BOOM AND BUST GROWTH: DO INSTITUTIONS MATTER?

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Abstract

An increasingly large literature on the empirics of growth has viewed economic growth as an 'episodic phenomena'. In this paper, we propose a new technique for measuring the total *magnitude* of a *growth episode:* the change in output per capita resulting from one structural break in the trend growth of output (acceleration or deceleration) to the next. Using this measure, we then reevaluate the relationship between growth and economic institutions within the growth episode framework, using separate measures of property rights institutions, contractual institutions and state capacity. Using cross-country data for 314 growth episodes for 125 countries, we show that higher institutional quality leads to a greater likelihood of successful growth episodes.

I. Introduction

The literature on growth empirics has taken very significant strides over the past two decades, moving from proximate determinants like investment and exports to deeper determinants like globalization, geography, human capital and finally, institutions. There has been significant debate over which of these deep determinants has the most robust impact on growth and there seems to be some consensus that "institutions rule". A number of studies (Hall and Jones 1999, Acemoglu et al 2001, Rodrik et. al 2004) have shown that good institutions are the best way to achieve higher growth rates over long periods of time.

Unfortunately, this literature focuses solely on long term growth rates and its correlates,and ignores the fact that medium term growth rates are highly volatile in most countries - particularly developing ones (see Pritchett 2000, Rodrik 1999, 2003, Hausmann et al. 2006, Aizenman and Spiegel 2010). Thus, the long-run average growth rates for these countries usually hide distinct medium term episodes of successful growth and growth failures (Jones and Olken 2008). Clearly, analyzing the growth of a developing country as a single long term episode when in reality, it is the aggregation of these dissimilar medium term episodes, simply fails to utilize a lot of information from the diversity of these medium term episodes that is relevant for growth policy. Moreover, in order to maximize long term growth rates, policy makers in these countries need to understand how to emulate the successful medium term growth episodes and how to avoid the episodes of growth failures(Berg et. al. 2012). This realization has led to increased interest in medium term growth fluctuations and the evolution of the episode-based approach to analysing economic growth. In this paper, we adopt this approach to study the possible determinants of 'successful' episodes of economic growth.

The episode-based analysis used in this paper redefines the problem of growth by posing three related questions:

1. For any country, how do we identify distinct growth episodes?
2. Given that different episodes may have different counterfactuals (i.e., what the growth rate *would have been* if the episode had not taken place) and different durations (i.e.,

how long the episode lasts) how do we define a measure of success or failure (in terms of growth) that is comparable across episodes?

3. Having defined such a measure, what are the underlying factors that determine more successful episodes?

Much of the "growth episode" literature has focused on the first question – that is, the timing of the structural breaks in economic growth and the correlates of the onset of growth accelerations and decelerations (Rodrik 1999, Hausmann, Pritchett, and Rodrik 2005, Hausmann, Rodriguez, and Warner 2006, Arbache and Page 2007, Aizenmann and Spiegel 2010, Breuer and McDermott 2013). With regard to the second question, Pritchett et al. (2013) propose a method for measuring the episode magnitudes of growth accelerations and decelerations.In this paper, we focus on the third question, using the composite measure of the 'impact' of a growth episode proposed by Pritchett et. al (2013).

This paper adds to the literature on growth episodes in two important ways. Firstly, it undertakes a regression-based analysis of the deep determinants of more successful growth episodes. The only other contribution to this literature is Berg et. al. (2012),where the impact of an episode is measured only in terms of its 'duration'.In this paper, we examine the determinants of not only the duration of an episode but also its average growth rate as well as alternative counterfactual growth outcomes during the period.

The second contribution of this study is that it reevaluates the relationship between growth and economic institutions within the growth episode framework. We focus on economic institutions not only in terms of property rights and contractual institutions - as is standard in the literature (see Rodrik et. al 2004, Acemoglu and Johnson 2005) - but also include state capacity - the institutional capability of the state to carry out various policies that deliver benefits and services to households and firms - an aspect of institutional quality that may be equally critical to the growth process of developing economies (Besley and Persson 2011, Savoia and Sen 2014). There are, of course, large areas of overlap between all three of these institutional aspects. Nevertheless, there are important differences as well. As pointed out in Acemoglu and Johnson (2005), while contractual institutions like the legal framework mostly enhance horizontal relationships between private citizens, property rights institutions are about vertical relationships, protecting the citizen from the power of the predatory state. It is plausible to argue that state capacity is also a vertical relationship since it deals with the state's ability to work for the private citizen. However, it is a "facilitating" institution - an institution that mostly enhances private enterprise rather than provide protection from the state - and hence it is distinct from property rights institutions which are "enforcing" institutions. Thus, each of these institutions can play an important role in the growth process, and in this paper, we attempt to understand the nature of these roles.

Our results show that higher institutional quality enhances the probability of a successful growth episode rather than one of growth failure. They also indicate reverse feedback running from growth outcomes to institutional quality. Initial conditions like per capita income and human capital are also found to be significant for growth outcomes.

The literature that motivates this study is reviewed in the next section. Section three summarizes the findings from our earlier work that answers the first two questions posed earlier in this section. First, it discusses a mechanism for identifying growth episodes. Second, it describes theconcept of 'episode magnitude' that we have defined as a measure of the impact of a growth episode and have used extensively in this paper. Section four discusses data and empirical strategy. Section five presents the results. Section six concludes the paper.

II. Related Literature

There are two different strands of the empirical growth literature that are relevant for this paper. The first deals with medium term growth volatility, focusing mostly on attempts to identify growth episodes and partly on measures of the impact of an episode. This literature relates to the endogenous (left hand side) variable in our regression analysis. The second strand deals with the deep determinants of growth and this literature relates to the explanatory (right hand side) variables in our regressions.

The literature dealing with growth volatility focuses mainly on the first of the three question posed earlier, i.e., how to identify a growth episode. The seminal paper in this area was Pritchett (2000), which showed that a single average growth rate fitted over a long time period gives very poor statistical fits in a large number of countries, particularly developing nations. A set of recent studies have followed this idea and attempted to identify breaks in growth rates of GDP per capita for countries with comparable income data. Two distinct approaches have been developed by this literature. The first is a 'filter-based' approach that identifies growth breaks on the basis of subjectively defined rules.Using this approach, Hausmann et al. (2005) studies breaks that involve growth accelerations, Hausmann et al. (2006) studies growth collapses and Aizenman and Spiegel (2010) studies takeoffs - periods of sustained high growth following periods of stagnation. The second approach is based on statistical structural break teststhat uses estimation and testing procedures to identify growth breaks in terms of statistically significant changes in (average) growth rates. The studies that have adopted the 'statistical' approach have used the Bai-Perron (BP) methodology (Bai and Perron 1998) which locates and tests for multiple growth breaks within a time-series framework.

Both approaches, however, have been shown to suffer from serious shortcomings. In the first approach, the use of filters pre-determined by the researcher is ad hoc, and leads to a lack of consistency in the identification of breaks across papers that use the filter-based approach. On the other hand, a significant shortcoming with the statistical approach is that it is limited by the low power of the Bai-Perron test, which leads to the rejection of true breaks which are suggested by the behavior of the underlying GDP per capita series. Kar et. al. (2013b) suggest an alternative methodology that deals with both of these shortcomings. We will discuss this methodology in the next section.

