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INSTITUTIONS, GROWTH ACCELERATIONS AND GROWTH COLLAPSES

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Abstract

A next step forward in examining economic growth and institutions is examining the frequency, timing and magnitude of “growth episodes”—discrete accelerations and decelerations in medium to long run growth. This will be challenging as to the extent that very long-run causes and consequences of institutions help determine causality this long-run approach with slowly evolving institutions obviously has a difficult time with explaining discrete turning points. This paper does three things. One, it documents a definition and method for determining the frequency and magnitude of growth episodes. Two, it discusses how the “product space” approach to export structure can help understand the joint dynamics of economic growth and institutions. Three, it discusses the relationship of measures of “institutions” to policy implementation and how “closed ordered deals” provide growth accelerations but that the dynamics of institutions during “closed ordered deal” growth determine the duration and lasting effect of a growth episode.

Institutions matter for growth and inclusive development, but despite increasing awareness of the importance of institutions on economic outcomes, there is little evidence on how positive institutional change can be achieved. The Economic Development and Institutions – EDI – research programme aims to fill this knowledge gap by working with some of the finest economic thinkers and social scientists across the globe.

The programme was launched in 2015 and will run for five years. It is made up of four parallel research activities: path-finding papers, institutional diagnostic, coordinated randomised control trials, and case studies. The programme is funded by the UK Department for International Development. For more information see http://edi.opml.co.uk.

Introduction

I) Levels of Prosperity versus Episodic growth, accelerations, decelerations, collapses

All happy families are alike; each unhappy family is unhappy in its own way

Tolstoy, Anna Karenina

The growth dynamics of the world's countries break into distinct groups. The rich industrial countries of the West are all "happy families" (partly this is how the group is defined) and hence all look nearly identical in long-run growth rates and in the modest medium run volatility and low "business cycle" variability. In contrast the developed countries range from not just happy growth but ecstatic—with the highest growth rates in history by a factor multiple—and the completely depressing. Moreover, a principal difference in the growth rates of the "developing" countries is the massive shifts in growth trends such that the within country growth differences over time often far exceed the usual cross-national growth differences.

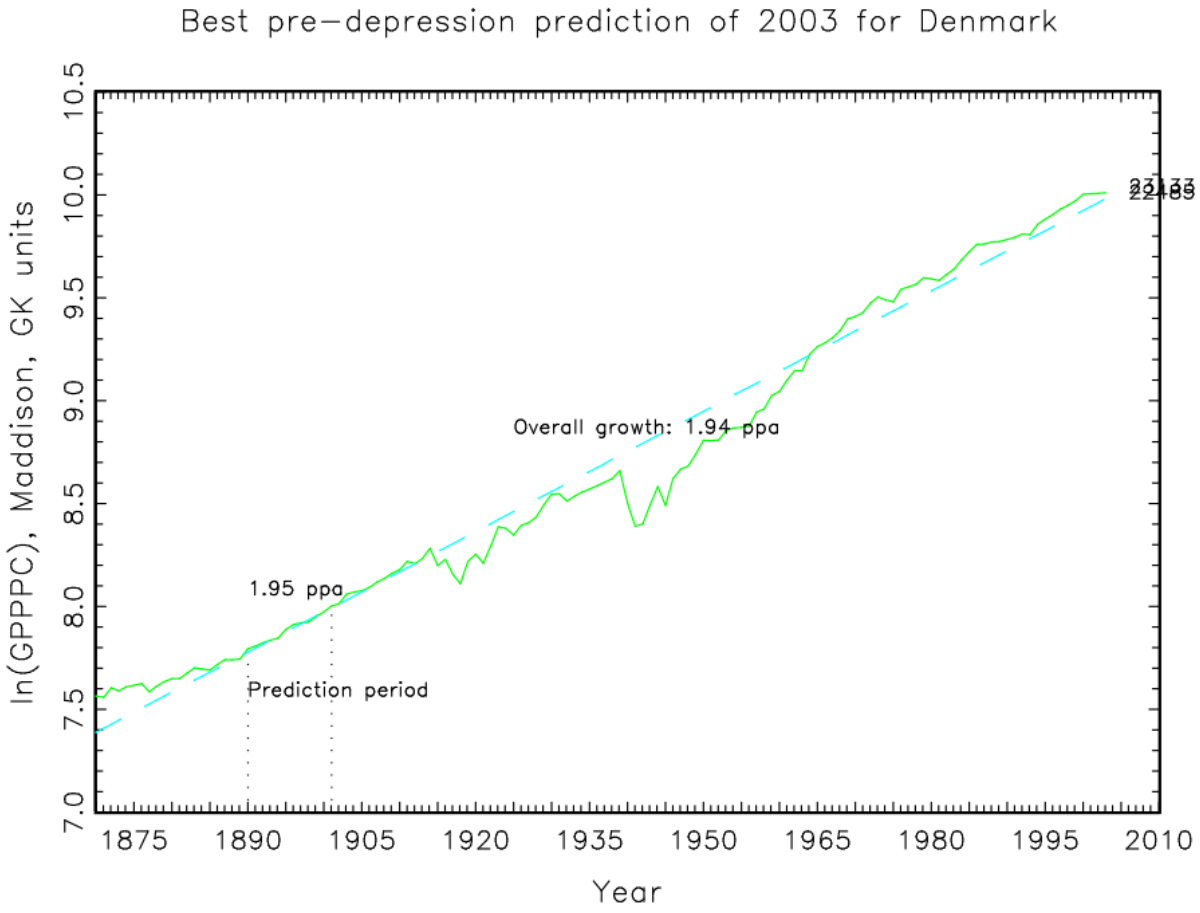
I.a) All happy families: steady 2 percent growth

