growth performance.

by Bai and Perron (1998) to determine sample-specific critical values for testing the presence of multiple structural breaks in a time series when both the total number and the location of breaks is unknown. Berg et al. (forthcoming)'s procedure differs from the Bai and Perron' approach in that it uses sample-specific critical values adjusted for the presence of heteroskedasticity and for small sample size. The last feature of this procedure is of particular relevance for our analysis which is based on a data-set with a time dimension of about thirty years.¹² Appendix 3 lists all the episodes of up and down breaks in economic growth since 1960 that we are able to detect by using the aforementioned statistical methodology.

Figures 4 and 5 plot the average level of the residuals – obtained through a panel regression of each index on country and year fixed effects – for a period starting five years before a structural break in growth (denoted as 0 on the horizontal axis) and ending five years after it. The set of countries which we rely on to plot the different graphs of Figure 4 and Figure 5 comprises those economies for which each sectorial reform index is available with continuity in the period starting three year before a break. In this manner, graphs of each indicator of structural reforms are drawn by using the same group of countries. The solid line depicts the evolution over time of each index's average residuals for countries that experience an up-breaks in economic growth; the dashed line for countries that have a down break in economic growth. Given that panel regressions remove country and year specific averages of each index, a movement of the plotted average residual from below to above the zero reference line on the vertical axis prior to an up-break (for example, in the case of the current account index, solid line of the middle panel in Figure 4) indicates that the reform index has gone from below the country-average to above the country-average prior to an up-break. The year-specific fixed effects effectively remove also the global trend in each index so that, in practice, the country-specific averages relative to which the plotted residuals are measured are trend-corrected. This means that the decline of the plotted residual lines around down-breaks (for example, in the case of the agriculture index, dashed line of bottom panel in Figure 4) can indicate either reform reversals or lack of reform in a period where many other countries are reforming.¹³

Among real-sector reforms (Figure 4), liberalization of the current account and of the agriculture sector are clearly associated with growth accelerations with the indices improving about three years before the up-break and continuing on an upward trend afterwards. Conversely, growth decelerations are associated with a tariff-based trade liberalization index below the country average (the zero reference line for the vertical axis) and with deteriorating indices of current account liberalization and agriculture. Among financial-sector reforms (Figure 5), liberalization of the domestic financial sector and of the capital account are both associated with

¹²Antoshin, Berg, and Souto (2008) provide a detailed description of these extensions and document how they improve both the power and the size properties of the test in applications with a small number of observations.

¹³In Figure 4, there is no chart for networks reform because of the few spells available after 1990.

growth accelerations. The banking component of the domestic financial sector index starts improving about two years before an up-break. As in the case of most real-sector indices, growth decelerations are associated with a downward trend of all financial indices, which tends to begin around the time of occurrence of the down-break and markedly continues afterwards.

Plotting the reform indices' average residuals around the time of an up break in growth allows for a preliminary analysis of whether sustained periods of economic growth are associated with an increase in the different indices of sectorial reforms we consider. As a further step, we are interested in understanding more about the average growth pattern around the time a sharp increase in each index of structural reforms occurs. Figure 6 and Figure 7 illustrate the average path of per capita GDP growth five years before and after an up-break in the reform indices – denoted as 0 on the horizontal axis of the graphs. The idea here is to see to what extent per capita GDP growth is associated with the main episodes of structural reforms that we are able to detect by using the methodology of Berg et al. (forthcoming). Among real-sector reforms (Figure 6), GDP growth shows a visible albeit weak trending up after substantial reforms of the current account and of the agricultural sector, while there is no such relation between growth and trade reforms. The association between growth and large financial reforms (especially banking) is much stronger as shown in Figure 7. Interestingly, these observations are qualitatively consistent with those in the previous exercise.

We have so far shown how different reforms are associated with the average per capita growth of countries which experience relevant episodes of reforms. Obviously, looking only at the average per capita growth may not be fully satisfactory as long as some processes of reforms can be misguided, mistimed or simply poorly implemented. Figures 8 and 9 show some evidence on how sharp liberalization attempts resulted in devastating growth outcomes with economies contracting at the rate of 5 percent or more per year. For instance, in the top panel of Figure 8 on Trade Liberalization, ZIM88 indicates that 2 years after Zimbabwe's major reform steps to reduce tariffs in 1988, there was a major growth decline (annual per capita GDP growth declined around 12 percent). Or, in the top panel of Figure 9 on Domestic Finance Liberalization, MOZ93 indicates that 3 years after Mozambique's major reform steps to liberalize banking and securities market sectors in 1993, there was a major growth decline (annual per capita GDP declined by 20 percent). The main message from this exercise is that we can detect, across all reform indices, several cases in which the process of reforming sectors of the economy worked poorly.¹⁴ For example, three years after main reforms in the agricultural market, countries in South America – such as Argentina in the late 70's, Brazil in the late 80's and Mexico in the early 90's – experienced major growth downturns. Several Sub-Sahara African countries went through a similar experience (for instance, Cameroon, Ethiopia in the early 90's, and Malawi in the

¹⁴Similar figures showing how reform up-breaks are associated with growth success stories (namely, per capita growth over 5 percent) are available upon request from the authors.

mid 80's). Also, substantial reforms undertaken in the banking sector by several low-income countries (e.g. Mauritanian, Mozambique and Zimbabwe around 1990) were followed by devastating growth decelerations. This evidence leads us to ask the reason why potentially beneficial reforms turned into growth disasters. In Figures 8 and 9 the symbol next to the country name denotes the level of institutional quality using the Polity IV index. The evidence we present, albeit preliminary, suggests that countries with a lower quality of institutions are likely to experience growth failures after undertaking reforms. While beyond the scope of this paper, it would be interesting to undertake a more careful and in-depth analysis of these results, perhaps focusing on country case studies and looking into these reform disasters.

Last but not least, we extend our analysis to consider the hypothesis that economic crises could lead to the adoption of structural reforms. That is, deteriorating economic conditions may facilitate major changes in economic policies (see, among the others, Drazen, 2000; and Drazen and Easterly, 2001). This could be analyzed directly here by looking at whether growth down breaks stimulate subsequent liberalizations upticks. Figure 10 shows some evidence in favor of the “crisis-reforms hypothesis” where major reform attempts emerge a few years after a growth collapse. In the real sector, several cases of trade and current account reforms emerged after a growth collapse. The same is observed, for domestic finance and specifically banking reforms, albeit with some lag.

3.2 Reforms and growth trends: baseline regressions

In this section we provide econometric evidence based on growth regressions about the relationship between structural reforms and economic growth. We estimate through ordinary least-squares (OLS) the following specification:

$$\ln GDP_{i,t} - \ln GDP_{i,t-1} = a_0 + a_1 \ln GDP_{i,t-1} + a_2 Reform_{i,t-1} + \eta_i + \delta_t + \varepsilon_{it}, \quad (1)$$

in which the per capita GDP growth in country i at period t is regressed on the log of a one year lag of per capita GDP and on a one year lag of each indicator of structural reforms ($Reform_{i,t-1}$). A full set of country and year fixed effects denoted by the terms η_i and δ_t , respectively, is included in the model; ε_{it} represents the error term. By including country fixed effects, we control for any country time-invariant characteristic (such as geographical location, historical legacies, and legal origins) that could affect both the adoption of structural reforms and per capita income growth. This specification allows, therefore, dealing with a potentially relevant case of omitted variables bias, even though it does not rule out all possible sources of bias in our estimates, like omitted country specific time-varying factors or reverse causation. Baseline estimates are obtained by using yearly data for the period 1973-2006.¹⁵

¹⁵Even though data for some indicators of structural reforms go back to the 1960s, we chose to base our estimation on data

Estimates from baseline specification (1) are reported in Table 1. With the exception of reforms in the electricity and telecommunications markets (network) the coefficient estimates of all the remaining indices of structural reforms are positive and statistical significant at conventional levels. As it concerns reforms of the real sectors of the economy, the coefficient estimate for the current account has the largest magnitude and is statistically significant at the 1 percent level. The coefficients of international trade and agricultural market reforms have a smaller magnitude and are statistically significant at 10 and 5 percent level, respectively. On the financial sector of the economy, the overall indicator of reforms of the domestic financial market (the composite index of six financial sector's sub-indices) shows the largest positive coefficient magnitude and is also precisely estimated. Reforms of the banking and security sectors show also positive and statistically significant coefficient estimates, with the coefficient magnitude of the second variable being smaller than the first one. The coefficient estimates of the three indices of the external capital account openness are also positive and statistically significant – even though smaller in magnitude and less precisely estimated than the ones pertaining to the domestic financial sector. It may be surprising that the electricity and telecommunications markets do not show a positive association with growth, but as subsequent robustness analysis shows this result is driven by the fact that network reforms have started much later than other reforms (see Figure 1 showing that the relevant index is close to zero from 1973 to the end of the 80's before showing a steep almost linear trend for the later period).

To gauge the size of the estimated correlation between structural reforms and increase in per capita income, we focus on long-term multipliers which take into account the different dynamics of each reform and make their association with growth comparable across the different kinds of reforms. Specifically, a full liberalization of the current account, which corresponds to a discrete jump of its index from the minimum of zero to the maximum of one, is associated with an estimated increase of the output per capita by almost 65 percent in the long run. As mentioned above the largest estimated coefficient refers to the reform of the domestic financial market: a discrete jump of this indicator from zero would more than double output per capita in the long run.¹⁶

It is also interesting to note that although the "breaks" analysis of the previous section is concerned with average spells rather than average estimated coefficients obtained by the current regression analysis, results from the two exercises are broadly consistent showing positive associations between current account and domestic financial reforms and growth.

starting from 1973, given their better quality.

¹⁶The inverse of (minus) the coefficient of the log of a one year lag of per capita GDP is the term by which the estimated coefficient of each indicator of reforms is multiplied to obtain the long-run association between a discrete jump of each index of reforms from zero to one and the increase in per capita income.

Motivated by the recent contributions to the literature, in the next two subsections we examine possible heterogeneity of the association between reforms and growth in two dimensions: the distance to technological frontier and the quality of institutions.

3.3 Reforms, distance from the technological frontier and growth

An alternative to the standard neoclassical growth model is the Schumpeterian growth theory, which emphasizes the process of creative destruction.¹⁷ A key implication of the literature motivated by this approach is that the process of economic development is influenced by a country's income difference from that of the countries at the world technology frontier. One of the most relevant questions in this literature is how quickly low-income countries can close their income gap with the economies at the technological frontier. The distance from the frontier becomes, therefore, a key economic dimension according to which policies aimed at fostering economic growth should be designed and implemented.

As stressed, for instance, in Acemoglu, Aghion and Zilibotti (2006), the main cause of growth for economies far from the technological frontier is the adoption of already existing technologies. As a country approaches the technological frontier, the main force behind the process of economic growth becomes innovation. According to these authors, the design of specific pro-growth policies should critically take into consideration the different stages of economic development in which different countries are. Aghion and Howitt (2006) analyze in depth the case of education,¹⁸ arguing that primary and secondary education matters more for a country's ability to imitate existing technologies, while tertiary education is more important for a country's ability to innovate. As countries catch up with the technology frontier, tertiary education should be more relevant for growth than primary and secondary education.¹⁹ In complementary work Aghion et al. (2009) show that close to the technological frontier, in addition to the education level, product market rigidities and employment protection legislation would be significantly related to TFP growth.

To test whether the association between reforms and growth nonlinearly depends on the distance to the technology frontier, we group the countries in our sample in quartiles according to this dimension. Specifically, we use the ratio of each country's per capita GDP to that of the United States as a proxy for its

¹⁷The process of creative destruction was pioneered in the writings of Joseph Schumpeter (1928, 1942) and refers to the endogenous introduction of new products and processes that inevitably eliminates some of the existing products and processes. Schumpeterian growth theory has been revived and formally modeled by Aghion and Howitt (1992).

¹⁸The analysis of education policies in Aghion and Howitt (2005, 2006) is based also on works by Vandenbussche, Aghion and Meghir (2006) and Aghion, Boustan, Hoxby and Vandenbussche (2005).

¹⁹Aghion and Howitt (2006) combine insights from Nelson and Phelps (1966) and Acemoglu, Aghion, Zilibotti (2006). Nelson and Phelps model an economy where the productivity growth is a function of domestic human capital and the distance from the frontier technology growing over time at an exogenous rate. A higher stock of human capital fosters growth by facilitating the catching up with the technological frontier. Similarly to Acemoglu, Aghion, Zilibotti (2006), in Aghion and Howitt (2006) productivity growth can be generated or by imitating the frontier technology or by innovating on past technologies. The relative importance of innovation increases as a country gets closer to the technological frontier. Moreover, investing in higher education should produce a bigger effect on a country's ability of making leading-edge innovation, while investing in primary and secondary education should exert a larger impact on a country's ability of implementing frontier technology.

distance to the technology frontier, in a given year. For each country we then compute the average distance to the frontier over the years in our sample, according to which economies are assigned to different quartiles. For each quartile, we estimate an econometric model similar to equation (1). The only difference is that we include a one year lag of the ratio of each country's per capita GDP to that of the U.S. instead of a one year lag of the log of per capita income. Consistent with the existing literature, this is done to account for the process of convergence to the technology frontier. As in the previous section, one indicator of reform per time is included in the specification.