The second of the three questions posed earlier, i.e., defining a measure that can compare between growth episodes has largely been ignored in the literature. This is mainly because most of the contributions have used a 'before-and-after-the-break' framework that did not necessitate any such measure. Berg et. al. (2012) is one of the few papers that attempts to deal with this issue by measuring the impact of an episode in terms of its 'duration'. However, this is only a partial answer to the problem as this does not account for two things namely, (i) the growth rate during the episode and (ii) a consideration of an appropriate counterfactual growth rate during the episode. Pritchet et. al. (2013) deals with all these issues and provides a measure of the impact of a growth episode that we call 'episode magnitude'. The next section gives a detailed discussion of this concept and we use alternative measures of this variable in our regression exercises in the empirical analysis.

The literature that deals with deep determinants of growth has evolved as a critique of the large number of proximate determinants (investment ratio, exports ratio, fiscal policy etc) that were found to be ‘causing’ growth in the earlier cross-country literature. Four competing alternatives have been proposed as deep determinants of long run growth. These are Geography, Globalization, Institutional Quality and Initial Human Capital Endowment of nations. Geography is animportant determinant of climate, endowment of natural resources, disease burden,transport costs, and cost of diffusion of knowledge and technology from developed nations. All of these factors have important effects on productivity and growth (Diamond 1997, Gallup, Sachs, and Mellinger 1998, Sachs 2001). It must be understood however that in an episode based approach to growth, geography has limited explanatory power as the geography of a particular nation does not change across its various growth episodes. Globalization is also argued to be an intrinsic factor underlying long term growth as it enables the transfer of capital as well as technology from developed to developing areas. Another important channel through which globalization helps developing countries is by providing an external market for its products. Important contribution to the globalization led growth literature include Frankel and Romer (1999) and Sachs and Warner (1995). The argument that institutions affect growth is an old one (North 1990). This is based on the premise that institutions, which are the rules of the game in a society, encourage desirable economic behavior. This would lead to increases in both accumulation and productivity and hence to higher long run growth. Hall and Jones (1999), Acemoglu et al (2001, 2002, 2004) and Rodrik et. al (2004) are important contributors to this literature. Glaeser et. al. (2004), on the other hand, has argued that it is the initial endowments of Human Capital lead to growth as well as better institutions.

An important limitation of the previous literature that has examined the institutional determinants of growth is that while there is a strong connection between *levels* of prosperity and *levels* of the quality of “institutions”, the connection between the initial level of the quality of institutions and subsequent growth or between *economic* growth and *changes* in institutions is often weak (Pritchett and Werker 2013). Thus, while the literature has succeededto a large extent to causally show the importance of institutional quality in determining long-run incomes, it remain an empirical question whether institutions are causally related to episodic growth, and whether institutions matter in determining successful growth episodes.

An emerging literature has also examined the determinants of the onsets of growth accelerations and decelerations. With respect to growth accelerations, Hausmann, Pritchett and Rodrik (2005) find that standard growth determinants such as major changes in economic policies, institutional arrangements, political circumstances or external conditions do a poor job of predicting the turning points. Pritchett (2000) suggests that slow moving determinants of growth such as improvements in the quality of institutions or time-constant factors such as geography (land-lockedness, distance from the equator), resource endowments (e.g. minerals), ethnic diversity, culture and colonial experience are less likely to explain the frequent shifts from one growth regime to another that we observe in many developing countries and the wide variations in within country economic growth. Jones and Olken (2008) show that growth accelerations are accompanied by increases in productivity and not investment, and with increases in trade, suggesting that reallocation of resources from less productive to more productive uses are an important part of growth accelerations. Growth declines, on the other hand, are associated with monetary instability and increases in inflation, along with higher frequency of military conflict, and trade does not play an important role in growth declines as it does in growth accelerations. Jones-Olken also find changes in institutions are not associated with either growth accelerations or declines, where institutional quality is measured by a lower level of corruption and the rule of law. Using a Markov switching model and calculating the transition probabilities of moving from one growth regime to another using historical GDP data, Jerzmanowski (2006) finds that better institutional quality improves the possibility that a country will remain in a growth acceleration episode and will be less likely to suffer a growth collapse.

However, none of these studies examine what determines the success (or lack of success) of a growth episode, *conditional* on the onset of a growth episode. For example, for two countries which have seen the initiation of a growth acceleration episode in a particular year, what determines which country will witness a higher magnitude of growth? For two countries which have witnessed a deceleration in growth in the same year, what determines which country is less likely to see a larger decline in incomes? Do institutions matter in being causal to successful growth episodes and reducing the likelihood of unsuccessful growth episodes, as they have been shown to matter in explaining long-run incomes? This paper attempts to address these questions.

III. Identifying Growth Episodes and Estimating Episode magnitudes

An episode-based analysis of growth is different from the Barro-type growth regressions or other standard regressions of long run growth in two different ways. The first difference is that in standard regressions, the period over which growth is measured is decided in an ad hoc manner (say a decade) while episode-based approaches have to precisely define how to identify the length of an episode. The second difference is that while average growth rates are a suitable measure of the impact of growth in the standard regressions, they are not so in episode-based approaches, as the duration of episodes (which vary widely) is as important as the growth rate in this approach. In this section, we describe previous work that suggests a procedure to identify growth episodes (Kar et. al. 2013b) and introduces the concept of 'episode-magnitude' that we have defined as a measure of the impact of a growth episode (Pritchett et. al. 2013). This measure combines in an intuitive way the impact of a change in the growth rate due to the episode, and the duration of the episode. Thus for example, an acceleration to a modest growth rate which is sustained over decades may have a larger episode-magnitude than a high but short-lived burst of growth.

Identifying Growth Episodes

Before we can estimate the episode-magnitude of a growth episode, we first need to identify episodes of growth accelerations and decelerations. To do this, we use a procedure for identifying structural breaks in economic growth that uses the Bai-Perron (BP, 1998) procedure of maximizing the F-statistic to identify *candidate* years for structural breaks in growth with thresholds on the magnitude of the shift to determine which are actual breaks (see Kar et al 2013). This procedure involves the best fit of the BP method to the data in the first stage, and the application of a filter to the breaks identified in the first stage in the second stage.[1] The magnitude filter was that the absolute value of the change in the growth rate after a BP potential break had to be (a) 2 percentage points if it was the first break, (b) 3 percentage points if the potential break was of the opposite sign of the previous break (an

[1] Our procedure avoids the weakness of the pure statistical approach to identifying breaks - that is, the BP methodology, which has low statistical power, leading to rejection of structural breaks even when they are 'true' breaks. Combining the BP test with a filter-based approach (where the filter is obtained from economic priors) provides an unified approach to identifying growth episodes (see Kar et al 2013 for an explanation of why the unified approach avoids the pitfalls of pure statistical and filter-based approaches).

acceleration that followed a deceleration had to have accelerated growth by more than 3 ppa to qualify as a break) and (c) 1 percentage point if the BP potential break was of the same sign as the previous break, so if BP identified an acceleration that directly followed an acceleration (or deceleration that followed a previous deceleration) the magnitude had to be larger than 1 ppa to qualify as a break. To estimate potential breaks, we assumed that a "growth regime" lasts a minimum of 8 years (as in Berg et al (2012)). The use of shorter periods (e.g. 3 or 5 years) risk conflation with "business cycle fluctuations" or truly "short run" shocks (e.g. droughts). Longer periods (e.g. 10 or 12 years) reduce the number of potential breaks.[2] Application of this procedure to the PWT7.1 data for 125 countries[3] for 1950-2010 identified 314 structural breaks in growth, with some countries having no breaks (e.g. USA, France, Australia) and others having four breaks (e.g. Argentina, Zambia). Appendix A in Kar et. al. (2013b) provides a list of all 314 breaks identified by country and year of break.