The nature of the growth process whereby most of the now prosperous countries reached their very high levels of GDP per capita is that there was a growth acceleration from historically low growth rates into "modern" growth of roughly 2 percent per capita sometime in the nineteenth century and that growth rate has been amazingly constant (averaged over medium runs periods and except for the Great Depression and World War II) ever since (at least until 2008, which may or may not represent a decisive slowing of the trend rate of growth).

Figure 1 using Maddison data on GDP per capita in Denmark illustrates the amazing growth stability of most (old) OECD countries. If one were to use a simple OLS of GDPPC on a trend from 1890 to 1901 one would predict Denmark's GDPPC in 2003—102 years ahead—to within 3 percent. The accurate prediction is because growth 1890 to 1901 was 1.94 ppa and growth over the entire period was 1.95 ppa. Appendix 1 shows the same graph showing the best pre-depression data prediction (which allows a different prediction for each country so cheats a bit in making predictions look accurate) for a number of OECD nearly all of which show roughly 2 percent per annum growth over the 1870 to 2003 period.

The "happy families" therefore all look pretty much the same with sustained, steady, roughly 2 percent growth and, other than the Great Depression and World War II, very modest cyclical fluctuations around that trend.

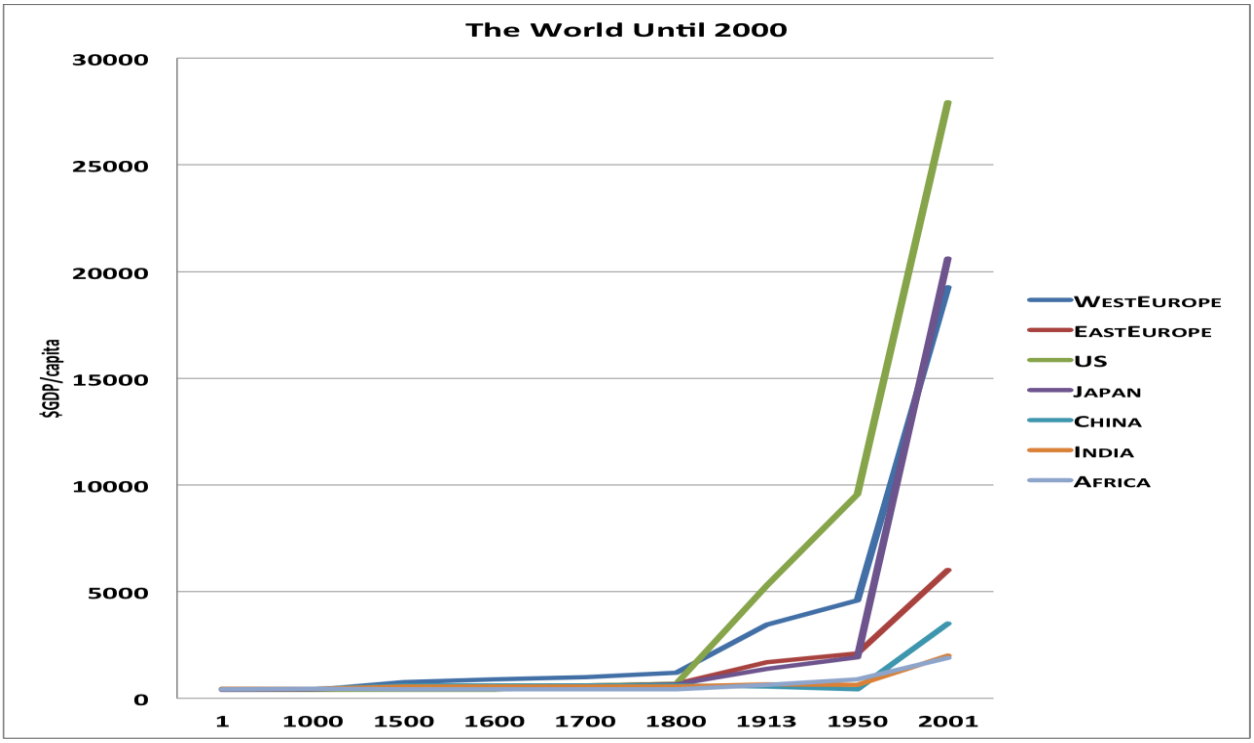
Figure 1: The level of GDPPC in Denmark can be predicted to within a few percent 100 years in advance—because growth has been steady at roughly 2 percent