Our findings are summarized in Table 2, which is organized as follows. In each of the columns (1)-(10) we report the coefficients and the standard errors (clustered at the country level) estimated for each indicator of reforms across the different quartiles. The bottom row reports the p-value of the test of the equality of the coefficient estimates across the different quartiles. We find no evidence of a significant association between reforms and growth for countries in the first quartile (countries most distant from the technology frontier). With the exception of openness to international trade (as measured by the average tariff rates) and of reforms in the networks sector, all the remaining indices display, instead, a statistically significant and positive coefficient estimate in the second quartile. The domestic financial sector and the banking sector maintain a positive and statistically significant coefficient estimate also in the third quartile. Current account and securities market reforms display an interesting nonlinear correlation with economic growth. Their estimated coefficients are positive and statistically significant at conventional levels also in the fourth quartile, even if the magnitude of the coefficients is smaller compared to the second quartile. The coefficient estimates for current account and domestic financial reform (and its banking and securities sub-components) are statistically different from each other across the different quartiles. Finally, the positive coefficient estimate of capital account openness for non-residents is also statistically significant in the fourth quartile (countries closest to the technology frontier). Its coefficient estimates, nevertheless, are not statistically different from each other across quartiles.

The lack of a significant association between reforms and growth for countries most distant from the technology frontier (first quartile) may be explained by considering that these economies are likely to have a poor institutional environment, in which case we find scattered evidence about the relevance of reforms for growth (for details, see the next section). On the other hand, that reduction of restrictions on current account reforms and policies that encourage the formation of bonds and securities' markets have a significant association with growth for countries closest to the frontier (fourth quartile) is suggestive of the idea that they may favor innovation-led growth through openness to international competition and the availability of financial instruments useful for financing the innovation process (consistent with Aghion et al., 2005).

Perhaps, more interesting are results for countries neither too far nor too close to the frontier (second and third quartiles). Several reforms, and specifically those of the domestic financial market, seem to work better in countries fighting their way towards the status of emerging or even advanced economies. Relaxing market constraints through reforms of the domestic financial market and of the banking sectors may be more valuable in countries that could benefit the most from large increases in private credit and investment. In such developing economies domestic financial reforms can facilitate the transfer and financing of existing technologies, contributing to a higher TFP and growth.

3.4 Reforms, institutions and growth

In this section we examine whether a country’s broad institutional environment affects the way in which reforms promote growth. On the basis of recent literature, we focus on two possible relevant dimensions of the institutional environment. First, we consider the quality of the political institutions, as captured by the degree of constraints imposed on the executive power. Acemoglu, Johnson, Querubin, and Robinson (2008) suggest that reforms can be expected to be more effective in countries characterized by an intermediate level of constraints on the executive power. Second, on the basis of the findings of Acemoglu, Johnson, and Robinson (2001), we investigate whether the average protection against the risk of expropriation influences the extent to which structural reforms matter for a country’s economic performance.

To test whether the association between reforms and growth is heterogeneous across each of these two institutional dimensions, we adopt an approach similar to the previous section. We compute each country’s average level of constraints on the executive power (taken from the Polity IV project)²⁰ over the years in our sample and, according to this dimension, we assign the countries in our panel to different quartiles. We group the countries in our sample in a second set of quartiles, by using the variable that measures the average protection against expropriation risk from Acemoglu, Johnson, and Robinson (2001).²¹ The regression specification used is the same as in equation (1) that now incorporates these institutional measures across different quartiles.

Results are summarized in Table 3 and Table 4 for constraints on the executive and average risk of expropriation, respectively. The tables are organized in the same manner as Table 2 in the previous section, by reporting in each column different indicators of structural reform coefficients and their standard errors,

²⁰See Marshall, Gurr, and Jagers (2010). As explained in the second section, this variable assumes values that go from 1, when there are no regular limitations on the executive power, to 7, when other political bodies rather have equal or more power than the executive. It assumes also values of -88, -77, -66 which denote, respectively, periods of transition, interregnum, and interruption. We turn such values to missing when computing the sample mean of the constraints on the executive power.

²¹As Acemoglu, Johnson, and Robinson (2001, p.1397) explain, this variable originally elaborated by the Political Risk Services, measures the “*risk of expropriation of private foreign investment by government.*” It takes values from 0 to 10, with higher values denoting a lower risk of being expropriated, and for each country is constructed as the average value over the years 1985-1995.

estimated across different quartiles.

The main finding here is that a positive and statistically significant association between reforms and growth comes from the third and, partially, the second quartiles (Table 3). Estimates for the first quartile show that only the two measures of international trade openness are associated with higher growth at a statistically significant level. Reforms for the domestic financial market and its banking sub-component are positively associated with growth at a statistically significant level only in the second and third quartile. In addition, their coefficient estimates are statistically different from each other across quartiles. Reforms of the securities markets display a statistically significant and positive coefficient in the second, third and fourth quartile, even though the coefficient estimates are not statistically different from each other across quartiles. Finally, current account and network reforms are associated at conventional statistical levels with higher growth for countries in the third quartile. Only for the network sector, though, the estimated coefficients differ from each other across quartiles.²²

With regards to the average risk of expropriation, estimates reported in Table 4 show that there is a positive and statistically significant association between reforms and growth coming mainly from the third quartile (specifically, for reforms of the current account, domestic financial sector and its two subcomponents, external capital account and its subindex for residents) and the fourth one (in particular, for openness to international trade, securities market, external capital account and its subindex for resident). In the first quartile only openness of the external capital account and its index for non-resident are positively associated with growth, at statistical conventional levels. Finally, it is worth noting that only reforms concerning the external capital accounts as captured by all three indices at hand have coefficient estimates which statistically differ from each other across quartiles.

4 Robustness

In this section we perform several econometric exercises to examine the robustness of the findings discussed in Section 3.2. We first check whether our results hold when use the GMM estimator proposed by Arellano and Bond (1991). We then include a set of time-varying control variables and investigate whether our baseline estimates are heterogeneous across different time periods and income groups. We also estimate equation (1) by using lower frequency data. Finally, we include in the baseline econometric model of Section 3.2 several indicators of structural reforms at the same time to deal with a possible relevant source of omitted variable

²²We also performed the same exercise by grouping countries in different quartiles according to the quality of democratic institutions as measured by the variable *polity2* from the Polity IV project. The evidence of a significant and positive association between reforms and growth comes mainly from countries in the third quartile, even though coefficient estimates (with the exception for reforms in the banking sector) are not statistically different from each other across quartiles. To save space we do not report these results which are available upon request from the authors.

bias.

4.1 Arellano-Bond GMM estimation

Through a simple manipulation we can write equation (1) as:

$$\ln GDP_{i,t} = a_0 + \bar{a}_1 \ln GDP_{i,t-1} + a_2 Reform_{i,t-1} + \eta_i + \delta_t + \varepsilon_{it}, \quad (2)$$

where $\bar{a}_1 = 1 + a_1$. Equation (1) is rearranged as a dynamic model in which the lagged dependent variable is included among the regressors (see Caselli, Esquivel and Lefort, 1996). Fixed effect OLS estimates are, therefore, inconsistent due to the correlation between the lagged dependent variable and the lagged error term. For fixed N , OLS estimates are consistent only for $T \rightarrow \infty$. Although the number of time periods in our data-set is not too small, fixed effect OLS estimates can still be inconsistent if the process for per capita income is persistent (on this point, see Wooldridge, 2002, chapter 11). To deal with this issue, we use the GMM estimator proposed by Arellano and Bond (1991), which takes the first differences of Equation (2) in order to remove country-specific unobserved heterogeneity and uses two or more lags of the dependent variable as instruments.

Table 5 reports results from GMM estimation. By comparing these results with those in Table 1, we note that the positive association between growth and openness to international trade as captured by the average tariff rates no longer holds, while the coefficient estimate of the variable measuring the lack of restrictions on current account transactions remains positive and statistically significant. The estimates confirm the positive association between the liberalization of the agricultural market and growth, while the degree of liberalization in the network and electricity markets keeps showing no statistically significant correlation with a country's economic performance.

Results for reforms in the financial sector of the economy are somewhat mixed compared to those reported in Table 1. Specifically, the overall index of the domestic financial sector reform and its two sub-components for banking and securities are associated with a higher rate of economic growth at a statistically significant level. Among the indicators of capital account liberalization, only the one measuring the lack of restrictions imposed on residents maintains a statistically significant and positive coefficient estimate.

The p-values reported at the bottom of Table 5 show that there is no statistically significant second order serial correlation among the first-differenced error terms (an assumption required for the consistency of the estimates). Yet the Sargan test rejects, for all the specifications, the null hypothesis that the over-identifying assumptions are valid, which leads us to take these results with a word of caution.

4.2 Additional robustness checks

Next, we start assessing the robustness of our results to the inclusion in equation (1) of an additional set of time-varying control variables. Table 6 reproduces the results of Table 1 by adding a one year lag of three additional covariates: political institutions (as measured by the polity2 indicator of quality of democracy from the Polity IV project), terms of trade, and tertiary educational attainment. Our results are fairly robust to the inclusion of this set of variables. In comparison with the results reported in Table 1, the index of liberalization of the capital account for non-resident is the only one to lose statistical significance. The sign of the coefficient estimate for the reforms in the electricity and telecommunication markets turns out to be negative but is still not statistically different from zero.²³

We then investigate whether the empirical evidence about reforms and growth reported in Table 1 is heterogeneous across different time periods. For instance, Billmeier and Nannicini (2009), by using a different estimation method than ours, find evidence of a positive effect of economic liberalizations on growth, which weakens after 1989. We report estimates for the periods 1973-1989 and 1990-2006 in Table 7 and in Table 8, respectively. Overall, the estimates for the years from 1973 to 1989 show a positive correlation between structural reforms and economic performance. It is worth noting that, when we restrict our sample to the period 1973-1989, the liberalization of the electricity and telecommunications markets displays a positive and statistically significant association with economic growth,²⁴ while compared with Table 1 such a correlation does no longer hold for the agricultural market reforms.

Estimates for the years from 1990 to 2006 (Table 8) confirm the positive association between growth and all the three available indices of domestic financial sector reforms, which we detect both in Table 1 and for the period 1973-1989. The evidence about openness to international trade is mixed: only the variable that captures the (lack of) restrictions on current account transactions maintains a positive and statistically significant coefficient. When we focus on the period 1990-2006, reforms of the agricultural markets displays, as in Table 1, a positive and statistically significant association with economic growth. There is no significant association between growth and reforms in the network industries (as in Table 1) and openness of the external capital account does not display a significant correlation with economic growth – differently from the period

²³Results with alternative sets of control variables have not been reported to save space but they are available upon request from the authors. These controls include, among the others, macro policy variables (i.e. inflation), alternative measures of educational attainment (primary and secondary education), alternative measures of political institutions (from the Polity IV database), and alternative definitions of terms of trade (growth of terms of trade).

²⁴We take the results about the network sector with a word of caution. For the period 1973-1989, this variable has a value of zero until the 75th percentile of the distribution. Results seem to be driven by few countries that started opening up this sector in the period under consideration.

1973-1989 and from the estimates in Table 1.²⁵

We also analyze whether the association between reforms and economic growth is heterogeneous across different income groups. We code the countries in our sample as advanced or emerging and developing economies, according to the IMF – World Economic Outlook Database classification (see Appendix 1).²⁶ Table 9 reports results for advanced economies, while Table 10 for emerging and developing economies.²⁷ As it concerns advanced economies, the indicators which display a statistically significant and positive coefficient are openness to international trade (as captured by the lack of restrictions on the current account) and the reforms of the securities markets. These findings can be considered broadly consistent with those concerning countries in the fourth quartile of distance to the technological frontier (see Table 2), for which we find that reforms of the current account and of the securities sector have positive and statistically significant coefficient estimates – which are also statistically different from those of the other quartiles. By comparing estimates for emerging and developing economies with those reported in Table 1, we note that the three available indicators of reforms of the capital account no longer show a statistically significant association with economic growth. As in Table 1, reforms of the network sector (electricity and telecommunications) display a positive but not statistically significant coefficient estimate.

Johnson, Larson, Papageorgiou, and Subramanian (2009) warn about the implications from estimating growth regressions with annual PPP-corrected GDP data from Penn World Tables due to the presence of measurement error. We take this warning seriously and, although we believe that for the question at hand using reform data at annual frequency is conceptually the preferred choice, we have re-estimated our baseline results by using three and five year interval data. As shown in Table 11, which reports estimates from using three year interval data,²⁸ our main results are fairly robust when employing these lower frequency data: among the reforms that display a positive and statistically significant coefficient estimate in Table 1, only the index for the liberalization of the agricultural sector is no longer statistically significant.²⁹

When estimating the specification (1) in Section 3.2 we include one indicator of structural reform per time. A concern with these results is that the process of reforming might involve several sectors of the economy at the same time. If this is the case, our indicators of structural reforms are likely to be correlated

²⁵ Figure 1 suggests that reforms of the network sector started around 1990 with a sharp increase in the last twenty years. Panel regressions do not show any significant correlation between reforms of the network sector and growth probably because the inclusion of year fixed effects captures a trend common to all countries in the process of reforming this sector.

²⁶ Available at: <http://www.imf.org/external/pubs/ft/weo/2011/02/weodata/weoselagr.aspx>

²⁷ IMF's classification does not include Somalia. Results in Table 10 are obtained without Somalia. In any case, including or not this country in the sample does not affect at all our estimates. Results are available upon request from the authors.

²⁸ To save space we do not report the results with 5-year intervals but are available upon request from the authors.