Estimating the Episode-Magnitude of Growth Accelerations and Decelerations

The calculation of episode-magnitudes for growth episodes is discussed in detail in Pritchett et. al. (2013). In this section we summarize this approach. We define the episode-magnitude as the magnitude of the gain (or loss) in per capita income by the end of the episode, as a result of the growth in the episode. Equivalently, it is the product of (i) the additional growth during the episode and (ii) the duration of the episode. The additional growth during the episode is the difference between the actual growth rate during the episode, and a predicted counter-factual growth rate of the economy, had it not transitioned to this particular episode.

How do we predict this counter-factual growth rate? One simple (although naive) prediction is that the growth rate would be what it was in the last episode (no change). This prediction however, ignores a very robust 'stylized fact' about medium term growth rates, i.e., the tendency of these growth rates to 'regress to the mean'. Like other volatile variables like

[2]The length of the output data series that is available in the Penn World Tables vary from country to country. This implies that we need to specify a maximum number of candidate breaks for each country depending on the length of the data series available. We postulate that a country with: i) Forty years of data (only since 1970), can have a maximum of two breaks; ii) More than forty years and up to fifty-five years (data since 1955), can have a maximum of three breaks; iii) More than fifty-five years (before 1955), can have a maximum of four breaks.

[3] From the PWT7.1 data we eliminated all countries that had very small populations (less than 700,000 in 1980) and those that did not have data since 1970 (which eliminated many former Soviet sphere countries and some oil countries like Kuwait and Saudi Arabia).

returns on financial investments, medium term growth rates have been shown to have very low persistence, and hence for example, high growth in the current period increases the possibility of lower growth in the future (Easterly et. al 1993, Pritchett and Summers 2014). In terms of growth episodes, this implies that a predicted counter-factual growth rate can do much better than a "no change" assumption, by adopting some version of regression to mean.

There is another important reason why regression to mean needs to be incorporated in a definition of episode-magnitudes. It should be noted that if there is a tendency of growth rates to regress to the mean, then it is a statistical phenomenon which is exhibited by many other variables. It is not causal in the sense that the reversal of growth rates in any episode for any particular country due to this tendency, is not attributable to changes in the determinants of growth during that episode. Since our interest in defining an episode-magnitude is to subsequently relate it to the underlying determinants of growth, our definition of this variable needs to remove the part that is due to this statistical phenomenon, leaving only that part of the variation in the growth outcome that can be explained by underlying factors. This implies that the measure of the success (or failure) of a growth episode has to be "over and above" its tendency to regress to the mean.

Based on these considerations, we propose three predicted “counter-factual” growth rates, i.e., (a) the growth rate in the previous episode reflecting the idea of "no regression to mean", (b) the world average growth rate during the episode reflecting the idea of "complete regression to mean" and (c) a predicted growth rate based on the idea of “partial regression to mean”. The “partial regression to mean” growth rate uses a regression for each country/episode to allow “predicted” growth to depend on a country’s initial GDP per capita, the episode period specific world average growth and a flexibly specified regression to the mean.

Suppose we have a structural break in growth in year t that ends a previous growth episode. Also suppose the growth in the previous episode was g_{before} that lasted for N_b years and the growth in the current episode is $g_{ep}$and this episode lasts N_{ep} years. We define the episode-magnitude of the current growth episode (where F denotes the episode) as the difference in logs between its actual GDP per capita (GDPPC) in year t+ N_{ep}, and its counter-factual level. If natural log of GDPPC is y then the equation is:

$$1)\ Episode\ Magnitude_F = y^{Actual}_{t+N_{ep}} - y^{Counter\ factual}_{t+N_{ep}}$$

By definition, the right hand side of equation 1 is nothing but the product of the actual growth rate during the episode (relative to the counterfactual) and the duration of the episode. This definition of episode-magnitude thus fulfils our criteria for a measure of the impact of a growth episode. Let us now formalize each of the three counter-factuals discussed above.

"No Regression to Mean": Counter-factual growth continues at pre-break levels. This assumes there is zero regression to the mean and the counter-factual for growth during the episode was the pre-break growth rate.[4] In this case the magnitude of the total gain/loss from the episode is:

$$2)\ Episode\ Magnitude^{No\ Change}_F = (\ g_{ep} - g_{before}) * N_{ep}$$

"Complete regression to mean": Counter-factual growth during the episode is world average (WA)growth during the episode. Complete regression to the mean assumes the growth rate during the episode would have been the world average growth during the same period.[5]

$$3)\ Episode\ Magnitude^{World\ Average}_F = (\ g_{ep} - g_{World\ Average_{t,t+N_{ep}}}) * N_{ep}$$

"Partial regression to mean": Counter-factual growth during the episode is predicted from past growth. This counter-factual growth is the prediction from a country/episode specific regression of growth for all countries j other than the country with the break on a constant plus initial GDP per capita plus previous growth. We use a spline to allow the coefficient on previous growth to be different whether the country's growth rate before the episode was higher or lower than the world average.

[4] The 'no change' growth rate is the coefficient from an OLS regression of ln(GDPPC) on a time trend over the pre-break period.

[5] The world average growth rate is the average of the growth rates of all countries minus the country in question for the period of the growth episode.

$$4)\ g_{ep}^{j} = \alpha^{ep} + \beta_{below}^{ep} * c^{j} * \left(g_{before}^{j} - g_{before}^{world\ average}\right) + \beta_{above}^{ep} * d^{j} * \left(g_{before}^{j} - g_{before}^{world\ average}\right) + \gamma * y_{t}^{j} + \varepsilon^{j}$$

This functional form for the counter-factual growth allows for four things: (1) the constant α^{ep} allows the world average growth rate to vary over time and be specific to the period of the episode to accommodate a global "business cycle"; (2) regression to the mean is period specific; (3) regression to the mean depends on previous growth (as recoveries from negative/slow growth make have different dynamics that the slowing of accelerations), with the persistence coefficients, β_{below}^{ep} and β_{above}^{ep} capturing regression to the mean, if previous growth was below and above the previous world average growth rate respectively (with $c^j = 1$ and $d^j = 1$ if the previous growth rate of the country in question was lower and higher than the previous world average growth rate respectively, 0 otherwise,); (4) growth to depend on the initial level of income, given by the coefficient γ (without conditioning variables this is *not* estimating "conditional convergence")[6]. The error term of the regression is given by ε^j.