Source: Author's calculations with Maddison (2007) data.

These countries illustrate that the "hockey stick" in Figure 2, which shows the long-run historical evolution of GDP per capita--is the biggest question in economic history: "what accounts for why GDPPC was (roughly) level for thousands of years of human history and then accelerated first to sustained growth and then to steady 2 percent per capita growth in one set of countries (and only much later, if yet at all, in others)?"

Figure 2: The "hockey stick" in levels of GDPPC: sometime in the nineteenth century a set of countries get into "modern" growth rates of 2 ppa—and that has made all the difference



Source: Maddison data.

This comparison of the long-run consequences of even modest growth differentials frames the big questions of economic history:

- why did growth take off when it did? and not sooner? Or later?

- why did the precursor to modern growth, the first Industrial Revolution, take off where it did in the UK versus Holland, France, or (what is now) Northern Italy?

- Why did modern growth initiate and diffuse in Western Europe (and areas of recent settlement) and not in other societies/civilizations: China or India or Egypt (for instance)?

- Why were some regions able to launch rapid growth and catch up from a late start on industrialization (e.g. Japan and Russia) and others not?

Many of the proffered answers to these very long-run questions have an "institutional" flavor in the sense of "institutions" for economic transactions proposed in various forms by North (1990), North et al. (2009), Acemoglu et al. (2001), Acemoglu and Robinson (2012), Rodrik et al. (2004)--although others appeal to geographic features (e.g. Diamond) or the conditions for scientific/technological progress (Rosenberg) or ethics and virtues (McCloskey 2006)—though it is hard to disentangle these latter from a broad definition of "institutions" and "institutions" as causal pathways of geographic impacts (e.g. Sokoloff and Engerman (2000)).

I.B) Unhappy families have had episodic growth: booms and busts

The idea growth dynamics can be divided into "trend" (of medium-run (10 plus years) to long-run (20 plus years)) which is roughly steady at 2 ppa and a "cycle" (of 3 to 5 year peak to trough fluctuations of modest size) dominates the way macroeconomics is conceptualized and taught in OECD countries. But everything we know about the dynamics of OECD growth is false about nearly every other country in the world.

The post-World War II global order led to de-colonialization and hence a massive expansion in the number of politically sovereign states who would make and enforce their own laws, choose their own political structures and leaders, and (at least nominally) set their own economic (and other) policies. The hope was that, freed of the explicit fetters of colonialism, countries would enjoy the "advantages of backwardness" (Gerschenkron, 1962) embark on rapid growth rates which would lead to a more equal distribution of income across countries in the world. This failed to happen. Absolute and relative divergence continued as the growth rates of "developing" countries were roughly the same as growth rates of the "developed" countries.