²⁹ When we estimate equation (1) by using five year interval data, the following indices display a positive and statistical significant association with economic growth: liberalization of the current account, the overall domestic financial sector and its banking component, openness of the external capital account and its sub-component for resident. To save space, we do not report these results which are available upon request from the authors.

with each other. Not including all of them in the specification (1) might lead to biased estimates.

Estimates reported in Table 12 deal with this issue. The table is organized in the following manner. Openness to international trade is measured by the average tariff rates in columns (1) to (4), and by the restrictions on current account transactions in columns (5) to (8). In columns (1) and (5) we consider the broader indices of liberalization of the domestic and international financial sectors together with the indicators for the agricultural, electricity and telecommunication markets – which are included in all columns (1) to (8). We include the two sub-indices of reform for the banking and securities sectors rather than the overall indicator for the domestic financial market in columns (2) and (6). We consider openness of the capital account for resident and non resident rather than the general index of liberalization of the external capital account in columns (3) and (7). Finally, in columns (4) and (8) we include at the same time the two sub-indices of reforms for the domestic financial sectors (banking and securities) and for the international capital account (resident and non resident).

By comparing these results with those reported in Table 1, the indicators of openness to international trade (as measured by both average tariff rates and by the restrictions on the current account) as well as the general index and the two sub-indices of openness of the external capital account never display a statistically significant association with economic growth. The coefficient estimate for the network industries remains statistically not different from zero. Reforms in the agricultural market and in the overall domestic financial sector, instead, maintain a positive and statistically significant association with economic growth. As it concerns specifically the domestic financial sector, the securities market reform displays a statistically significant and positive association with economic growth in all the specifications in which we include it (columns (2), (4), (6) and (8)), while the positive coefficient estimate for the liberalization of the banking sector is statistically significant at conventional levels only when we measure openness to international trade with the restrictions imposed on the current account (columns (6) and (8)).

To summarize, the results from the baseline growth regressions reported in Table 1 are broadly robust to GMM estimation, to the inclusion of control variables and to the use of lower frequency data. While for the period 1973-1989 our estimates show a positive association between reforms and growth for all our indicators of reforms with the exception of the agricultural market, the evidence is mixed for the years after 1989. The association between reforms and growth holds for a fairly large number of economic sectors in the case of emerging and developing economies while it is limited to only the openness to international trade (as measured by the lack of restrictions on the current account) and to the securities sector in the case of advanced economies. Finally, when considering more than one index of reforms at the same time, reforms in the agricultural, in the overall domestic financial market, and its securities sub-component display a positive

and statistically significant association with a country's economic performance.

5 Conclusion

This paper examines whether real and financial reforms over the last three decades have been associated with higher growth, and whether there has been a differential growth response due to a country's institutional environment. Underpinning the empirical analysis is a significant data collection effort that involves the compilation of indicators of structural reforms for a large sample of developing and developed countries over the past three decades. Not only is the resulting dataset unique in its country and time coverage, but it is also much broader in terms of the sectorial coverage of reforms—as long as it includes indicators of liberalization in domestic product markets, international trade, several indicators of liberalization of the domestic financial sector, and measures of the capital account liberalization.

Our main findings are as follows: first, illustrative growth breaks analysis reveals a broadly positive (average) association between real and financial reforms and growth. The first two exercises (plotting the level of reform indices around growth breaks, and reporting growth conditional on observing liberalization upticks) show that while there is a positive association between real and financial reforms and growth breaks, reverse causation is also at play. The third exercise reveals that focusing only at average reform performances may be masking botched reforms that resulted in growth disasters. The final exercise shows some evidence in favor of the hypothesis that crises may lead to the adoption of subsequent structural reforms.

Second, panel growth regression analysis provides evidence of a broad positive association between both real- and financial-sector reforms and growth. However, as in the growth breaks analysis, also in this case the average positive reform-growth relationship masks considerable heterogeneity related to a country's constraints on the authority of the executive power and to its distance to the technology frontier. Regarding the distance to the technological frontier, there is no evidence of a positive relationship for countries far away from the technology frontier. This may be because markets or institutions in such economies are still not sufficiently developed to allow taking full advantage of substantial structural reforms. Reforms of the current account and of the securities markets have a positive and statistically significant association with growth for countries close to the technology frontier, which may indicate that openness to international competition and the availability of financial instruments may favor innovation. Perhaps, one of the most interesting results is the fact that reforms of the overall domestic financial sector and of its banking sub-component exhibit positive association with growth for countries in the middle two quartiles (neither too far nor too close to the technology frontier). This result may suggest that domestic financial reforms can facilitate the financing of technology adoption in dynamic developing economies and contribute, in this manner, to higher

productivity and economic growth. The main finding concerning constraints on the executive power is the significant positive correlation between reforms of the overall domestic financial and banking sectors and growth for countries with intermediate levels of constraints on the executive authority. This is quite an intriguing finding as it is consistent with the result concerning the distance to the technology frontier. Taken together, these heterogeneity results suggest that reforms are more effective when markets and institutions are not at their infancy but at a somewhat more advanced stage in their process of development.

A word of caution has to be spent here. Our results should be taken as evidence of strong associations rather than causation. While it is certainly the case that reforms are at least partially determined by the political process, appropriate instrumental variables that could resolve this and other sources of endogeneity are particularly difficult to find. Having said that, we do not view this as a drawback of this paper but rather a constraint inherently embedded in the complex composition of structural reforms. The heterogeneous effects that key variables – like the broad institutional environment or the distance from the technological frontier – have on the reform-growth relationship are remarkable and we hope that together with the novel dataset on reforms this will stimulate further research on this important issue. In addition, while regression results reporting average effects are valuable exercises to obtain broad associations, they cannot tell the whole story. As shown in the last two exercises on growth breaks analysis in section (3.1) there is substantial variation in reform outcomes (including reform attempts associated with severe growth decelerations). Therefore, regression results should be complemented with more thorough and detailed event analysis. Such direction is both intriguing and potentially very fruitful.

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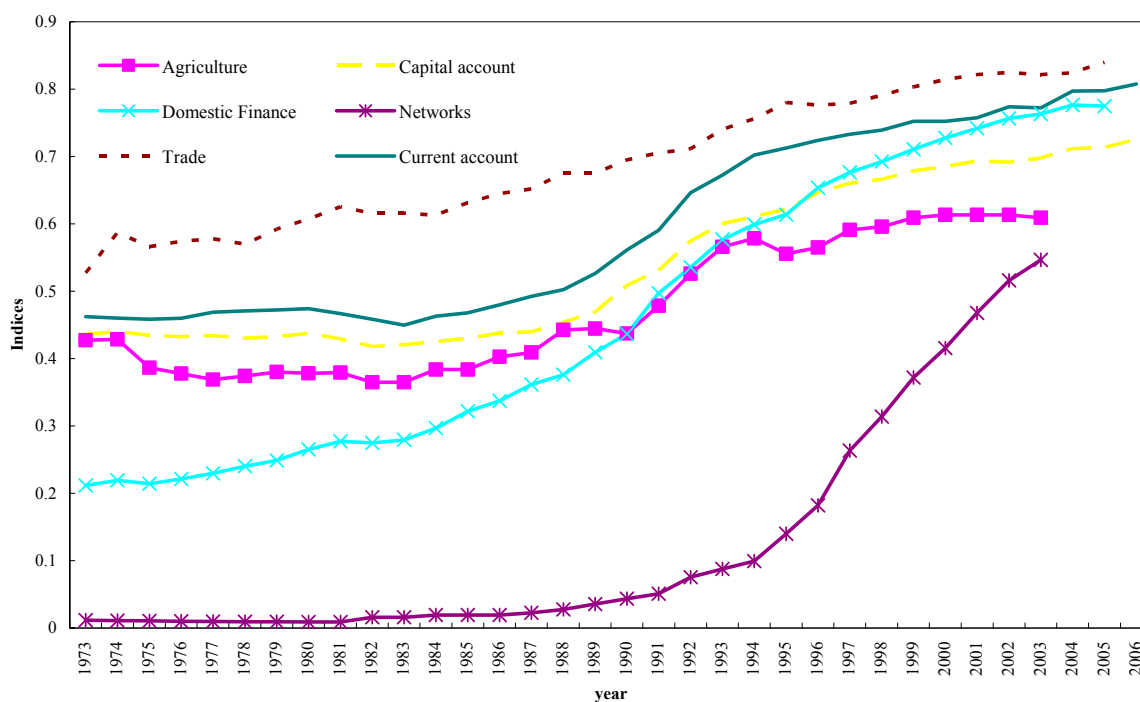
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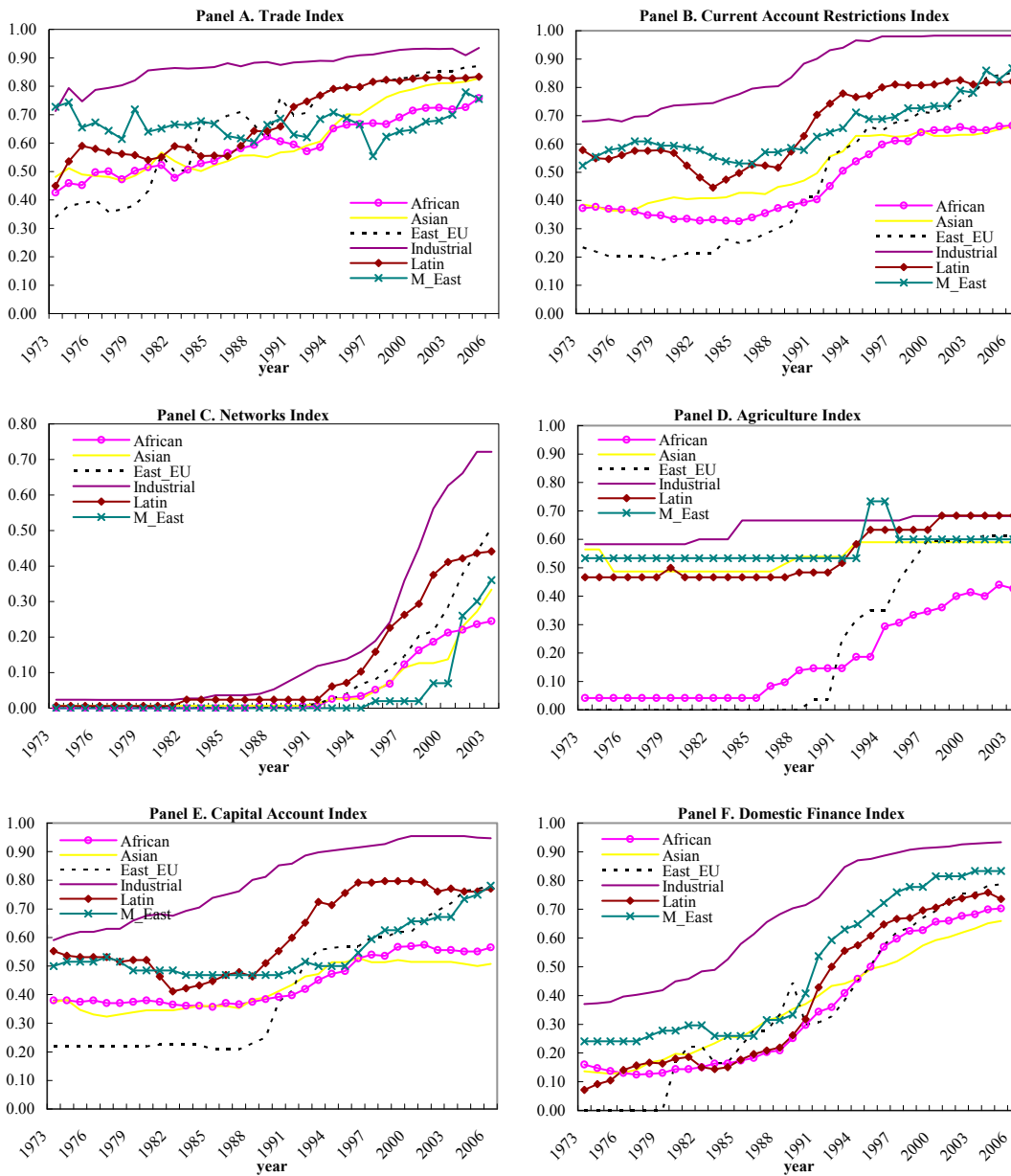
Figure 1. Structural Reforms Indices
(All countries)



Source: IMF estimates.

Notes: Higher values of the indices denote a larger degree of structural reforms. Each index is rescaled to range between zero and one. Their plotted values correspond to the mean of each index across countries in a given year. "Agriculture" captures public intervention in the market for each country's main agricultural export commodity. "Domestic Finance" takes into account restrictions on the interest rate determination and on the banking sector's competition, credit controls, and the quality of supervision in the banking sector, as well as the degree of liberalization of securities markets. "Trade" denotes average tariff rates. "Capital Account" is an indicator of restrictions on financial credits and personal capital transactions for residents, and financial credits for non-resident. "Networks" captures the degree of competition and liberalization, and the quality of regulation, in the electricity and telecommunications markets. "Current Account" denotes current account restrictions on the proceeds from international trade in goods and services. See Appendix 2 for more details.