The episode-magnitude of a growth episode, using the "Partial regression to mean" as the counter-factual growth rate, is given by:

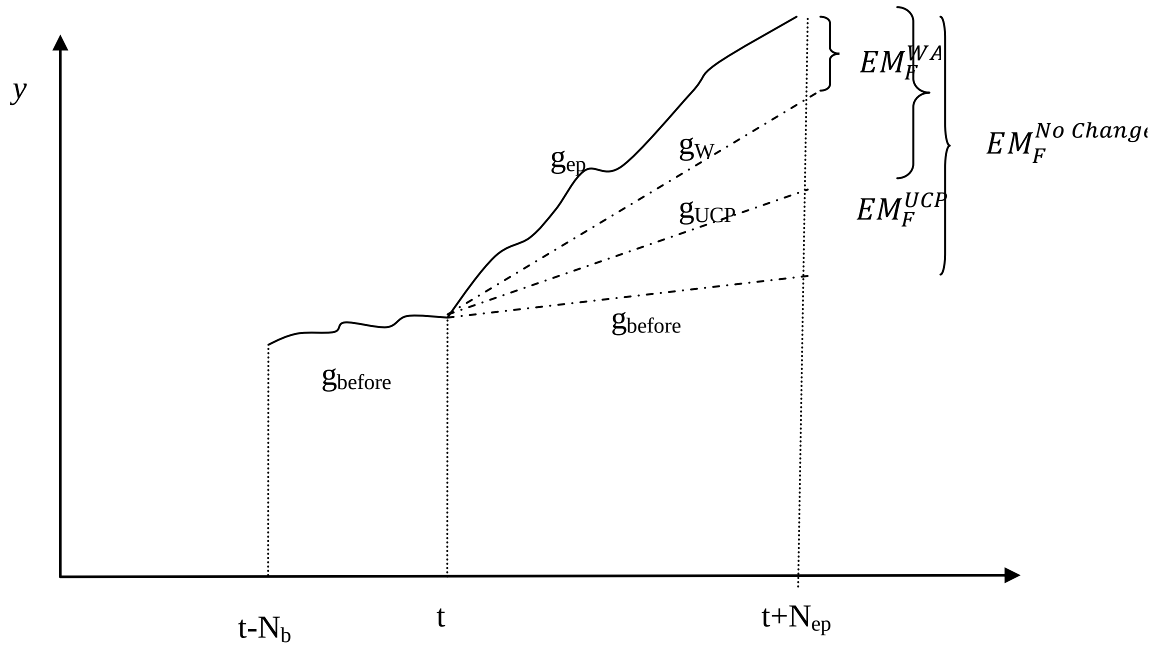
$$5)\ Episode\ Magnitude_{F}^{UCP} = \left(g_{ep} - g_{UCP}\right) * N_{ep}$$

Figure 1 illustrates the estimates of the episode magnitude for the three counter-factuals for the case of an acceleration from low growth to high growth. In this (hypothetical) case the "no regression to mean" counter-factual implies a very large magnitude, the "complete regression to mean" counter-factual a small magnitude (as the post-acceleration growth is not much higher than the world average). The "partial regression to mean" counter-factual will essentially be a regression determined weighted average of the two and hence will tend to be the two extremes. When using the "Complete regression to mean" or "Partial regression to

[6] For the period from the beginning of the data to the first growth break the UCP is just a regression of growth on the natural log level of initial output.

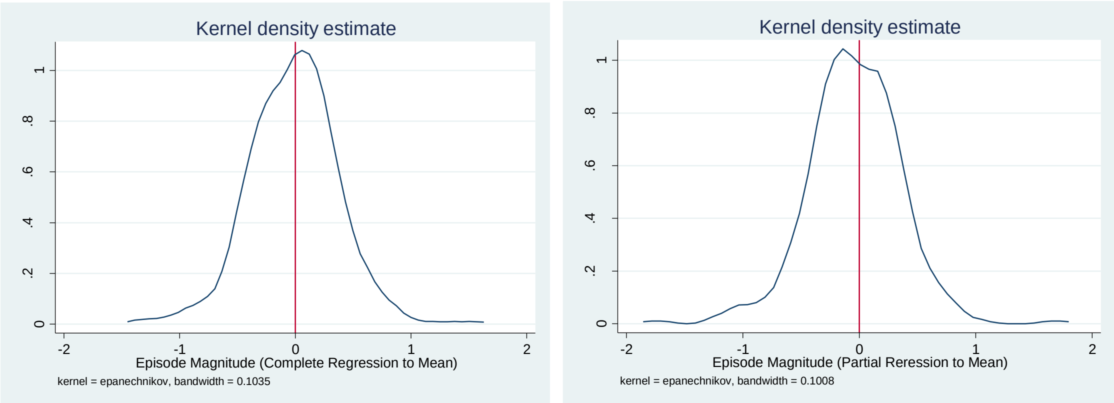
mean" counter-factual a growth acceleration could have a negative magnitude (or a growth deceleration a positive magnitude).

Figure 1: Episode Magnitude of a growth episode based on three counter-factuals



We have estimated the episode-magnitude for all 314 episodes based on the three counter-factual growth rates and these are reported in Pritchett et. al (2013) (Appendix 1). For our empirical exercises however, we will be using the two episode-magnitudes based on the idea of regression to mean. Figure 2 gives a kernel density estimate of these two measures, representing the underlying statistical distribution for these variables. The figure on the left hand side of the panel represents episode-magnitudes where the counter-factual is the world average growth rate (Complete Regression to Mean). The figure on the right hand side of the panel shows episode-magnitudes for which the predicted counter-factual reflects Partial Regression to Mean. The two figures are significantly similar to each other, having a central tendency that is close to zero, and most of the density symmetrically distributed between -1 and 1.

Figure 2: Distribution of Episode Magnitudes



Next, we look at the best and worst growth episodes according to these measures. The highest episode-magnitude (Complete Regression to Mean) is 1.53 for Taiwan during the period 1962 to 1993, which is due to an additional growth (i.e., actual minus world average) of 0.047 (i.e., 4.7%) and a duration of 32 years. In comparison, the Chinese growth episode between 1977 and 1990 has higher additional growth of 0.064 (i.e., 6.4%), but a lower episode-magnitude of 0.9, since its duration is less (19 years). The lowest episode-magnitude (Complete Regression to Mean) is -1.34 for Democratic Republic of Congo during the period 1989 to 1999, which is due to an additional growth of -0.122 (i.e., -12.2%) and a duration of 11 years. The second variable, i.e., episode-magnitude (Partial Regression to Mean) has the same Taiwanese episode as its best growth outcome, although the worst growth outcome in this case is an episode for Iran between 1976 and 1987, for which the episode-magnitude is -1.74, which is due to an additional growth of -0.146 (i.e., -14.6%) and a duration of 12 years.