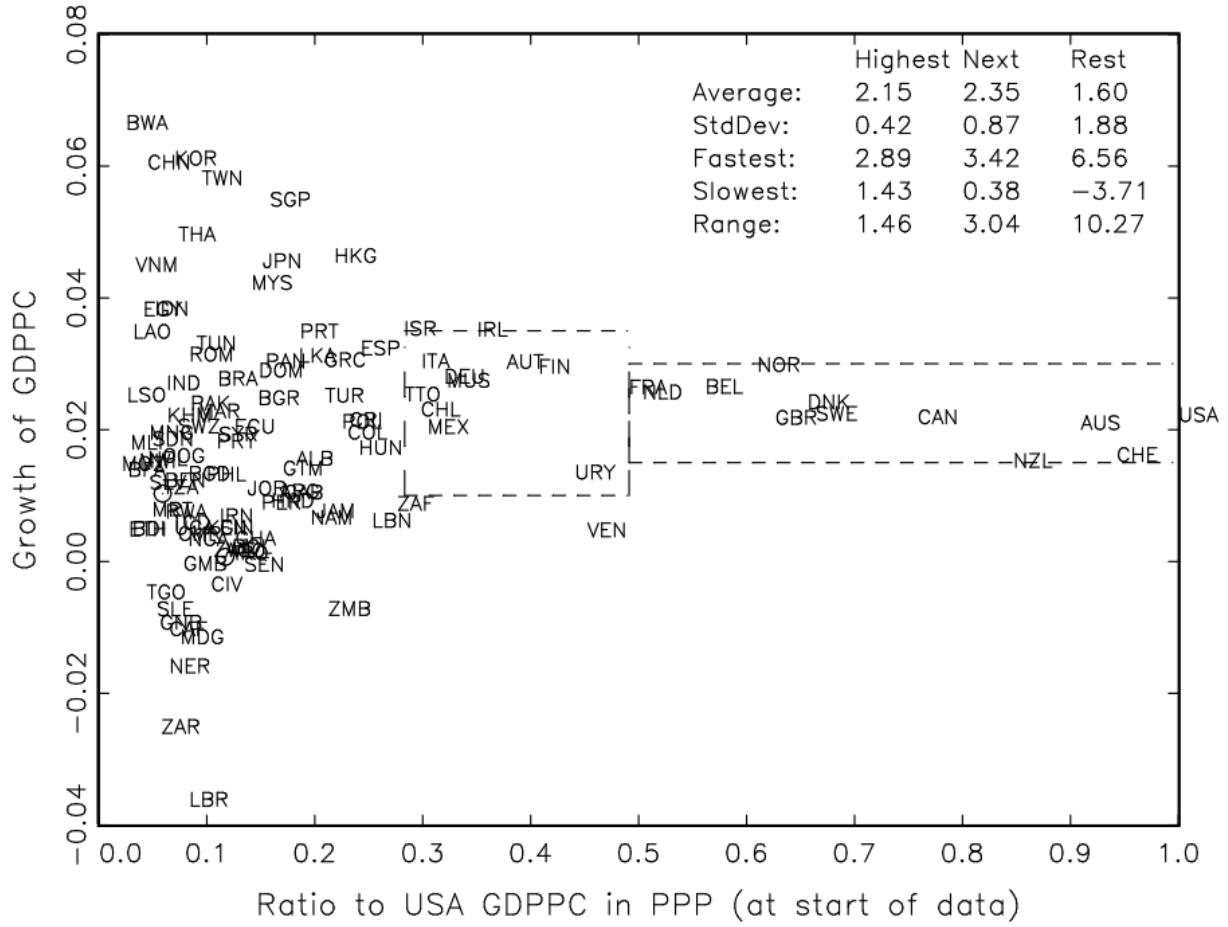
Figure 3 illustrates what did happen, which is that economic growth (not weighted by country population, more about that later) had about the same average in poorer as in richer countries but that countries that were poorer had much, much more variance across countries than among the richer countries[1]. Figure 3 shows country growth rates and their level of GDP per capita when their data began (after 1950) relative to the USA. These countries are grouped into the top 10 percent (with GDPPC roughly more than 50 percent of US level—e.g. France, Netherlands, Canada, Australia), the next 10 percent (with GDPPC more than 28 percent of USA in the aftermath of World War II which were the war recovery Europe (Germany, Austria), periphery of Europe (Italy, Ireland) and the richer of Latin America (Chile, Mexico, Uruguay, Venezuela).

The top countries have exhibited since 1950 a continuation of their previous growth experience—2.15 ppa. There is also very little variation across the "happy families"—the highest growth was 2.89 in Norway and the lowest 1.43 in New Zealand for a total range of 1.46 ppa between fastest and slowest. The next 10 percent also have growth of 2.35 ppa. The range is modestly higher at 3.04 ppa as Venezuela had very slow growth and Ireland and Israel had very rapid growth.

The range among "the rest" is enormous. The average growth is only 1.60 ppa but the range is from extremely rapid growth of over 4 ppa in Botswana, China, Singapore, South Korea, Taiwan, Thailand, Vietnam, Hong Kong, and Malaysia to zero or less in 13 countries.