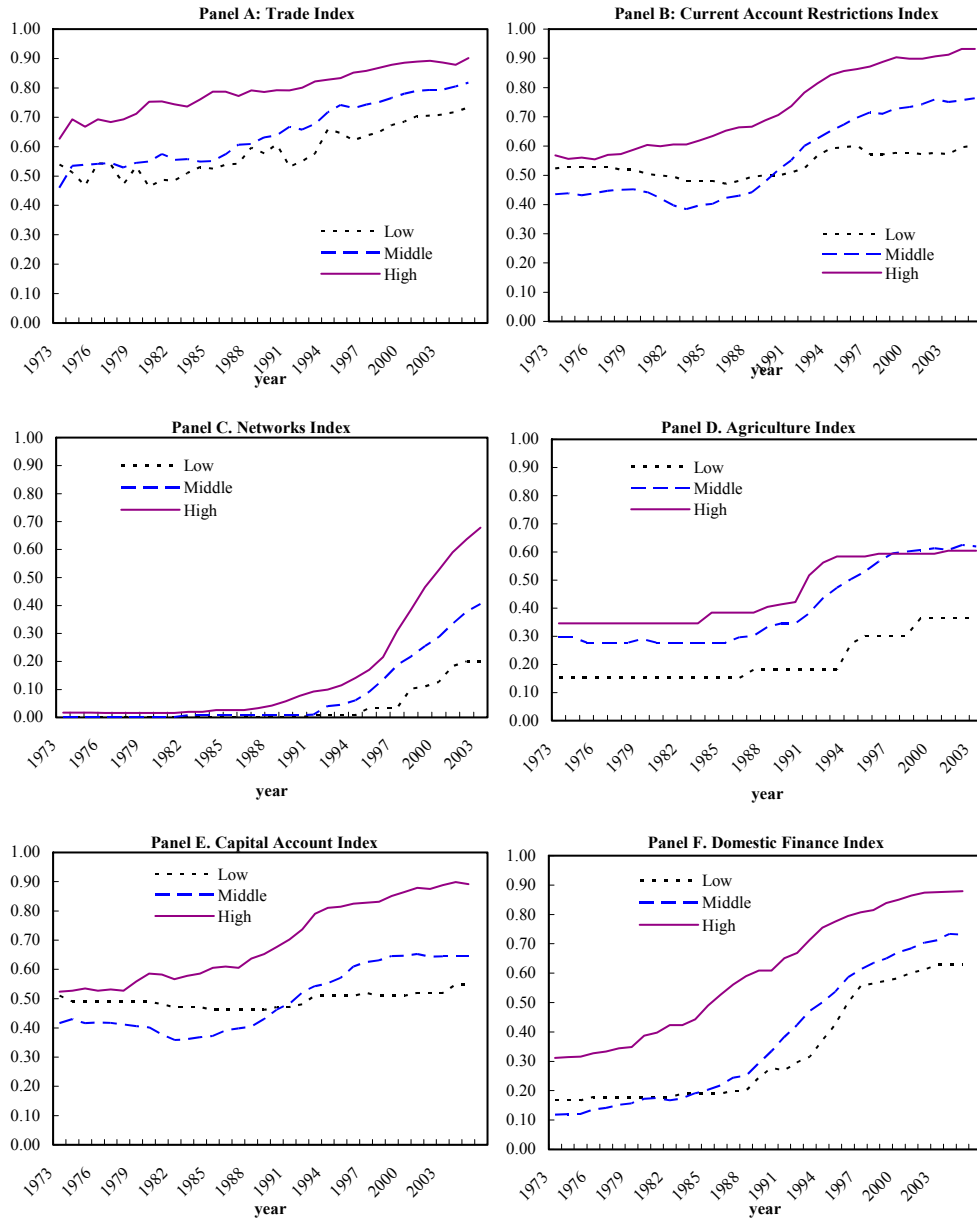
Figure 2. Structural Reforms Indices by Region



Source: IMF estimates.

Notes: Higher values of the indices denote a larger degree of structural reforms. Each index is rescaled to range between zero and one. Their plotted values correspond to the mean of each index across countries in a given year. "Trade" denotes average tariff rates. "Current Account" denotes current account restrictions on the proceeds from international trade in goods and services. "Networks" captures the degree of competition and liberalization, and the quality of regulation, in the electricity and telecommunications markets. "Agriculture" captures public intervention in the market for each country's main agricultural export commodity. "Capital Account" is an indicator of restrictions on financial credits and personal capital transactions for residents, and financial credits for non-resident. "Domestic Finance" takes into account restrictions on the interest rate determination and on the banking sector's competition, credit controls, and the quality of supervision in the banking sector, as well as the degree of liberalization of securities markets. See Appendix 2 for more details.

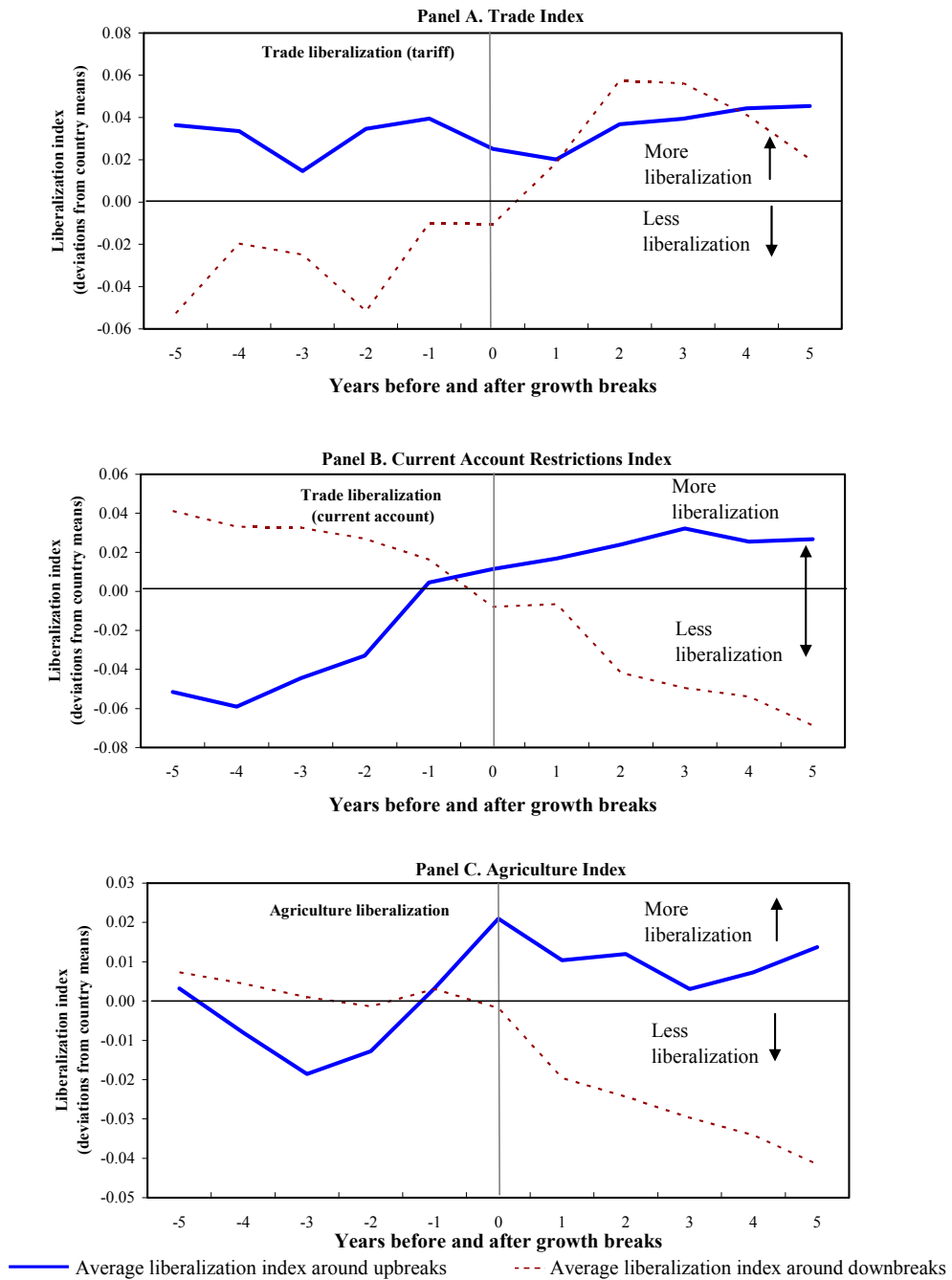
Figure 3. Structural Reforms Indices by Constraint to the Executive Level



Source: IMF estimates.

Notes: Higher values of the indices denote a larger degree of structural reforms. Each index is rescaled to range between zero and one. Their plotted values correspond to the mean of each index across countries in a given year. "Trade" denotes average tariff rates. "Current Account" denotes current account restrictions on the proceeds from international trade in goods and services. "Networks" captures the degree of competition and liberalization, and the quality of regulation, in the electricity and telecommunications markets. "Agriculture" captures public intervention in the market for each country's main agricultural export commodity. "Capital Account" is an indicator of restrictions on financial credits and personal capital transactions for residents, and financial credits for non-resident. "Domestic Finance" takes into account restrictions on the interest rate determination and on the banking sector's competition, credit controls, and the quality of supervision in the banking sector, as well as the degree of liberalization of securities markets. See Appendix 2 for more details.

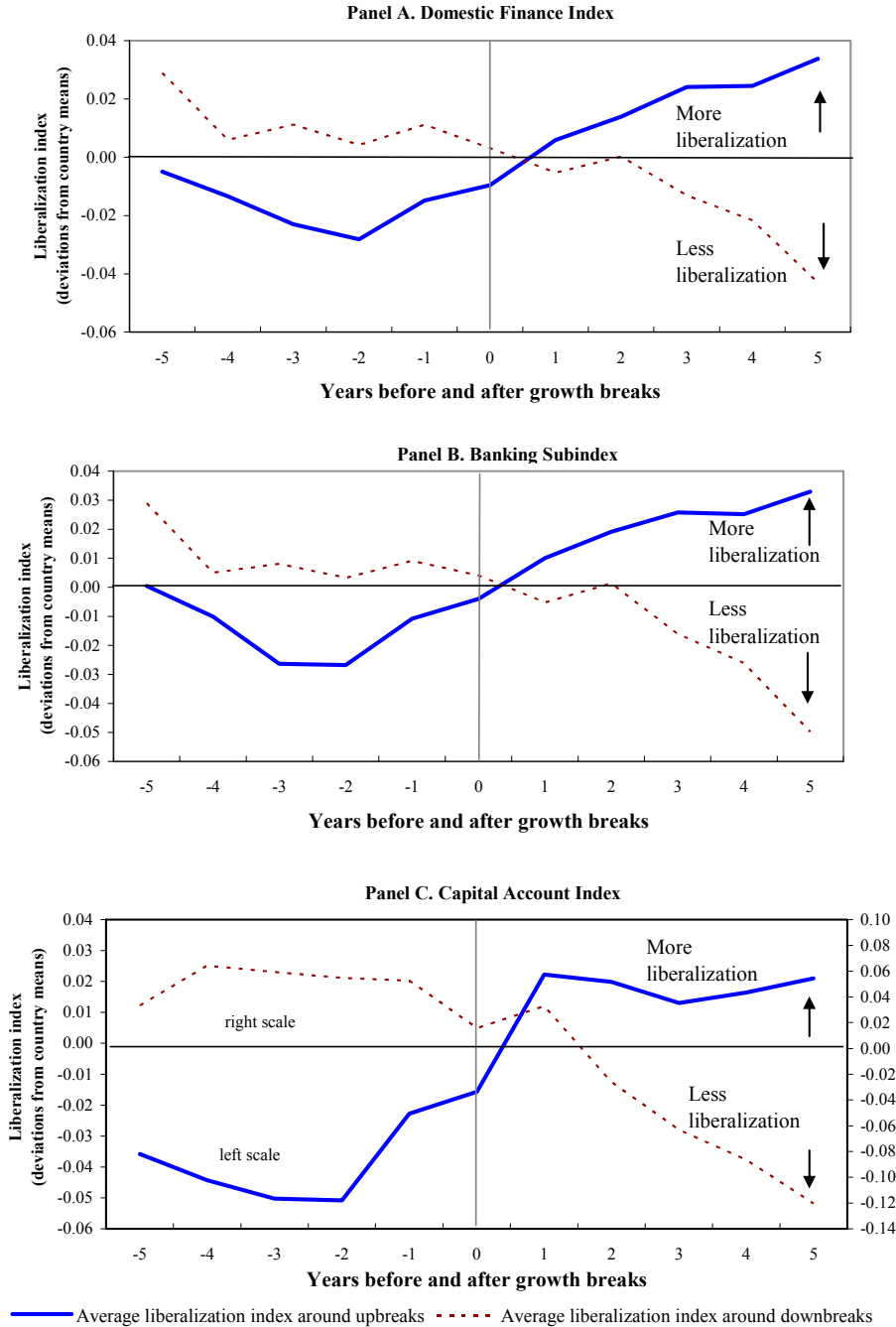
Figure 4. Growth Breaks and Real Sector Reforms



Source: Authors estimates based on Penn World Tables, version 6.2.

Notes: The figures plot the (average) residuals of the reform indicators for a five year period before and after the year of a break in economic growth – normalized to 0 on the horizontal axis. Residuals of the indices are obtained by regressing each index on country fixed effects (to remove country averages) and year fixed effects (to remove common trends). The blue line plots average residuals of the indices for countries that experience up-breaks in growth; the red-dot one for countries that experience down-breaks in growth.