IV. Data and Empirical Strategy

Data

The objective of this paper is to study the relationship between institutional quality and economic growth in a 'growth-episode' framework. To do this, we estimate and test the strength of the relationship between better institutions and more successful growth episodes.
In previous work (Kar et. al. 2013) we have identified and listed a total of 314 growth episodes based on125 countries covering a period from 1950 to 2010. In this study, we are constrained to use a smaller number of episodes for the regression exercises, since data for a

number of explanatory variables are available only for those episodes.In particular, data on the institutional measures are only available from 1984 onwards. In order to keep our sample size as large as possiblewe have also included those episodes for which we have at least some years of data. Sinceinstitutional variables are relatively stable over time, we have used the limited data to calculate the average value of the institutional variables for those episodes (in a subsequent section, we have tested for the robustness of the results by dropping these episodes that have partial data). Following this approach, the total number of episodes included in the regressions vary from 194 to 210.

As discussed earlier, average growth rates do not capture the duration of growth episodes, making them unsuitable as a measure of the success these episodes. Instead, we use the variable ‘episode magnitude’ as it captures both the growth rate (relative to counterfactuals) and the duration of the episode. We use the episode magnitude-world average (i.e., complete-regression-to-mean) as our endogenous variable of interest and use the episode magnitude-partial-regression-to-mean for robustness checks. The values of the two variables are taken from Pritchett et. al., 2013.

The data for all three measures of institutional quality, which is the explanatory variable of interest, is taken from the International Country Risk Guide database (ICRG 2013) which is published by the Political Risk Services Group. In particular, the ICRG variable ‘bureaucratic quality’ is used as a measure of state capacity, while ‘law & order’ is used as a measure of contractual institutions and ‘contract viability’ is a measure of property rights institutions. Bureaucratic quality is a good measure of state capacity as it reflects both the inherent merit of the bureaucracy as well as its independence from the political system. For contractual institutions, the literature on institutions and growth has used measures of the legal framework (see Acemoglu and Johnson, 2005).We adopt the same approach by using the ICRG variable law & order. The ICRG data on law & order measures the rule of law by the strength and impartiality of the judicial system while order is measured by the extent of popular observance of the law. Finally, we use contract viability as a measure of property rights as it is a combination of two variables, i.e., risk of repudiation of contracts and expropriation risk[7]. It may be noted that while the ICRG provides data for bureaucratic quality and law & order from 1984 onwards, data on contract viability is available only since

[7] See Hansson (2006)

2001. However, data on both repudiation of contract and expropriation risk is available for the earlier period and we have combined them using various weighing schemes in order to get alternative measures of contract viability for the whole period. Since all these alternative combinations give similar regression results, we choose to present the simplest one in this paper which gives equal weights to both the variables.

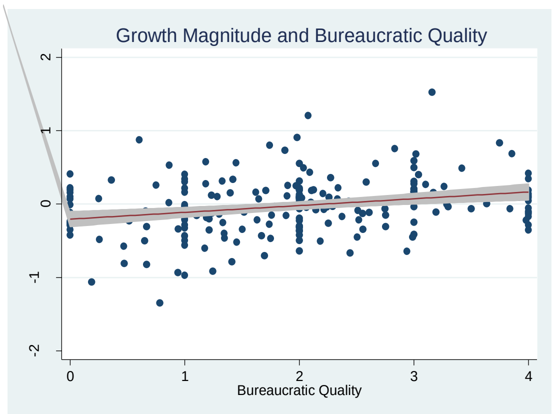
Table 1: Summary Statistics

Variable Name	Obs	Mean	Std. Dev.	Min	Max
Episode magnitude (World Average)	210	-0.026	0.390	-1.347	1.526
Episode magnitude (Partial-Regression-to- Mean)	210	-0.070	0.411	-1.755	1.699
Bureaucratic Quality	210	1.933	1.106	0	4
Law and Order	210	3.282	1.366	0.977	6
Contract Viability	209	6.708	1.952	1.538	10
(log) Initial Per Capita Income	198	8.149	1.246	5.116	10.515
Globalization(Trade Ratio)	198	69.262	48.001	3.821	373.179
Initial Human Capital	198	4.733	2.588	0.261	10.837
Legal Origin	195	1.908	0.880	1	5
Geography (Absolute Value Of Latitude)	195	0.250	0.174	0	0.7111
Break year from 1950	195	36.441	9.339	17	52

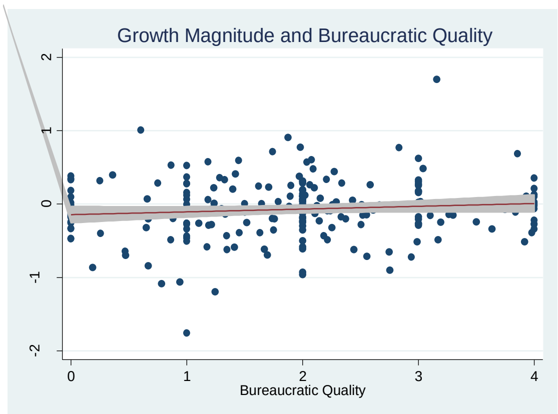
Explanatory variables also include other deep determinants of growth like trade ratio (proxy for globalization), initial levels of human capital and initial levels of per capita income. We do not include geographical measures as an explanatory variable since they do not vary across growth episodes for any given country. The trade data is taken from World Development Indicators, 2013. The measure for human capital is Barro and Lee's average schooling years in the total population aged 15 and over, which is taken from the Quality of Government standard Dataset, (Teorell et al. 2011). We have augmented this data for more countries and years using Caselli et al. 2010. The per capita income data is from the Penn World Tables 7.1 (Heston et al. 2012). The data also includes some variables that are widely accepted as reasonably good instruments of institutional quality. These include the legal origin of a country and the geography of a country (absolute value of latitude). These are taken from the Quality of Government standard Dataset, (Teorell et al. 2011). We also include a variable called ‘break year from 1950’ that is calculated by the authors, which measures how recently a specific episode has started. This variable is used as an instrument for institutional quality that varies with time across the episodes. A more detailed discussion of the logic of using this variable is given later on in this section. The summary statistics for these variables are presented in table 1.

Before we undertake a rigorous econometric exercise, it is useful to study the bi-variate relationship between the endogenous variable (episode magnitude) and the variables measuring institutional quality. Figure 2 presents scatter-plots for these variables with the panels on the left (2a, 2c and 2e) using ‘episode magnitude-world average’ on the Y-axis and the panels on the right (2b, 2d and 2f) using ‘episode magnitude-partial-regression-to-mean’ on the Y-axis.