[1] These graphs and calculations exclude: (a) oil rich Gulf States (e.g. Saudi Arabia, Kuwait, Bahrain, Oman, Qatar), (b) the Former Soviet Union, and (c) all countries with less than one million population

Figure 3: Poorer countries did not have higher average growth rates but had much higher variance of growth in the post WWII period



Source: Author's calculations with PWT8.0 data (Feenstra et al., 2013)

Not only was there a big range of long-run growth outcomes *across* the developing countries but there was also a big range of growth experiences *within* each country as growth accelerated and decelerated. North, Wallis and Weingast (2009) for instance, emphasize that poorer countries (those below PPP$20,000) actually have much more rapid growth when they are growing than do richer (non-oil) countries, of 5.37 ppa versus 3.88 (Table 1, which is adapted from Table 1.2 of NWW). But, when their growth is negative their growth is also much more negative—*negative* 4.61 versus only *negative* 2.33 for the richer countries. The differences in long-run growth rates are because the richer countries spend more time in positive growth (84 percent) and lose less in periods of negative growth whereas the poorest countries do have rapid positive growth—but only just above half the time—whereas they lose much more when in negative growth, equal to their growth when positive, and spend 44 percent of the years in negative growth.

Table 1: Compared to the advanced industrial countries the "developing" countries growth much faster when growing but also grow slower when in negative growth and spend more time in negative growth

Per capita income in 2000 (PPP)	Number of countries	Percent of Years with positive growth	Growth rate, when positive	Growth rate, when negative
>20,000 (non-oil)	27	84%	3.88%	-2.33%
"Developing" countries				
15,000 to 20,000	12	76%	5.59%	-4.25%
10,000 to 15,000	14	71%	5.27%	-4.07%
5,000 to 10,000	37	73%	5.25%	-4.59%
2,000 to 5,000	46	66%	5.39%	-4.75%
300 to 2,000	44	56%	5.37%	-5.38%
Average of<20,000			5.37%	-4.61%

Source: Adapted from North, Wallis, Weingast, 2009, table 1.2

One measure of growth volatility is to calculate K years of growth starting from each year T since the beginning of the data and then compare for each country the range between the *highest* and *lowest* K year growth episodes. I choose K=10 years so as to smooth out over what most economics would consider to be "cyclical" variations but the results are robust to reasonable variations in the growth duration. For example, the fastest 10 years of growth for Brazil were 1966 to 1976 with growth of 7.0 ppa. The 10 slowest years were 1985 to 1995 with growth of -.01 ppa. The total max-min spread is 7.01 ppa. Similarly, for Nigeria the slowest growth was 1977-87 of -5.2 ppa and fastest 1998-2008 at 6.2 ppa for a growth spread of 11.4 ppa between fastest and slowest 10 year growth rates.

Figure 4 shows the growth spread versus initial level of GDPPC. There are two obvious visual points. First, the variation in growth *within* a country over time is much, much, bigger than the variation in long-run growth rates across countries. For instance, for these countries the cross-country standard deviation of growth across all countries is 1.72 percent. The median country growth spread over time for "the rest" (the bottom 80 percent) is 7.1 percent.[2] This implies that the typical country has a growth spread that is larger than moving four standard deviations across the distribution of country long-run growth rates[3]. As we show below this within country variability of growth rates has important implications for the kinds or types of variables that can potentially explain variability in growth.