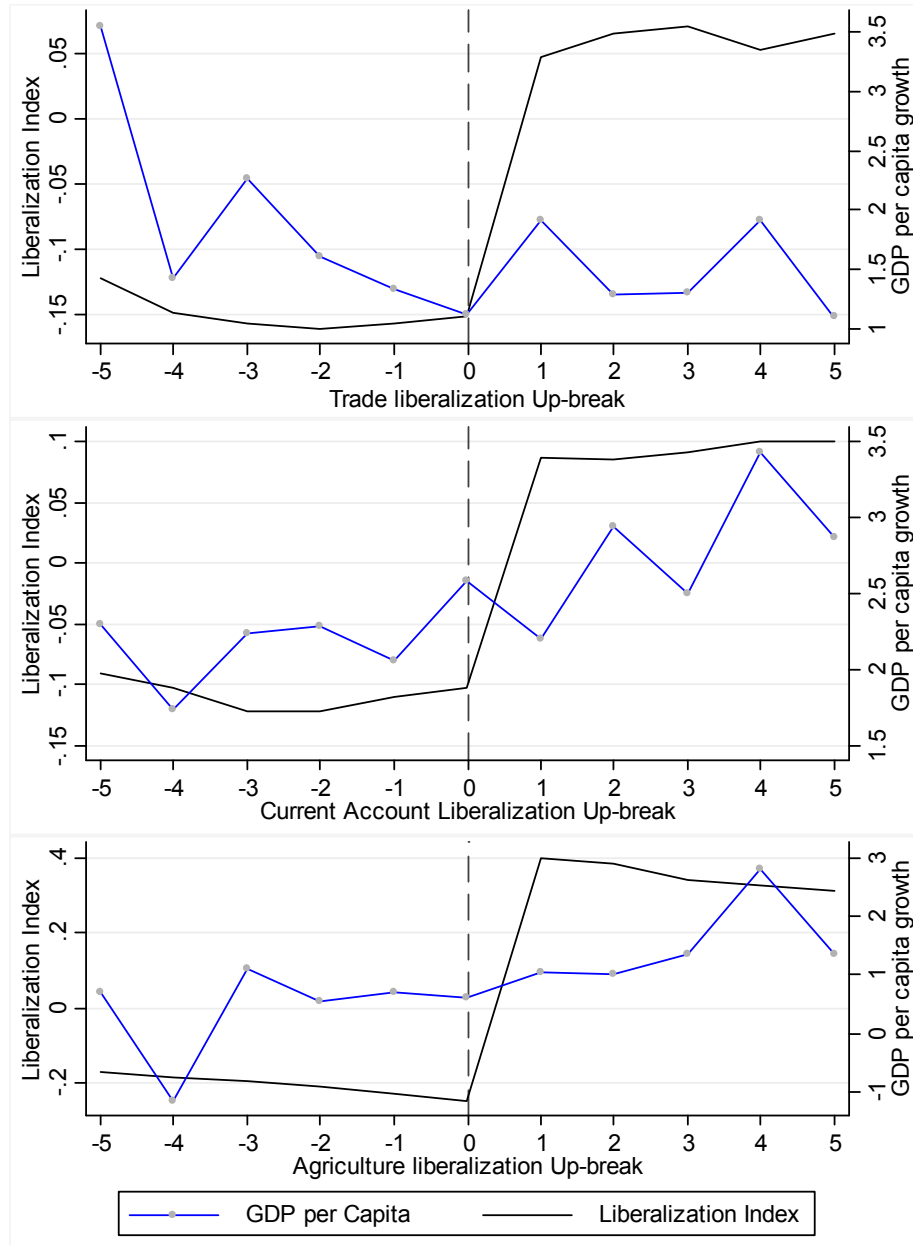
Figure 5. Growth Breaks and Financial Sector Reforms



Source: Authors estimates based on Penn World Tables, version 6.2.

Notes: The figures plot the (average) residuals of the reform indicators for a five year period before and after the year of a break in economic growth – normalized to 0 on the horizontal axis. Residuals of the indices are obtained by regressing each index on country fixed effects (to remove country averages) and year fixed effects (to remove common trends). The blue line plots average residuals of the indices for countries that experience up-breaks in growth; the red-dot one for countries that experience down-breaks in growth.

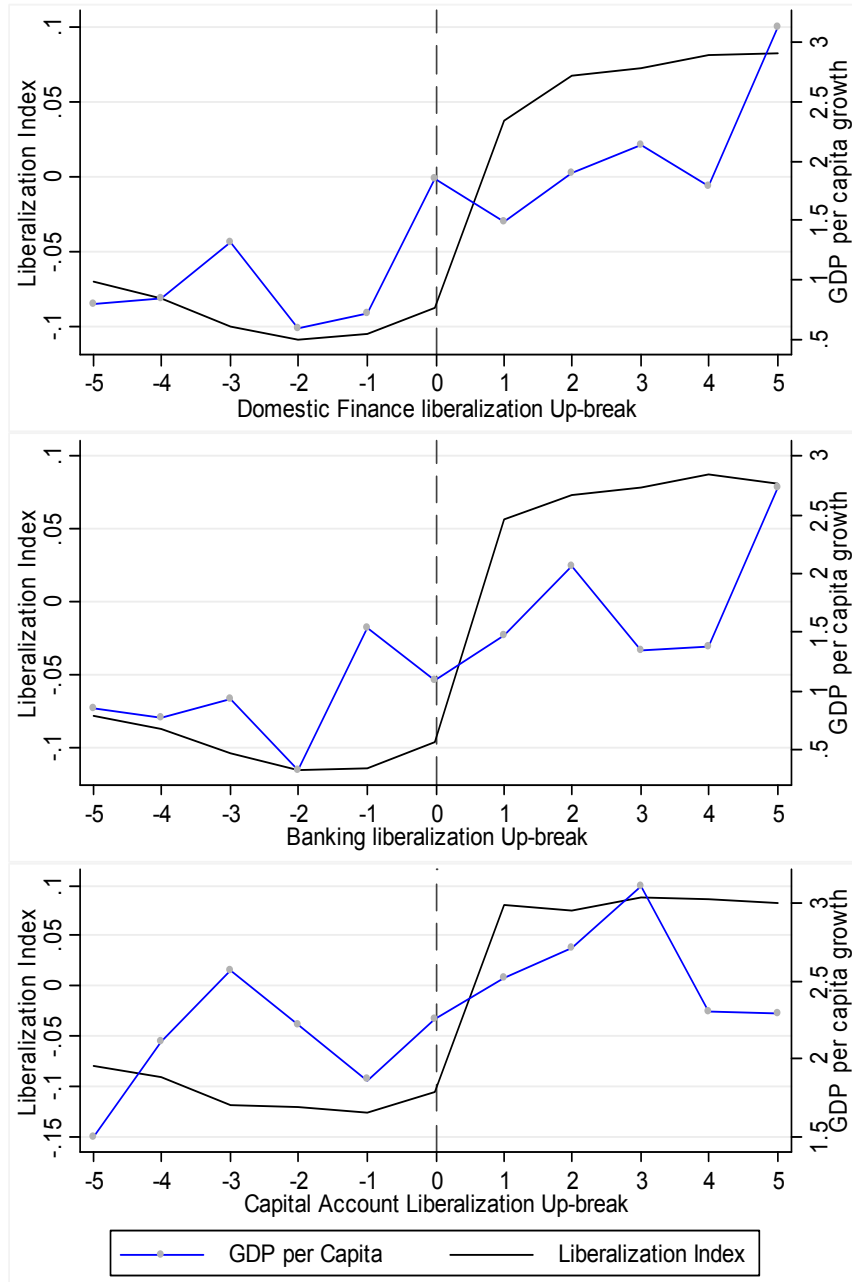
Figure 6. Reforms in the Real Sector and Growth Performance



Source: Authors estimates based on Penn World Tables, version 6.2.

Notes: The figures plot the average per capita GDP growth (in blue) and the average reform index (in black) during a five year period before and after the year of an up-break in each reform index (zero on the horizontal axis).

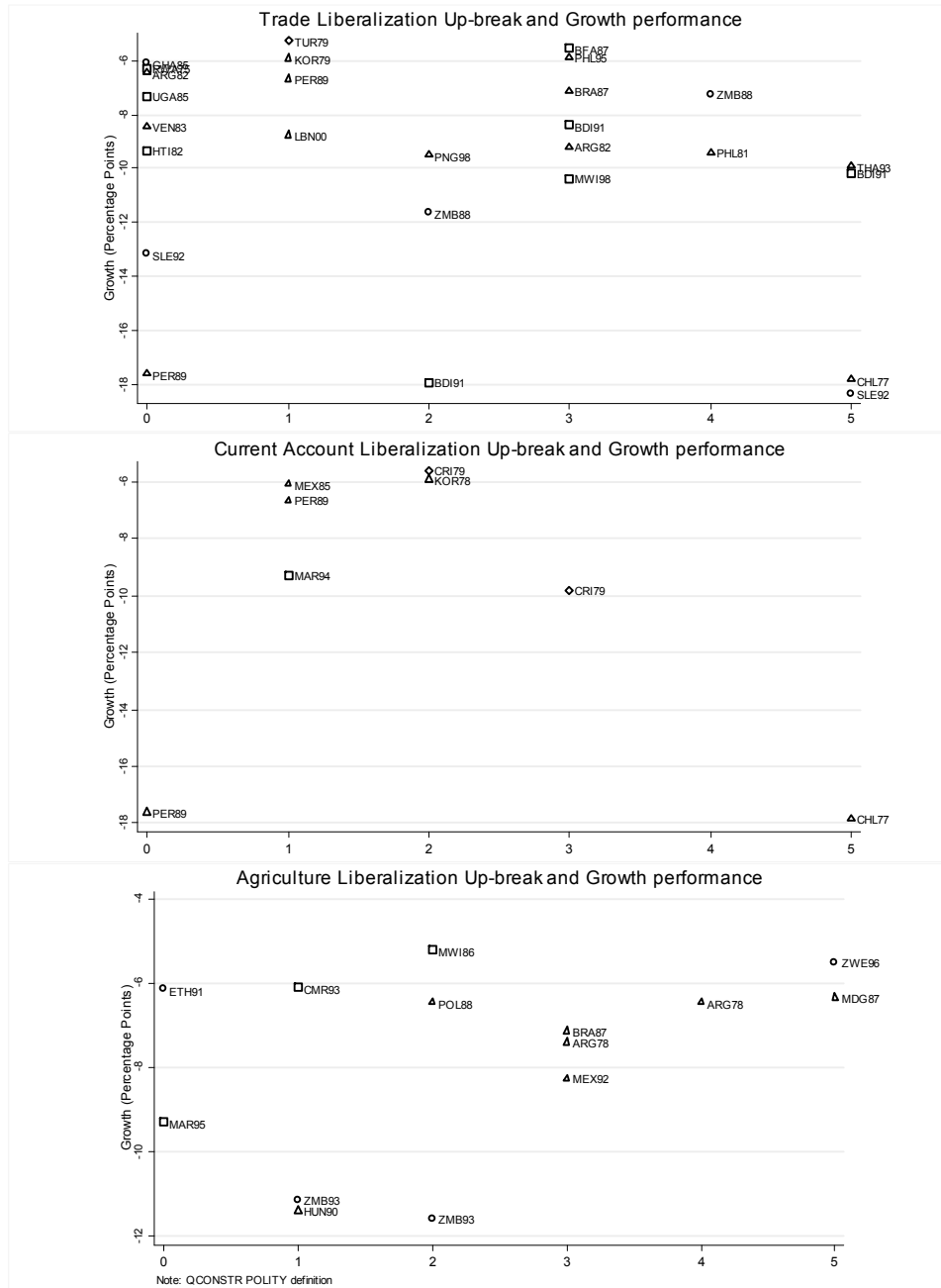
Figure 7. Reforms in the Financial Sector and Growth Performance



Source: Authors estimates based on Penn World Tables, version 6.2.

Notes: The figures plot the average per capita GDP growth (in blue) and the average reform index (in black) during a five year period before and after the year of an up-break in reform (zero on the horizontal axis).