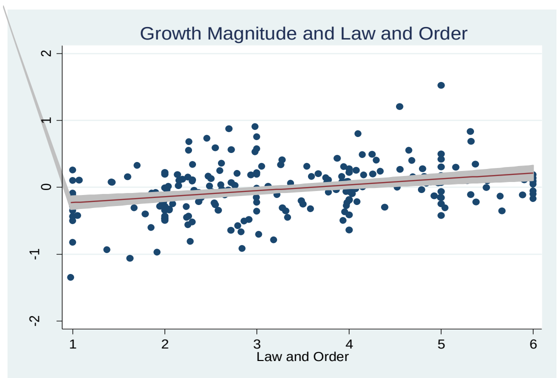
Figure2: Relationship between Episode magnitude and Institutions



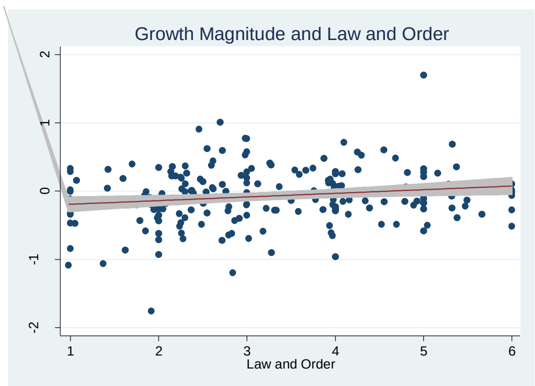
(a)



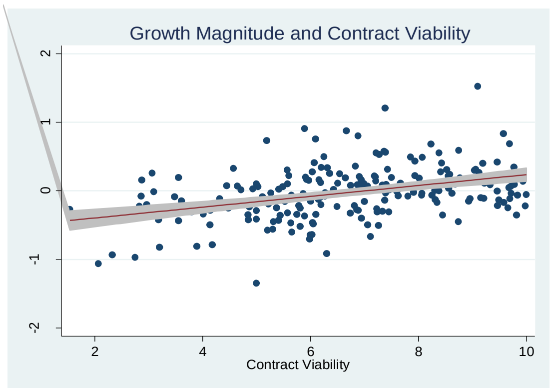
(b)



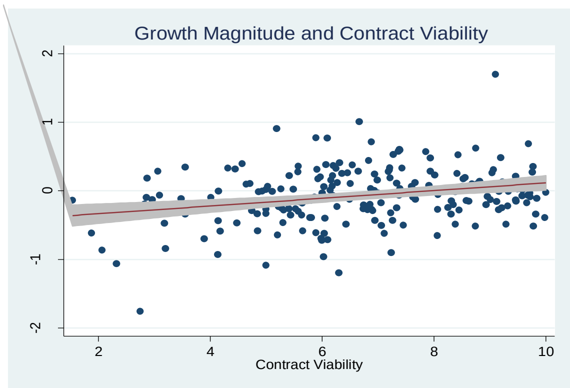
(c)



(d)



(e)



(f)

The graphs indicate that there is a positive relationship between the measures of institutional quality and episode magnitudes. This is more pronounced for 'episode magnitude-world average' but reasonably true for 'episode magnitude-partial-regression-to-mean' as well. This seems to indicate a relationship between the variables but clearly needs more rigorous empirical analysis that estimates and tests them robustly.

Empirical Strategy

Our empirical exercise attempts to estimate the relationship between episode magnitude and institutional quality. We start with episode magnitude-world average and regress it on one aspect of institutional quality at a time (i.e., either on bureaucratic quality or on law & order or on contract viability). For each of these three cases, there are three sets of regression equations. The first equationis an unconditional OLS regression between episode magnitude and institutional quality.This captures the relationship represented by the scatter-plots presented earlier. The second equation is a conditional OLS regression that controls for other deep determinants of growth identified in the literature. These include initial per capita income, initial human capital and trade ratio.

The empirical literature has underlined the possibility of a reverse feedback effect of growth on institutional quality rendering the OLS estimates between the two variables biased. In order to isolate the 'true' impact of institutional quality on episode magnitude, we estimate a third equation usingtwo-stage least squares (TSLS) regression and appropriate instrumental variables. A comparison of the OLS and TSLS estimates can then be used to empirically validate the direction of causality between the two variables. The instruments used for the

TSLS regressions are mostly widely accepted as reasonably good instruments of institutional quality. These include legal origin of countries and geography (absolute value of latitude). One shortcoming with these instruments is that they are country specific and hence do not vary over time. Nevertheless, as the empirical exercises show, they are reasonably good instruments. Furthermore, we have also includedone instrument that varies over time.This variable is called‘break year from 1950’ andgives the number of years between the year 1950 (the earliest year for which we have data) and the first year of the episode. Thus it measures how recently the episode has started (the higher the value of the variable the more recent the beginning of the episode). The logic for using this variable as an instrument is that –arguably -the more recent the beginning of an episode, the higher the chances of that episode of having better institutional quality. Our argument is that over time - and much more strongly in the recent decades - there has been an increasing focus on the important role of institutional quality in the overall development of countries - both by multilateral organizations like the World Bank and IMF and by mainstream academia.This has resulted in an attempt by most countries to enhance their institutional quality in recent years. This implies that - on an average - a more recent episode has a higher chance of having a better institutional quality. At the same time, there is no reason to expect the episode magnitudeof an episode - which depends on both the growth rate and the duration of the episode - to be higher for recent episodes, independently of the institutional quality. Empirically, we find that together with the other instruments, the variable ‘break year from 1950’ satisfies the conditions that are necessary for a strong instrument.

The TSLS estimates based on the approach described above, represents our benchmark results. We next run another three sets of TSLS regressions to test for the robustness of the results obtained from the benchmark estimates. As mentioned earlier, in the benchmark estimate, we have included episodes for which we have data only for some years. The first robustness exercise tests whether this introduces a strong bias that leads to misleading results. We do this by repeating the TSLS regressions but including only those episodes that start after 1980 -a period for which almost all data is available.Another source of bias in the benchmark estimates may arise due to the fact that a number of episodes are brought to an end in 2010 due to lack of data availability after that year. The second set of robustness exercises test whether this bias is significantly large by including a dummy that has a value equal to one for all such truncated episodes and zero otherwise. Thus it controls for the possibility that the truncated episodes unduly influence the results in the benchmark exercise.

Finally, the third set of robustness exercises repeat the TSLS estimation for an alternative measure of the endogenous variable, i.e., we use episode magnitude-partial-regression-to-mean.

V. Results

Table 2 presents results of regressions relating episode magnitude to different aspects of institutional quality. The measure of episode magnitude used is that based on world averages (gm_wa). For institutional quality, columns 2 to 4 uses 'bureaucratic quality',columns 5 to 7 uses 'law & order' and columns 8 to 10 uses 'contract viability' respectively. For each of these three measures of institutional quality, the table presentsthree alternative regression estimates based on different functional specifications and alternative estimation techniques. The first column (say column 2) presents unconditional OLS estimates representing the bi-variate relationship between the episode magnitude and the institutional variable. The second column (say column 3) presents conditional OLS estimates which additionally control for initial per capita income, initial human capital and an average measure of globalization which is proxied by the trade ratio. The final column (say column 4) presents TSLS estimates that also include the control variables in column 3. The results of the first stage regressions for the TSLS estimation are given in Table A1 in the appendix.