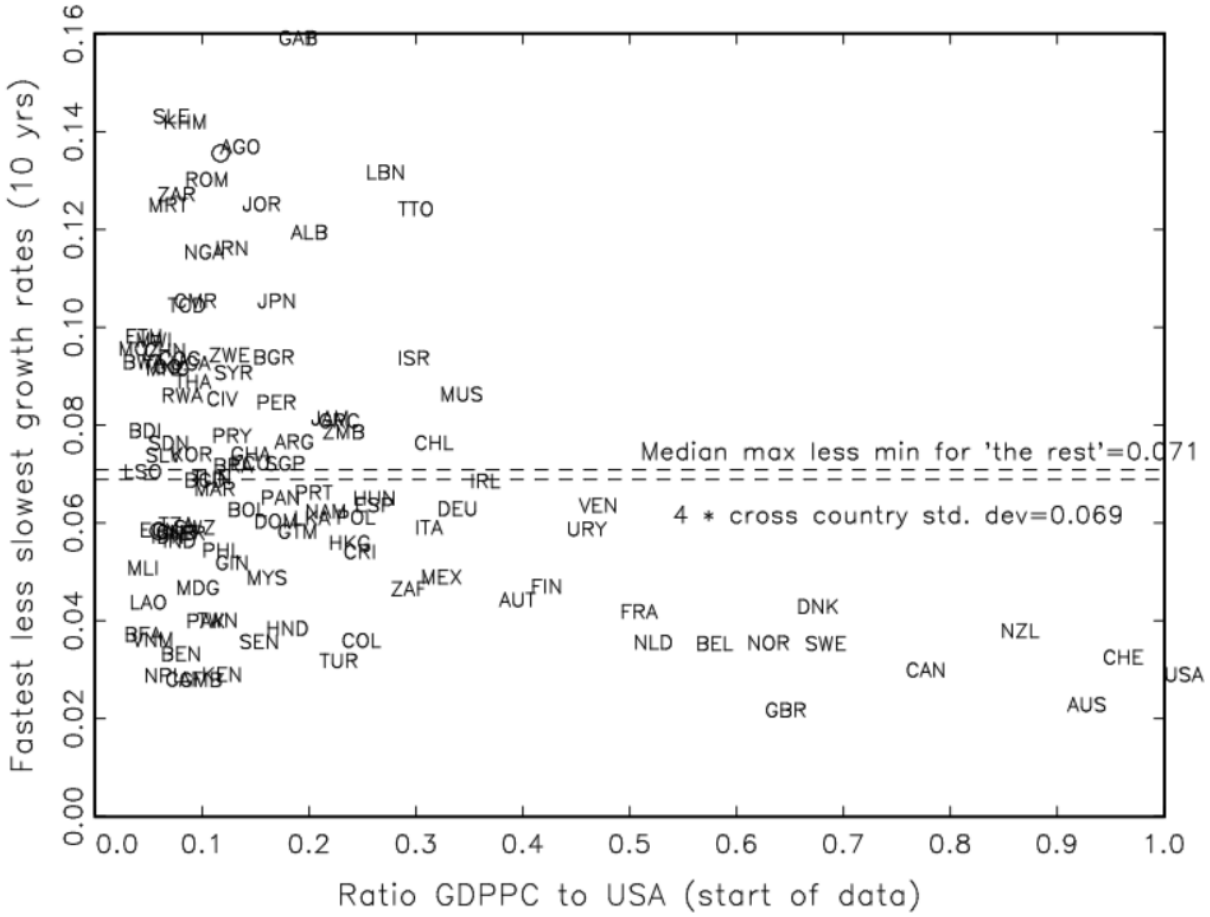
The second obvious feature is that the volatility itself is higher for poor countries. No country with more than 50 percent of USA GDPPC has had a growth spread larger than 4 ppa (with the

[2] We use the mean to downplay the influence of outliers like Liberia and Iraq as this measure is bound below and hence skewed right.

[3] This is a somewhat unfair comparison as it is comparing 10 year country versus long-run across country. The standard deviation across countries of the 10 year growth rates is 2.8 percent (versus 1.72) so the median within country 10 year growth spread is still 2.5 times larger than the cross-national standard deviation of 10 year growth rates.

reminder this excludes oil dependent Gulf countries) whereas relative few developing countries have had growth volatility that low.

Figure 4: The spread in 10 year growth rate differences (max less min) in the same country over time are much bigger than standard deviation of the the long-run differences across countries