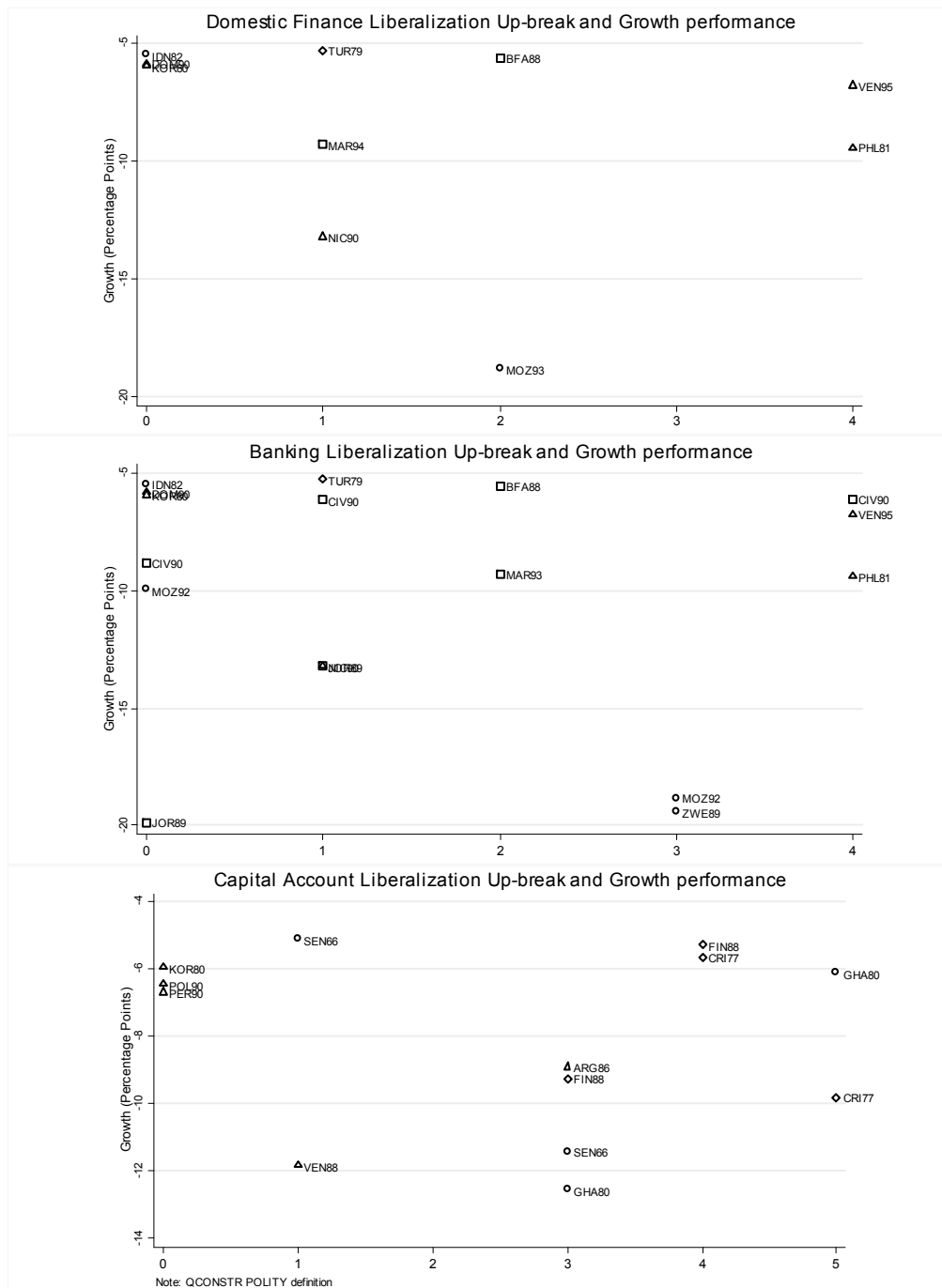
Figure 8. Liberalization Failures in the Real Sector



Source: Authors estimates based on Penn World Tables, version 6.2 and Acemoglu et al. (2008).

Notes: The figures plot negative growth experiences (worse than -5 percent) from failed real reforms. For example in the top panel on Trade Liberalization, ZIM88 indicates that 2 years after Zimbabwe’s major reform to reduce tariffs in 1988, there was a major growth downturn (annual per capita GDP declined by around 12 percent). The symbol next to the country name denotes the level of institutional quality by using the Polity IV index as follows: diamond (fourth quartile – highest institutional quality); triangle (third quartile); circle (second quartile); square (first quartile – lowest institutional quality).

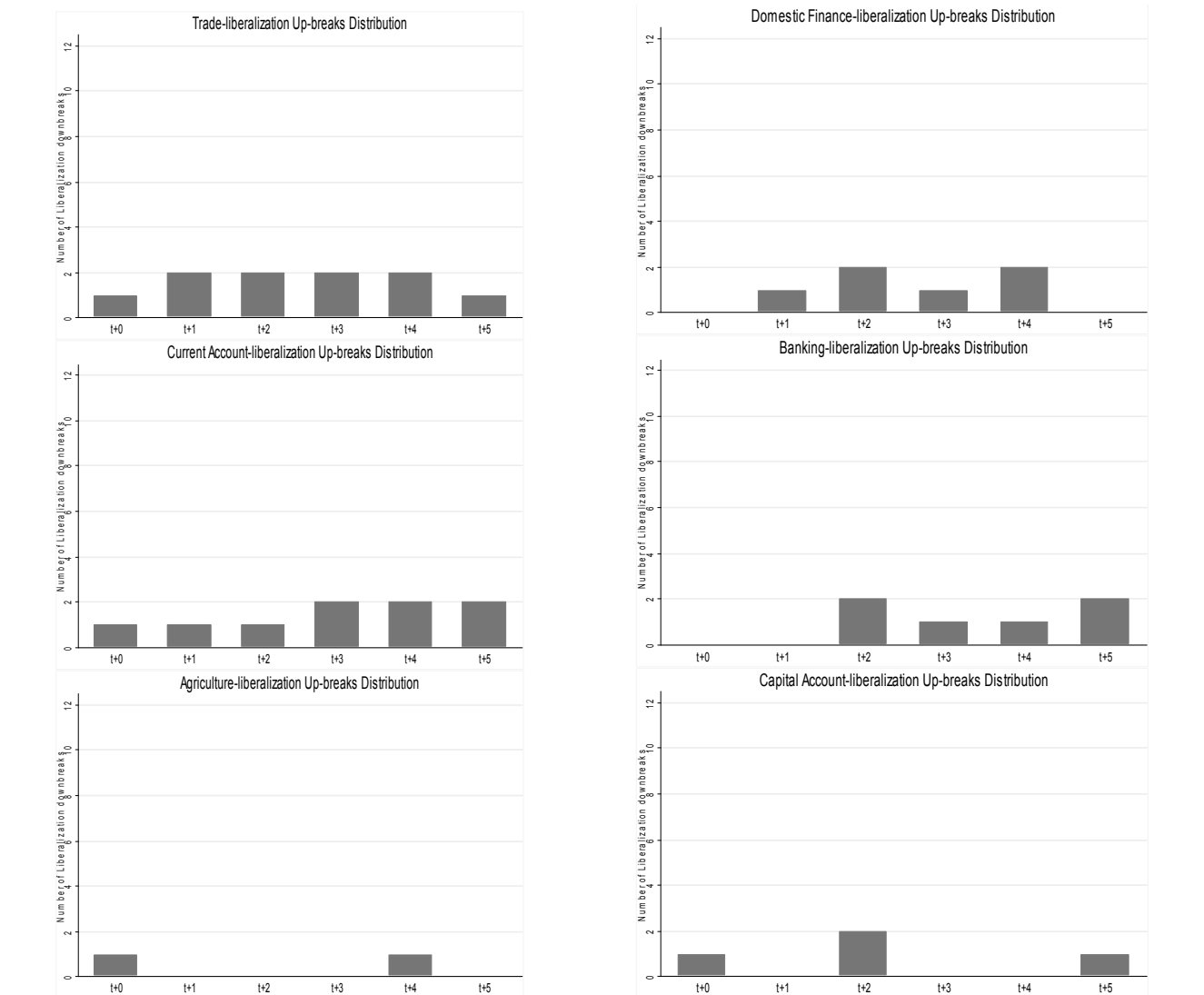
Figure 9. Liberalization Failures in the Financial Sector



Source: Authors estimates based on Penn World Tables, version 6.2 and Acemoglu et al. (2008).

Notes: The figures plot negative growth experiences (worse than -5 percent) from failed financial reforms. For example in the top panel on Domestic Finance Liberalization, MOZ93 indicates that 3 years after Mozambique's major reform to liberalize banking in 1993, and securities markets sectors there was a major growth downturn (annual per capita GDP declined by 20 percent). The symbol next to the country name denotes the level of institutional quality using Polity IV index as follows: diamond (fourth quartile – highest institutional quality); triangle (third quartile); circle (second quartile); square (first quartile – lowest institutional quality).

Figure 10: Crises and Reform Upticks



Source: Authors estimates based on Penn World Tables, version 6.2.

Notes: The figure plots real and financial reform upticks following economic crises defined as growth down breaks (severe and sustained growth decelerations).

Table 1. Baseline growth regressions

Dependent variable: lnGDP (t)- lnGDP (t-1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<u>Real sector's reforms</u>										
Trade (t-1)	0.019*									
	(0.010)									
Current Account (t-1)		0.033***								
		(0.008)								
Agriculture (t-1)			0.018**							
			(0.008)							
Network (t-1)				0.004						
				(0.009)						
<u>Financial sector's reforms</u>										
Domestic Finance (t-1)					0.064***					
					(0.014)					
Banking (t-1)						0.050***				
						(0.012)				
Securities (t-1)							0.037***			
							(0.008)			
Capital (t-1)								0.021**		
								(0.009)		
Capital (resident) (t-1)									0.015**	
									(0.007)	
Capital (non-resident) (t-1)										0.016*
										(0.008)
lnGDP (t-1)	-0.048***	-0.051***	-0.036***	-0.045***	-0.042***	-0.041***	-0.047***	-0.051***	-0.049***	-0.051***
	(0.007)	(0.009)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)
Observations	3,418	3,530	3,390	3,796	2,653	2,653	2,653	3,530	3,556	3,530
R-squared	0.194	0.141	0.169	0.148	0.199	0.194	0.196	0.139	0.137	0.138

Sources: Penn World Tables version 6.2 and IMF staff estimates.

Notes: Robust standard errors clustered at country level in parentheses. All specifications are estimated by OLS and include country and year fixed effects. Annual data over 1973-2006. GDP in real terms and PPP adjusted. ***, **, * denote statistical significance at 1, 5 and 10 percent, respectively.

Table 2. Reforms and growth by quartile of distance to the technological frontier

	(1) Trade	(2) Current Account	(3) Agriculture	(4) Network	(5) Domestic Finance	(6) Banking	(7) Securities	(8) Capital	(9) Capital (resident)	(10) Capital (non- resident)
1 st quartile	0.041 (0.025)	0.028 (0.022)	0.010 (0.016)	0.025 (0.022)	0.026 (0.044)	0.017 (0.040)	0.030 (0.024)	0.006 (0.019)	0.016 (0.016)	-0.008 (0.019)
2 nd quartile	0.027 (0.023)	0.054*** (0.016)	0.041** (0.018)	0.006 (0.026)	0.109*** (0.030)	0.083*** (0.026)	0.075*** (0.020)	0.038*** (0.013)	0.022* (0.012)	0.030** (0.012)
3 rd quartile	-0.005 (0.016)	-0.003 (0.014)	0.007 (0.013)	0.008 (0.022)	0.114*** (0.031)	0.101*** (0.027)	0.030 (0.020)	-0.004 (0.015)	0.002 (0.010)	-0.009 (0.016)
4 th quartile	0.024 (0.016)	0.037** (0.014)	0.000 (0.014)	0.003 (0.014)	0.004 (0.012)	-0.005 (0.010)	0.019** (0.007)	0.032 (0.019)	0.024 (0.017)	0.028* (0.015)
Test eq. coeff. (<i>p-value</i>)	0.3609	0.0537	0.3444	0.8620	0.0004	0.0003	0.0845	0.1660	0.5131	0.1185

Sources: Penn World Tables version 6.2 and IMF staff estimates.

Notes: Coefficients and robust standard errors clustered at country level (in parentheses) are obtained - for each quartile - by OLS estimates of an equation in which each country's growth rate of per capita gdp at time t is regressed on 1 year lag of each indicator of reforms per time and on 1 year lag of the ratio of each country's per capita gdp to that of the US. All specifications include country and year fixed effects. The *p-value* of the test of equality of the coefficient estimates across quartiles is reported in the bottom row of the table. Annual data over 1973-2006. GDP in real terms and PPP adjusted. ***, **, * denote statistical significance at 1, 5 and 10 percent, respectively.

Table 3. Reforms and growth by quartile of constraints on the executive power

	(1) Trade	(2) Current Account	(3) Agriculture	(4) Network	(5) Domestic Finance	(6) Banking	(7) Securities	(8) Capital	(9) Capital (resident)	(10) Capital (non- resident)
1 st quartile	0.051* (0.029)	0.085** (0.034)	0.010 (0.028)	-0.026 (0.047)	0.125 (0.091)	0.090 (0.070)	0.055 (0.051)	0.041 (0.027)	0.024 (0.025)	0.036 (0.026)
2 nd quartile	0.011 (0.021)	0.024 (0.023)	0.024 (0.019)	-0.041 (0.027)	0.096*** (0.031)	0.075** (0.027)	0.041* (0.023)	-0.010 (0.018)	-0.002 (0.013)	-0.015 (0.019)
3 rd quartile	0.022 (0.019)	0.019* (0.011)	0.020 (0.012)	0.033* (0.017)	0.080*** (0.024)	0.066*** (0.023)	0.031** (0.012)	0.020 (0.012)	0.016 (0.010)	0.015 (0.011)
4 th quartile	0.001 (0.010)	0.020 (0.013)	0.021 (0.015)	-0.002 (0.014)	0.023 (0.017)	0.009 (0.013)	0.031*** (0.010)	0.017 (0.017)	0.009 (0.014)	0.018 (0.013)
Test eq. coeff. (<i>p-value</i>)	0.3507	0.2966	0.9808	0.0934	0.0704	0.0434	0.9358	0.3801	0.6675	0.3652

Sources: Penn World Tables version 6.2 and IMF staff estimates.

Notes: Coefficients and robust standard errors clustered at country level (in parentheses) are obtained - for each quartile - by OLS estimates of an equation in which each country's growth rate of per capita gdp at time t is regressed on 1 year lag of each indicator of reforms per time and on 1 year lag of the log of per capita gdp. All specifications include country and year fixed effects. The *p-value* of the test of equality of the coefficient estimates across quartiles is reported in the bottom row of the table. Annual data over 1973-2006. GDP in real terms and PPP adjusted. ***, **, * denote statistical significance at 1, 5 and 10 percent, respectively.