Column 2 shows that in a bivariate regression, the institutional variable 'bureaucratic quality' has a significant coefficient with the correct sign. Column 3 indicates that even after including control variables, the coefficient of bureaucratic quality remains strongly significant. Column 4 presents the results of the second stage regression using the two stage least square (TSLS) method. The instruments are (i) legal origin of countries (ii) geography (absolute value of latitude) and (iii) break year from 1950. The first stage regressions presented in Table A1in the appendix show that the instruments explain a large part of the variance of the institutional variable, bureaucratic quality. The underidentification and the instrument suitability (Hansen J statistic) testsare presented in the bottom panel (Table 2).These show that the estimation does not suffer from weak instruments problem. The instrument suitability is also not rejected by the overidentification test (Hansen J statistic). The results of column 4 show that the coefficient for bureaucratic quality has the correct sign and is statistically significant, although the t-statistic is far less strong compared to column 3. This indicates that the OLS estimates in column 3 were biased. Columns 3 and 4 also show that the initial levels of per capita income and the initial levels of human capital are both significantly related to episode magnitude with the correct signs, while globalization (trade ratio) shows no such relationship.

Table-2

Determinants of episode magnitude: Dependent variable is based on complete-regression-to-mean

	OLS	OLS	TSLS	OLS	OLS	TSLS	OLS	OLS	TSLS
Bureaucratic Quality	0.093***	0.097***	0.225**						
	(4.06)	(3.62)	(2.23)						
Law and Order				0.089***	0.077***	0.130**			
				(4.86)	(3.85)	(2.37)			
Contract Viability							0.079***	0.078***	0.097**
							(6.23)	(5.75)	(1.99)
(log) Initial PCY		-0.132***	-0.186***		-0.116***	-0.132***		-0.126***	-0.134***
		(-3.40)	(-3.11)		(-3.40)	(-3.45)		(-3.94)	(-3.85)
Trade Ratio		0.001	0.001		0.001	0.001		0.001	0.001
		(1.60)	(0.86)		(1.51)	(1.29)		(0.96)	(0.59)
Initial Human Capital		0 .053***	0.042**		0.049***	0.041***		0.043***	0.038**
		(3.46)	(2.53)		(3.29)	(2.63)		(3.04)	(2.24)
Cons	-0.205***	0 .538**	0.795**	-0.317***	0.359	0.352	-0.554***	0.229	0.189
	(-3.80)	(2.08)	(2.26)	(-4.72)	(1.55)	(1.54)	(-6.13)	(1.05)	(0.79)
Number of obs	210	198	195	210	198	195	209	197	194
R-squared	0.069	0.163		0.096	0.172		0.157	0.217	
Hansen J statistic			1.539			0.180			2.344
P-value			0.463			0.914			0.310
Underidentification test			16.878			25.323			16.632
P-value			0.001			0.000			0.001

Note: ***, ** and * denote significance at 1%, 5% and 10% level respectively. Robust t-statistics are in parenthesis.

Columns 5 to 7 presents results of regressions relating episode magnitude to law & order. The TSLS estimation in column 7 again uses the same instruments, i.e., (i) legal origin of countries (ii) geography (absolute value of latitude) and (iii) break year from 1950.The results are very similar to those with bureaucratic quality. Thus, the OLS and TSLS estimates in columns 5,6 and 7 all show that law & order has a positive and significant relationship with episode magnitude, although the results are much stronger for the OLS estimates. The TSLS estimates do not suffer from either weak instruments problem or lack of instrument suitability (bottom panel). Columns 6 and 7 also show that the initial levels of per capita income and the initial levels of human capital are both significantly related to episode magnitude with the correct signs, while globalization (trade ratio) shows no such relationship.

Columns 8 to 10 presents results of regressions relating episode magnitude to contract viability. The TSLS estimation in column 10 uses the same instruments, i.e., (i) legal origin of countries (ii) geography (absolute value of latitude) and (iii) break year from 1950.The results are again very similar to those with bureaucratic quality and law & order. The OLS and TSLS estimates in columns 8,9 and 10 all show that contract viability has a positive and significant relationship with episode magnitude, and here the results are even stronger for the OLS estimates. The TSLS estimates do not suffer from either weak instruments problem or lack of instrument suitability (bottom panel). Columns 9 and 10 again show that the initial levels of per capita income and the initial levels of human capital are both significantly related to episode magnitude with the correct signs, while globalization (trade ratio) shows no such relationship.

Robustness tests

In table 2 presented above, we have already tested for the robustness of the results across alternative functional forms of the regression (unconditional and conditional OLS) and alternative estimation techniques (OLS and TSLS). In this section we undertake more robustness checks. As described earlier, there are three sets of robustness checks that we have undertaken and these are presented in Table 3. The first robustness exercise tests whether the inclusion of episodes where there was some missing institutional data (and hence the measures of these institutional variables were the averages of only those years for which the data was available) introduces a bias in the benchmark TSLS results discussed earlier. We do this test by repeating the benchmark TSLS regressions but including only those episodes that start after 1980 - a period for which almost all data is available. These TSLS regressions for bureaucratic quality, law & order and contract viability respectively are presented in column 2, 3 and 4 of Table 3. The second robustness exercise tests whether the truncated episodes (i.e., episodes which end in 2010 due to lack of data availability after that year) unduly bias the results in the benchmark exercise. In order to control for such a possibility, we repeat the benchmark TSLS estimation by including a dummy that has a value equal to one for all such truncated episodes and zero otherwise. The results for bureaucratic quality, law & order and contract viability respectively are presented in column 5, 6 and 7 of Table 3. Finally, the third set of robustness exercises repeat the benchmark TSLS estimations for an alternative measure of the endogenous variable, i.e., episode magnitude-partial-regression-to-mean.Columns 8 to 10 present the results from these TSLS regressions for bureaucratic quality, law & order and contract viability respectively. The results from all three sets of robustness exercises confirm the results of the benchmark TSLS estimates in Table 2, underlining the robustness of these results.