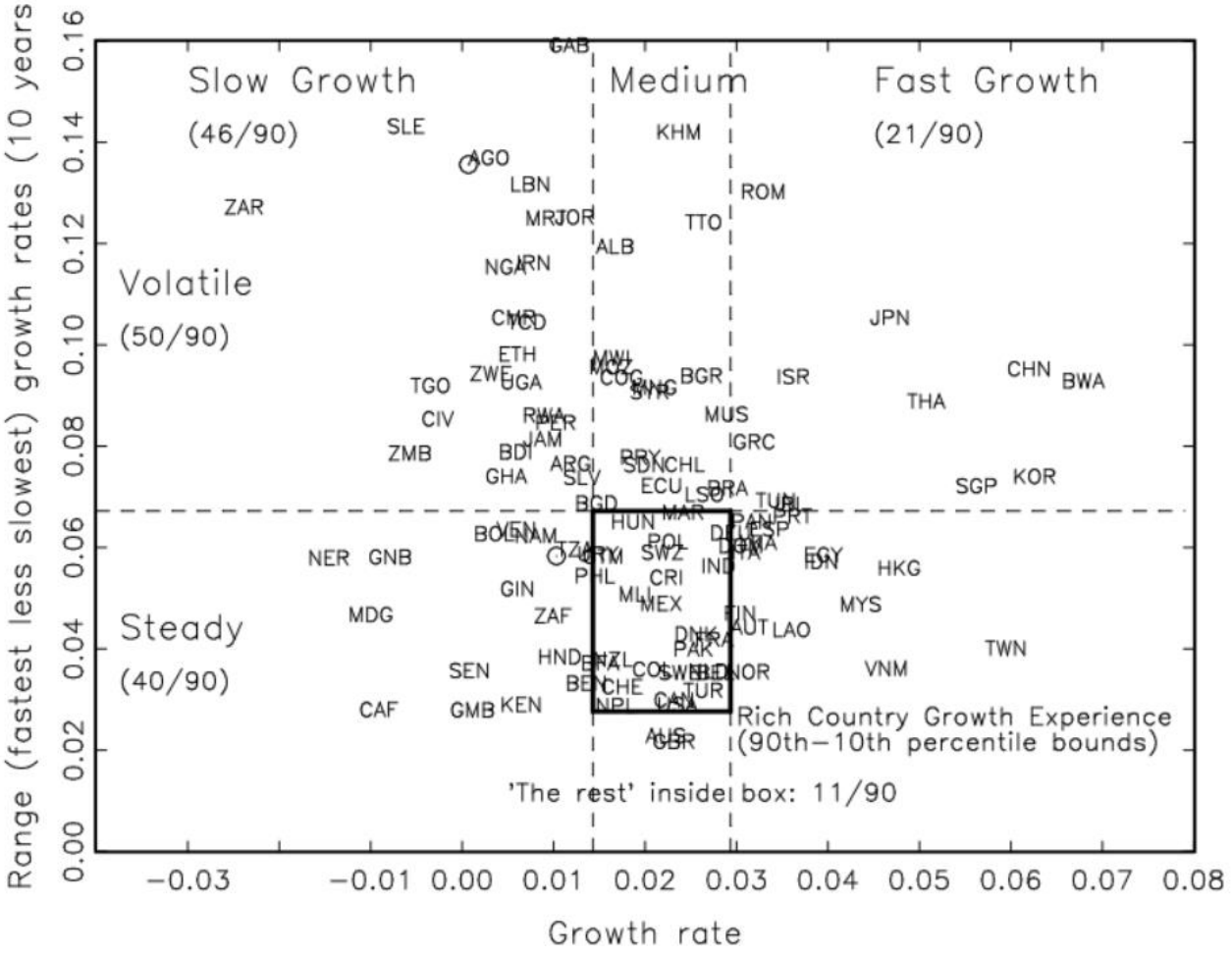
Source: Author's calculations with PWT8.0 (Feenstra et al., 2013). Graph excludes two extreme observations Liberia (.356) and Iraq (.225).

Figure 5 brings the long-run growth (over the entire period of each country's data) and the growth spread (max less min of 10 year growth rates) together into the same graph. The box in the graph is the 10th-90th percentile of the growth experience of the top 20 percent richest countries on long-run (entire period) growth (from 1.42 ppa to 2.93 ppa) and on growth spread (from 2.76 to 6.71). On each dimension this range includes by construction 80 percent of the growth experiences of the richest countries. The graph illustrates that the growth experiences of "the rest" are wildly different both in terms of the range of long-run outcomes with countries with 21/90 countries with growth faster than the 90th percentile of the rich countries (the region labeled "Fast Growth") and with 46/90 countries with slower growth than the 10th percentile of the rich countries (the region labeled "Slow Growth"). Also 50/90 countries have volatility greater than the 90th percentile of the volatility of the richest 20 percent of countries.

This graph illustrates that the growth experiences of "the rest" were markedly different in both the variation of the long run level across countries and of the volatility of the medium run growth experience within countries. Only 11 of 90 countries were within the 10th/90th range of growth and volatility of the rich countries (and most of these countries, e.g. Poland, Hungary,

Turkey, Colombia, Costa Rica, were middle income countries)[4].

Figure 5: Long-run growth rates and growth volatility (range of 10 year growth rates) show the OECD growth experience (steady moderate growth) is atypical of developing countries



Source: Author's calculations with PWT8.0 (Feenstra et al., 2013). Graph excludes two extreme observations in the range: Liberia (.356) and Iraq (.225).

The figure divides growth experiences characterized as long-run growth and medium run growth volatility into six categories, five of which are outside of the 10th/90th range of rich country experience:

[4] The 11 countries are: Poland, Pakistan, Mali, Turkey, Morocco, India, Hungary, Dominican Republic, Costa Rica, Colombia and Swaziland.

Slow growth/high volatility (29/90) countries have experienced 10 year episodes of rapid growth and 10 year episodes of slow growth producing on average slow long-run growth (e.g Nigeria, Uganda, Jamaica, Iran, Ethiopia).