Table 4. Reforms and growth by quartile of average protection against risk of expropriation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Trade	Current Account	Agriculture	Network	Domestic Finance	Banking	Securities	Capital	Capital (resident)	Capital (non-resident)
1 st quartile	0.038 (0.025)	0.041 (0.026)	0.011 (0.013)	0.035 (0.023)	-0.021 (0.043)	-0.025 (0.038)	0.019 (0.027)	0.038* (0.019)	0.025 (0.017)	0.034* (0.019)
2 nd quartile	0.019 (0.019)	0.024 (0.020)	0.014 (0.011)	-0.003 (0.027)	0.046 (0.031)	0.041 (0.031)	0.010 (0.017)	-0.026 (0.016)	-0.013 (0.012)	-0.024 (0.018)
3 rd quartile	-0.002 (0.012)	0.030** (0.014)	-0.010 (0.009)	0.017 (0.020)	0.069*** (0.019)	0.052*** (0.015)	0.036*** (0.011)	0.039** (0.016)	0.025** (0.011)	0.025 (0.017)
4 th quartile	0.047** (0.020)	0.025** (0.010)	0.004 (0.012)	0.001 (0.010)	0.021 (0.016)	0.011 (0.014)	0.022* (0.013)	0.022* (0.012)	0.018* (0.010)	0.015 (0.013)
Test eq. coeff. (<i>p-value</i>)	0.1400	0.9420	0.2913	0.5037	0.1151	0.1072	0.5913	0.0148	0.0920	0.0933

Sources: Penn World Tables version 6.2, IMF staff estimates, and Acemoglu, Johnson and Robinson (2001).

Notes: Coefficients and robust standard errors clustered at country level (in parentheses) are obtained - for each quartile - by OLS estimates of an equation in which each country's growth rate of per capita gdp at time t is regressed on 1 year lag of each indicator of reforms per time and on 1 year lag of the log of per capita gdp. All specifications include country and year fixed effects. The *p-value* of the test of equality of the coefficient estimates across quartiles is reported in the bottom row of the table. Annual data over 1973-2006. GDP in real terms and PPP adjusted. ***, **, * denote statistical significance at 1, 5 and 10 percent, respectively.

Table 5. Reforms and growth. Arellano-Bond GMM estimator

Dependent variable: lnGDP (t)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<u>Real sector's reforms</u>										
Trade (t-1)	0.031 (0.020)									
Current Account (t-1)		0.054** (0.023)								
Agriculture (t-1)			0.055** (0.022)							
Network (t-1)				0.001 (0.029)						
<u>Financial sector's reforms</u>										
Domestic Finance (t-1)					0.116*** (0.025)					
Banking (t-1)						0.095*** (0.022)				
Securities (t-1)							0.070*** (0.016)			
Capital (t-1)								0.037 (0.025)		
Capital (resident) (t-1)									0.034* (0.019)	
Capital (non-resident) (t-1)										0.024 (0.023)
lnGDP (t-1)	0.913*** (0.021)	0.880*** (0.023)	0.941*** (0.020)	0.901*** (0.022)	0.954*** (0.018)	0.954*** (0.018)	0.935*** (0.019)	0.878*** (0.023)	0.884*** (0.024)	0.879*** (0.023)
Test 2 nd order serial correlation (<i>p.value</i>)	0.180	0.205	0.438	0.186	0.796	0.816	0.752	0.216	0.210	0.210
Sargan Test	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	3264	3411	3267	3665	2562	2562	2562	3411	3436	3411

Sources: Penn World Tables version 6.2, and IMF staff estimates.

Notes: Robust standard errors in parentheses. All specifications are estimated by GMM – Arellano Bond and include year fixed effects. Two and more year lags of the log of per capita gdp are used as instruments. Annual data over 1973-2006. GDP in real terms and PPP adjusted. ***, **, * denote statistical significance at 1, 5 and 10 percent, respectively.

Table 6. Baseline growth regressions with controls

Dependent variable: lnGDP (t)- lnGDP (t-1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Real sector's reforms										
Trade (t-1)	0.021*									
	(0.013)									
Current Account (t-1)		0.034***								
		(0.009)								
Agriculture (t-1)			0.024***							
			(0.009)							
Network (t-1)				-0.009						
				(0.012)						
Financial sector's reforms										
Domestic Finance (t-1)					0.060***					
					(0.015)					
Banking (t-1)						0.046***				
						(0.014)				
Securities (t-1)							0.035***			
							(0.009)			
Capital (t-1)								0.022**		
								(0.010)		
Capital (resident) (t-1)									0.017**	
									(0.007)	
Capital (non-resident) (t-1)										0.016
										(0.011)
lnGDP (t-1)	-0.057***	-0.053***	-0.048***	-0.058***	-0.060***	-0.059***	-0.067***	-0.054***	-0.053***	-0.053***
	(0.011)	(0.013)	(0.014)	(0.016)	(0.012)	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)
Democracy (t-1)	-0.000	-0.001	-0.001	-0.001	-0.000	-0.000	-0.000	-0.001	-0.000	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)
Terms of trade (t-1)	0.000	-0.000	-0.000	-0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tertiary enroll (t-1)	0.033*	0.025	0.041*	0.034	0.026	0.027	0.028	0.017	0.022	0.018
	(0.017)	(0.019)	(0.023)	(0.023)	(0.018)	(0.018)	(0.019)	(0.020)	(0.020)	(0.020)
Observations	2,460	2,580	2,402	2,584	2,114	2,114	2,114	2,580	2,583	2,580
R-squared	0.180	0.164	0.189	0.172	0.184	0.180	0.183	0.161	0.159	0.160

Sources: Penn World Tables version 6.2, IMF staff estimates, International Financial Statistics, Polity IV, and World Development Indicators.

Notes: Robust standard errors clustered at country level in parentheses. All specifications are estimated by OLS and include country and year fixed effects. Annual data over 1973-2006. GDP in real terms and PPP adjusted. ***, **, * denote statistical significance at 1, 5 and 10 percent, respectively.

Table 7. Reforms and growth, 1973-1989

Dependent variable: lnGDP (t)- lnGDP (t-1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<u>Real sector's reforms</u>										
Trade (t-1)	0.022** (0.010)									
Current Account (t-1)		0.051*** (0.014)								
Agriculture (t-1)			0.002 (0.012)							
Network (t-1)				0.102*** (0.014)						
<u>Financial sector's reforms</u>										
Domestic Finance (t-1)					0.053** (0.021)					
Banking (t-1)						0.043** (0.020)				
Securities (t-1)							0.032*** (0.011)			
Capital (t-1)								0.054*** (0.017)		
Capital (resident) (t-1)									0.038*** (0.013)	
Capital (non-resident) (t-1)										0.037** (0.014)
lnGDP (t-1)	-0.077*** (0.018)	-0.087*** (0.019)	-0.067*** (0.016)	-0.071*** (0.013)	-0.075*** (0.018)	-0.074*** (0.018)	-0.074*** (0.020)	-0.089*** (0.019)	-0.087*** (0.019)	-0.087*** (0.019)
Observations	1,313	1,599	1,452	1,695	1,160	1,160	1,160	1,599	1,599	1,599
R-squared	0.240	0.200	0.172	0.181	0.237	0.235	0.235	0.200	0.199	0.198

Sources: Penn World Tables version 6.2 and IMF staff estimates.

Notes: Robust standard errors clustered at country level in parentheses. All specifications are estimated by OLS and include country and year fixed effects. Annual data over 1973-1989. GDP in real terms and PPP adjusted. ***, **, * denote statistical significance at 1, 5 and 10 percent, respectively.

Table 8. Reforms and growth, 1990-2006

Dependent variable: lnGDP (t)- lnGDP (t-1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<u>Real sector's reforms</u>										
Trade (t-1)	0.018 (0.020)									
Current Account (t-1)		0.039** (0.017)								
Agriculture (t-1)			0.047** (0.019)							
Network (t-1)				0.000 (0.014)						
<u>Financial sector's reforms</u>										
Domestic Finance (t-1)					0.124*** (0.026)					
Banking (t-1)						0.097*** (0.024)				
Securities (t-1)							0.063*** (0.012)			
Capital (t-1)								0.017 (0.014)		
Capital (resident) (t-1)									0.018 (0.011)	
Capital (non-resident) (t-1)										0.002 (0.014)
lnGDP (t-1)	-0.124*** (0.019)	-0.188*** (0.041)	-0.118*** (0.020)	-0.129*** (0.020)	-0.116*** (0.024)	-0.113*** (0.024)	-0.120*** (0.023)	-0.186*** (0.041)	-0.178*** (0.041)	-0.186*** (0.041)
Observations	2,105	1,931	1,938	2,101	1,493	1,493	1,493	1,931	1,957	1,931
R-squared	0.248	0.222	0.272	0.223	0.263	0.252	0.252	0.219	0.214	0.218

Sources: Penn World Tables version 6.2 and IMF staff estimates.

Notes: Robust standard errors clustered at country level in parentheses. All specifications are estimated by OLS and include country and year fixed effects. Annual data over 1990-2006. GDP in real terms and PPP adjusted. ***, **, * denote statistical significance at 1, 5 and 10 percent, respectively.

Table 9. Reforms and growth, advanced economies

Dependent variable: lnGDP (t)- lnGDP (t-1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<u>Real sector's reforms</u>										
Trade (t-1)	0.016 (0.015)									
Current Account (t-1)		0.025** (0.011)								
Agriculture (t-1)			0.033 (0.024)							
Network (t-1)				0.002 (0.006)						
<u>Financial sector's reforms</u>										
Domestic Finance (t-1)					0.020 (0.018)					
Banking (t-1)						0.010 (0.013)				
Securities (t-1)							0.023* (0.012)			
Capital (t-1)								0.017 (0.011)		
Capital (resident) (t-1)									0.011 (0.010)	
Capital (non-resident) (t-1)										0.016 (0.011)
lnGDP (t-1)	-0.045*** (0.011)	-0.052*** (0.017)	-0.023*** (0.007)	-0.035*** (0.008)	-0.036*** (0.008)	-0.036*** (0.009)	-0.036*** (0.008)	-0.053*** (0.017)	-0.053*** (0.017)	-0.054*** (0.017)
Observations	983	966	745	898	886	886	886	966	966	966
R-squared	0.326	0.333	0.402	0.358	0.351	0.348	0.362	0.329	0.328	0.329

Sources: Penn World Tables version 6.2, IMF staff estimates, and IMF-World Economic Outlook Database.

Notes: Robust standard errors clustered at country level in parentheses. All specifications are estimated by OLS and include country and year fixed effects. Annual data over 1973-2006. GDP in real terms and PPP adjusted. ***, **, * denote statistical significance at 1, 5 and 10 percent, respectively.

Table 10. Reforms and growth, emerging and developing economies

Dependent variable: lnGDP (t)- lnGDP (t-1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<u>Real sector's reforms</u>										
Trade (t-1)	0.021*									
	(0.012)									
Current Account (t-1)		0.031***								
		(0.010)								
Agriculture (t-1)			0.015*							
			(0.009)							
Network (t-1)				0.010						
				(0.013)						
<u>Financial sector's reforms</u>										
Domestic Finance (t-1)					0.075***					
					(0.020)					
Banking (t-1)						0.058***				
						(0.018)				
Securities (t-1)							0.040***			
							(0.011)			
Capital (t-1)								0.016		
								(0.010)		
Capital (resident) (t-1)									0.012	
									(0.008)	
Capital (non-resident) (t-1)										0.010
										(0.009)
lnGDP (t-1)	-0.053***	-0.055***	-0.040***	-0.048***	-0.048***	-0.047***	-0.056***	-0.054***	-0.052***	-0.054***
	(0.009)	(0.013)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)	(0.012)	(0.012)	(0.012)
Observations	2,432	2,564	2,645	2,898	1,767	1,767	1,767	2,564	2,590	2,564
R-squared	0.190	0.135	0.163	0.143	0.193	0.189	0.188	0.132	0.131	0.132

Sources: Penn World Tables version 6.2, IMF staff estimates, and IMF-World Economic Outlook Database.

Notes: Robust standard errors clustered at country level in parentheses. All specifications are estimated by OLS and include country and year fixed effects. Annual data over 1973-2006. GDP in real terms and PPP adjusted. ***, **, * denote statistical significance at 1, 5 and 10 percent, respectively.

Table 11. Reforms and growth, three year interval data

Dependent variable: lnGDP (t)- lnGDP (t-3)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<u>Real sector's reforms</u>										
Trade (t-3)	0.063** (0.032)									
Current Account (t-3)		0.090*** (0.027)								
Agriculture (t-3)			0.020 (0.022)							
Network (t-3)				0.007 (0.024)						
<u>Financial sector's reforms</u>										
Domestic Finance (t-3)					0.108*** (0.038)					
Banking (t-3)						0.081** (0.034)				
Securities (t-3)							0.070*** (0.021)			
Capital (t-3)								0.056** (0.026)		
Capital (resident) (t-3)									0.040* (0.022)	
Capital (non-resident) (t-3)										0.041* (0.024)
lnGDP (t-3)	-0.160*** (0.023)	-0.173*** (0.031)	-0.129*** (0.025)	-0.145*** (0.025)	-0.131*** (0.022)	-0.130*** (0.022)	-0.139*** (0.022)	-0.172*** (0.030)	-0.169*** (0.030)	-0.172*** (0.030)
Observations	1,110	1,166	1,119	1,259	878	878	878	1,166	1,174	1,166
R-squared	0.416	0.307	0.333	0.316	0.399	0.395	0.400	0.301	0.299	0.300

Sources: Penn World Tables version 6.2 and IMF staff estimates.