Table-3

Alternative robustness tests

	Sample to include only breaks from 1980			Controlling for incomplete episodes			Alternative measure of episode magnitude		
	Dependent variable: gm_wa			Dependent variable: gm_wa			Dependent variable: gm_up		
Bureaucratic Quality	0.214*			0.222**			0.238**		
	(1.78)			(2.42)			(2.09)		
Law and Order		0.096*			0.131**			0.119**	
		(1.73)			(2.46)			(1.98)	
Contract Viability			0.071*			0.158**			0.116**
			(1.65)			(2.34)			(2.28)
(log) Initial PCY	-0.155**	-0.095**	-0.108***	-0.181***	-0.129***	-0.171***	-0.249***	-0.187***	-0.200***
	(-2.31)	(-2.41)	(-2.72)	(-3.16)	(-3.24)	(-3.52)	(-3.73)	(-4.43)	(-5.38)
Trade Ratio	0.001	0.001*	0.001	0.001	0.001	0.0003	-0.001	-0.0002	-0.001
	(1.35)	(1.81)	(1.58)	(0.68)	(1.11)	(0.40)	(-0.91)	(-0.34)	(-1.15)
Initial Human Capital	0.031	0.035**	0.036**	0.040**	0.039**	0.030*	0.049**	0.050***	0.041**
	(1.58)	(2.01)	(2.08)	(2.38)	(2.49)	(1.71)	(2.52)	(2.72)	(2.29)
Dummy(final year)				0.047	0.038	-0.106			
				(0.86)	(0.70)	(-1.09)			
Cons	0.628*	0.196	0.120	0.754**	0.324	0.179	1.296***	0.824***	0.632***
	(1.67)	(0.80)	(0.49)	(2.17)	(1.34)	(0.78)	(3.39)	(3.42)	(2.67)
Number of obs	142	142	142	195	195	194	195	195	194
Hansen J statistic	0.335	0.760	2.111	0.984	0.136	0.911	2.270	2.809	2.595
P-value	0.846	0.684	0.348	0.611	0.934	0.634	0.321	0.246	0.273
Underidentification test	13.187	24.488	19.497	20.888	26.278	9.927	16.878	25.323	16.632
P-value	0.004	0.000	0.000	0.000	0.000	0.019	0.001	0.000	0.001

Note: ***, ** and * denote significance at 1%, 5% and 10% level respectively. Robust t-statistics are in parenthesis.

VI. Conclusions

In this paper, we contribute to the growth episode literature by carrying out a regression-based analysis of the determinants of more successful episodes. In particular, we reevaluate the relationship between growth and economic institutions within the growth episode framework.In contrast to the previous literature which has focused mostly on the correlates of the timing of growth episodes, we examine the determinants of successful and unsuccessful growth episodes. To do this, we propose a measure of the *magnitude* of countries' growth accelerations and decelerations, which is the difference between the level of output at the end of the episode and the counter-factual of what the level of output would have been in the absence of the onset of the growth episode. We then use data for 125 countries from 1950-2010 to obtain 314 growth episodes, and examine the magnitude of growth in these episodes, with our key explanatory variables being different measures of institutional quality - property rights institutions, contractual institutions and state capacity. Our results show that higher institutional quality, irrespective of the measure of institutions, enhances the probability of a successful growth episode rather than one of growth failure. These results are robust to alternate specifications and to concerns of reverse causality.

Our results also indicate that there is reverse feedback running from episode magnitude to institutional quality. Initial conditions like per capita income and human capital are also found to be significant determinants of growth outcomes. The fact that the institutional variables have a significant relationship with growth magnitude after controlling for initial conditions also make these results stronger, since it disproves the argument that institutions do not cause growth independently of initial endowments of human capital etc (Glaeser et. al. (2004)). The negative coefficient of initial per capita income also resonates with the idea of convergence of growth rates.

The previous literature on the determinants of long-run incomes across countries has established the causality of institutions; however, the correlation between initial institutional quality or its change over time and economic growth has been observed to be weak. In this paper, we show that institutions matter in how successful a country will be in observing an increase in per capita incomes, with the onset of a growth acceleration episode. Conversely, higher institutional quality reduces the likelihood of a large decline in per capita incomes in a growth deceleration. Our findings, therefore, suggest that for many developing countries, strengthening institutional quality is a key ingredient in the achievement of successful growth episodes.

APPENDIX

TableA1: First-stage regression results for the benchmark model

Independent variables	fl_burqua	fl_lo	fl_contviab2
(log) Initial PCY	0.343***	0.201**	0.490***
	(4.86)	(2.12)	(3.22)
Trade Ratio	0.004***	0.006***	0.009***
	(2.93)	(3.29)	(3.56)
Initial Human Capital	0.057	0.036	0.069
	(1.46)	(0.63)	(0.85)
Legal Origin	-0.124	0.008	-0.040
	(-1.63)	(0.08)	(-0.29)
Latitude (Absolute)	1.723***	3.428***	2.762***
	(4.09)	(5.81)	(3.12)
Break Year From 1950	-0.007	0.005	0.041***
	(-0.99)	(0.48)	(3.02)
Cons	-1.348**	0.018	-0.345
	(-2.39)	(0.02)	(-0.28)
Number of obs	195	195	194
Centered R2	0.477	0.421	0.427
Uncentered R2	0.872	0.915	0.957

Note: ***, ** and * denote significance at 1%, 5% and 10% level respectively.
Robust t-statistics are in parenthesis.

TableA2: First-stage regression results for robustness test

	Sample to include only breaks from 1980			Controlling for incomplete episodes			Alternative measure of episode magnitude		
	fl_burqua	fl_lo	fl_contviab2	fl_burqua	fl_lo	fl_contviab2	fl_burqua	fl_lo	fl_contviab2
(log) Initial PCY	0.417***	0.298***	0.708***	0.340***	0.197**	0.482***	0.342***	0.201**	0.490***
	(5.34)	(2.96)	(4.57)	(4.79)	(2.10)	(3.28)	(4.86)	(2.12)	(3.22)
Trade Ratio	0.004**	0.008***	0.009***	0.003**	0.005***	0.007***	0.004***	0.006***	0.009***
	(2.28)	(3.76)	(3.21)	(2.46)	(2.68)	(2.72)	(2.93)	(3.29)	(3.56)
Initial Human Capital	0.015	-0.074	-0.070	0.058	0.038	0.073	0.057	0.036	0.069
	(0.34)	(-1.28)	(-0.84)	(1.54)	(0.70)	(1.00)	(1.46)	(0.63)	(0.85)
Legal Origin	-0.202**	-0.0003	-0.068	-0.133*	-0.006	-0.075	-0.124	.008	-0.040
	(-2.02)	(-0.00)	(-0.43)	(-1.76)	(-0.06)	(-0.59)	(-1.63)	(0.08)	(-0.29)
Latitude (Absolute)	1.715***	3.787***	2.843***	1.713***	3.414***	2.731***	1.723***	3.428***	2.762***
	(3.68)	(5.77)	(2.78)	(4.08)	(5.78)	(3.15)	(4.09)	(5.81)	(3.12)
Break Year From 1950	0.017	0.037***	0.075***	-0.015**	-0.007	0.011	-0.007	0.005	0.041***
	(1.56)	(2.63)	(4.1)	(-2.30)	(-0.72)	(0.88)	(-0.99)	(0.48)	(3.02)
Dummy(final year)				0.309**	0.439***	1.114***			
				(2.49)	(2.60)	(5.57)			
Cons	-2.535***	-1.769**	-2.687**	-1.116**	0.348	0.485	-1.348**	0.0184	-0.345
	(-3.34)	(-2.01)	(-1.98)	(-2.04)	(0.46)	(0.42)	(-2.39)	(0.02)	(-0.28)
Number of obs	142	142	142	195	195	194	195	195	194
Centered R2	0.473	0.420	0.468	0.490	0.439	0.486	0.477	0.421	0.427
Uncentered R2	0.874	0.919	0.967	0.875	0.917	0.961	0.872	0.915	0.957

Note: ***, ** and * denote significance at 1%, 5% and 10% level respectively. Robust t-statistics are in parenthesis.

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