Notes: Robust standard errors clustered at country level in parentheses. All specifications are estimated by OLS and include country and year fixed effects. Three year interval data over 1973-2006. GDP in real terms and PPP adjusted. ***, **, * denote statistical significance at 1, 5 and 10 percent, respectively.

Table 12. Growth regressions, all indices of reforms

Dependent variable: lnGDP (t)- lnGDP (t-1)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Real sector's reforms								
Trade (t-1)	0.012 (0.011)	0.011 (0.011)	0.012 (0.011)	0.010 (0.011)				
Current Account (t-1)					0.017 (0.015)	0.017 (0.015)	0.016 (0.015)	0.017 (0.015)
Agriculture (t-1)	0.018* (0.010)	0.018* (0.010)	0.018* (0.010)	0.018* (0.010)	0.022** (0.010)	0.021** (0.010)	0.021** (0.010)	0.021** (0.010)
Network (t-1)	-0.002 (0.010)	-0.002 (0.009)	-0.003 (0.010)	-0.002 (0.010)	-0.005 (0.011)	-0.005 (0.011)	-0.006 (0.011)	-0.005 (0.011)
Financial sector's reforms								
Domestic Finance (t-1)	0.037*** (0.014)		0.037*** (0.014)		0.049*** (0.015)		0.049*** (0.016)	
Banking (t-1)		0.015 (0.013)		0.015 (0.013)		0.026* (0.014)		0.026* (0.015)
Securities (t-1)		0.029*** (0.009)		0.029*** (0.009)		0.029*** (0.009)		0.030*** (0.009)
Capital (t-1)	0.002 (0.010)	0.000 (0.010)			-0.012 (0.013)	-0.014 (0.014)		
Capital (resident) (t-1)			0.007 (0.008)	0.006 (0.008)			-0.002 (0.011)	-0.002 (0.011)
Capital (non-resident) (t-1)			-0.006 (0.010)	-0.008 (0.010)			-0.011 (0.011)	-0.012 (0.011)
lnGDP (t-1)	-0.036*** (0.007)	-0.039*** (0.008)	-0.037*** (0.007)	-0.040*** (0.008)	-0.039*** (0.008)	-0.042*** (0.008)	-0.039*** (0.008)	-0.043*** (0.008)
Observations	2,137	2,137	2,137	2,137	2,235	2,235	2,235	2,235
R-squared	0.222	0.227	0.223	0.228	0.212	0.216	0.212	0.216

Sources: Penn World Tables version 6.2 and IMF staff estimates.

Notes: Robust standard errors clustered at country level in parentheses. All specifications are estimated by OLS and include country and year fixed effects. Annual data over 1973-2006. GDP in real terms and PPP adjusted. ***, **, * denote statistical significance at 1, 5 and 10 percent, respectively.

Appendix 1. List of countries in the sample, by income group

Advanced Economies	Emerging and Developing Economies		
Australia	Albania	Guinea	Paraguay
Austria	Algeria	Guinea-Bissau	Peru
Belgium	Angola	Guyana	Philippines
Canada	Argentina	Haiti	Poland
Cyprus	Armenia	Honduras	Romania
Czech Republic	Azerbaijan	Hungary	Russia
Denmark	Bahamas	India	Rwanda
Estonia	Bahrain	Indonesia	Saudi Arabia
Finland	Bangladesh	Iran	Senegal
France	Barbados	Iraq	Serbia and Montenegro
Germany	Belarus	Jamaica	Sierra Leone
Greece	Belize	Jordan	Solomon Islands
Hong Kong	Benin	Kazakhstan	Somalia*
Iceland	Bhutan	Kenya	South Africa
Ireland	Bolivia	Kyrgyz Republic	Sri Lanka
Israel	Botswana	Lao	St Kitts and Nevis
Italy	Brazil	Latvia	St Lucia
Japan	Bulgaria	Lebanon	St Vincent Grenadines
Korea	Burkina Faso	Lesotho	Sudan
Luxembourg	Burundi	Liberia	Suriname
Malta	Cambodia	Libya	Swaziland
Netherlands	Cameroon	Lithuania	Syria
New Zealand	Cape Verde	Macedonia	Tajikistan
Norway	Central African Republic	Madagascar	Tanzania
Portugal	Chad	Malawi	Thailand
Singapore	Chile	Malaysia	Togo
Slovak Republic	China	Mali	Tonga
Slovenia	Colombia	Mauritania	Trinidad and Tobago
Spain	Congo	Mauritius	Tunisia
Sweden	Costa Rica	Mexico	Turkey
Switzerland	Cote D'Ivoire	Moldova	Turkmenistan
Taiwan	Croatia	Mongolia	Uganda
UK	Dominican Republic	Morocco	Ukraine
US	Ecuador	Mozambique	Uruguay
	Egypt	Myanmar	Uzbekistan
	El Salvador	Namibia	Venezuela
	Eritrea	Nepal	Vietnam
	Ethiopia	Nicaragua	Yemen
	Fiji	Niger	Zaire
	Gabon	Nigeria	Zambia
	Gambia	Oman	Zimbabwe
	Georgia	Pakistan	
	Ghana	Panama	
	Guatemala	Papa New Guinea	

Source: IMF – World Economic Outlook Database.

Notes: *Not included in the IMF's classification.

Appendix 2. Description of Reform Indices

Reform Indices	Description	Source	Coverage			
			Start Year	End Year	MIN# of Countries in any Year	MAX# of Countries in any Year
Real Indices						
Trade Openness						
Tariff Rates	Average tariff rates, with missing values extrapolated using implicit weighted tariff rates. Index normalized to be between zero and unity: zero means the tariff rates are 60 percent or higher, while unity means the tariff rates are zero.	Various sources, including IMF, World Bank, WTO, UN, and the academic literature (particularly Clemens and Williamson, 2004)	1960	2005	47	142
Current-Account Restrictions	An indicator of how compliant a government is with its obligations under the IMF's Article VIII to free from government restriction the proceeds from international trade in goods and services. The index represents the sum of two sub-components, dealing with restrictions on trade in visibles, as well as in invisibles (financial and other services). It distinguishes between restrictions on residents (receipts for exports) and on non-residents (payments for imports). Although the index measures restrictions on the proceeds from transactions, rather than on the underlying transactions, many countries in practice use restrictions on trade proceeds as a type of trade restriction. The index is scored between zero and 8 in half-integer units, with 8 indicating full compliance.	Quinn (1997), and Quinn and Toyoda (2007; forthcoming).	1960	2005	50	65
Product Markets						
Telecom and Electricity Industries	Simple average of the electricity and telecom markets sub-indices, which are constructed, in turn, from scores along three dimensions. For electricity, they capture: (i) the degree of unbundling of generation, transmission, and distribution; (ii) whether a regulator other than government has been established; and (iii) whether the wholesale market has been liberalized. For telecom, they capture: (i) the degree of competition in local services; (ii) whether a regulator other than government has been established; and (iii) the degree of liberalization of interconnection changes. Indices are coded with values ranging from zero (not liberalized) to two (completely liberalized).	Based on legislation and other official documents.	1960	2003	106	108

Appendix 2 (cont.) Description of Reform Indices

Reform Indices	Description	Source	Coverage			
			Start Year	End Year	MIN # of Countries in any Year	MAX # of Countries in any Year
Real Indices						
Agriculture	Given that developing countries constitute most of our sample, the degree of regulation in agriculture, which continues to account for a large part of many of these economies, is an essential aspect of product market competition. Index aims to capture intervention in the market for the main agricultural export commodity in each country. As data limitations preclude coding separate dimensions of intervention, the index provides a summary measure of intervention. Each country-year pair is assigned one of four degrees of intervention: (i) maximum (public monopoly or monopsony in production, transportation, or marketing); (ii) high (administered prices); (iii) moderate (public ownership in relevant producers, concession requirements); and (iv) no intervention.	Based on legislation and other official documents.	1960	2003	96	104
Financial Indices						
Capital Account Openness: Aggregate	Qualitative indicators of restrictions on financial credits and personal capital transactions of residents and financial credits to nonresidents, as well as the use of multiple exchange rates. Index coded from zero (fully repressed) to three (fully liberalized).	Abiad and others (2008), which follows the methodology in Abiad and Mody (2005). The original sources are mostly various IMF reports and working papers, but also central bank websites, etc.	1973	2005	72	91
Capital Account Openness: Residents (nonresidents) only	Measures the extent to which residents (nonresidents) are free from legal restrictions to move capital into and out of a country.	Resident/nonresident-specific indices are based on Quinn (1997), and Quinn and Toyoda (2007).				
Domestic Financial Liberalization	The index of domestic financial liberalization is an average of six sub-indices. Five of them relate to <i>banking</i> : (i) interest rate controls, such as floors or ceilings; (ii) credit controls, such as directed credit, and subsidized lending; (iii) competition restrictions, such as limits on branches and entry barriers in the banking sector, including licensing requirements or limits on foreign banks; (iv) the degree of state ownership; and (v) the quality of banking supervision and regulation, including power of independence of bank supervisors, adoption of a Basel I capital adequacy ratio, and framework for bank inspections. The sixth sub index refers to the regulation of <i>securities markets</i> , including policies to encourage the development of bond and equity markets, and to permit access of the domestic stock market to foreigners. The sub-indices are aggregated with equal weights. Each sub-index is coded from zero (fully repressed) to three (fully liberalized).					

Appendix 3. Down and Up Breaks in per capital GDP Growth

Down Breaks		Down Breaks		Up Breaks		Up Breaks	
country	year	country	year	country	year	country	year
Antigua Barb	1988	Liberia	1986	Antigua Barb	1978	Kuwait	1990
Austria	1973	Luxembourg	1991	Bangladesh	1995	Lao	1978
Barbados	1971	Madagascar	1971	Bolivia	1986	Liberia	1994
Belgium	1974	Malaysia	1972	Burkina Faso	1998	Luxembourg	1983
Belize	1980	Malaysia	1980	Cambodia	1987	Malaysia	1964
Bhutan	1987	Malaysia	1996	Cameroon	1978	Malaysia	1988
Bolivia	1977	Maldives	1990	Cameroon	1994	Mali	1969
Botswana	1989	Malta	1979	Chile	1983	Mauritius	1960
Brazil	1980	Mexico	1981	China	1977	Morocco	1960
Burundi	1992	Morocco	1968	Costa Rica	1991	Mozambique	1995
Cameroon	1986	Morocco	1982	Cuba	1980	Namibia	1998
Chile	1971	Nicaragua	1976	Cuba	1996	Nepal	1980
Comoros	1968	Niger	1981	Djibouti	1998	Nicaragua	1993
Comoros	1988	Nigeria	1960	Dominica	1980	Nigeria	1968
Congo	1982	Nigeria	1977	Ecuador	1971	Nigeria	1987
Costa Rica	1979	Pakistan	1970	Egypt	1975	Pakistan	1962
Cote D'Ivoire	1979	Pakistan	1988	Equat Guinea	1994	Pakistan	1978
Cuba	1988	Panama	1981	Ethiopia	1987	Paraguay	1973
Denmark	1969	Papua New G.	1978	Ghana	1965	Philippines	1998
Djibouti	1987	Paraguay	1981	Ghana	1981	Qatar	1996
Dominica	1988	Philippines	1981	Ghana	1997	Rwanda	1994
Ecuador	1979	Portugal	1973	Greece	1962	Samoa	1994
Egypt	1983	Romania	1979	Greece	1996	Sao Tome Pr	1987
El Salvador	1978	Rwanda	1986	Guatemala	1988	South Africa	1995
Equat Guinea	1977	Samoa	1978	Guinea	1994	St Lucia	1981
Ethiopia	1979	Samoa	1986	Haiti	1989	Suriname	1995
France	1973	Sao Tome Pr	1979	Haiti	1997	Syria	1990
Gabon	1976	Sierra Leone	1985	Hungary	1996	Taiwan	1962
Ghana	1973	South Africa	1983	India	1994	Tanzania	1996
Ghana	1989	Spain	1974	Indonesia	1968	Thailand	1987
Greece	1973	St Lucia	1989	Iran	1989	Togo	1987
Guatemala	1980	Swaziland	1979	Ireland	1993	Tonga	1979
Haiti	1980	Sweden	1970	Jamaica	1980	Trinidad Tob	1974
Hong Kong	1988	Switzerland	1973	Jordan	1975	Trinidad Tob	1990
Hungary	1979	Syria	1982	Korea	1962	Tunisia	1995
Hungary	1988	Syria	1998			Uganda	1988
Indonesia	1977	Taiwan	1996				
Iran	1976	Tanzania	1968				
Italy	1974	Thailand	1995				
Jamaica	1972	Togo	1969				
Japan	1973	Togo	1979				
Jordan	1967	Tonga	1987				
Jordan	1986	Trinidad Tob	1966				
Korea	1996	Trinidad Tob	1982				
		Tunisia	1972				
		Zimbabwe	1991				

Source: IMF – World Economic Outlook Database, and Berg et al. (2008)