Slow growth/low volatility (17/90) countries have slow long-run growth but are not particularly volatile. Kenya, for instance, has long-run average growth less than one percent per annum but the range of 10 year growth of the USA or Canada. These include many African countries (Niger, Senegal, Benin) but also Latin American countries that have poor growth performance and never really had a large positive growth episode (e,g. Honduras, Bolivia, Venezuela) and the Philippines.

Fast growth/high volatility (10/90) countries grew faster than the OECD 90th percentile but had a range of 10 year growth episodes larger than 7 percent. These are mostly countries that had a period of stagnation followed by a long and persistent episode of rapid growth. Korea, for instance, had growth of only 1.1 percent from 1955 to 1965 (its data only starts in 1953) but had growth of 8.3 percent from 1981 to 1991. Conversely, Japan had rapid growth followed by slow growth.

Fast growth/low volatility (11/90) countries had rapid growth but not a particularly high range of growth experiences. Of course, this is in part because the countries lack data from the low growth periods—like Vietnam whose PWT8.0 data only start in 1970 or Indonesia whose data only start in 1960 therefore excluding the post-independence slow growth period. This graph shows how truly unique the combination of very rapid and low volatility growth has been as really only Malaysia, Taiwan and Hong Kong have had both very rapid (>4 ppa) and steady (range<7 ppa) growth (excluding Vietnam and Indonesia for lack of data in the slow growth periods).

Medium growth/high volatility (11/90) countries have long-run growth (over the entire period of available data) that is within the rich country 10th/90th range (between 1.43 and 2.93 ppa) but have a growth range higher than the rich country 90th percentile. For instance, the USA and Cambodia (KHM) have had exactly the same growth rate of 2.1 percent but this reveals the inadequacy of the growth rate alone as a summary of the growth experience as the USA's range is only 2.8 percent whereas Cambodia's 2.1 percent growth includes a collapse of 6.4 ppa from 1970 to 1980 and a boom at 7.7 ppa from 1998 to 2008—a growth spread of 14.1 ppa.

The task of a research agenda on inclusive growth and institutions must be to explain this range of growth *experiences* across countries, not just the summary statistic of the average growth.

II) *Growth accelerations/decelerations and the magnitude of growth episodes: Methods and results*

II.A) Growth persistence and identifying growth accelerations and decelerations

By the 1990s it was obvious that the standard decomposition of growth experience into a (roughly) stable "trend" and a "cycle" around that trend was missing the possibilities of growth slow-downs and accelerations. Two, related but distinct, empirical literatures about the dynamics of growth emerged.

One, was a literature about “regression to the mean” in growth rates. Easterly et al (1993) showed that even over medium term horizons of 10 to 15 years (or longer) that there was substantial regression to the mean in country growth rates. The cross-decadal correlations of growth rates was on the order of .2 to .3, suggesting that most of the observed medium run growth differences across countries at any point in time were transitory not permanent. This low persistence of medium run growth rates and low inter-temporal correlation of growth rates and “regression to the mean” has proved to be perhaps the most robust stylized fact about economic growth dynamics (Pritchett and Summers, 2014).

This literature on growth persistence led to three important insights about the growth process which, we emphasize in more detail below, are important to research on institutions.

First, there was often an important mismatch in the dynamics of growth and of many of the commonly used “right hand side” variables (correlates or determinants). That is, many of the variables in growth regressions like geographic characteristics or language spoken or colonial heritage were invariant over time and many others like the *level* of school attainment or enrollment or population or even openness were persistent. This just had the mechanical implication that, unless interacted with some other variable that was changing over time, these variables could only be explaining the persistent component of growth rates and hence could necessarily have little explanatory power in explaining *differences* in growth rates (accelerations or decelerations). For instance, Pritchett (2006) shows that the *maximum* explanatory power of schooling on economic growth, estimated as the incremental R-Squared of including both the linear, square and inverse of both the level and changes of schooling in linear, quadratic and inverse, is smaller and smaller the shorter the time horizon and is only .033 for 10 year growth rates and .01 for 5 year growth rates simply because measured schooling of the labor force evolves very smoothly and hence cannot account for growth dynamics.

Second, Rodrik (1999) showed that *changes* in growth over time (such the change in growth before and after 1975) were associated with an *interaction* between external shocks such as terms of trade shocks and measures of the social capability to cope with shocks. This was an early example of work emphasizing an interaction between a time-varying and a persistent country characteristic to explain *changes* in growth rates.

Beyond the fact of generally low persistence of growth rates a second literature was about identifying the dates and magnitudes of the changes in economic growth. In “Slow-downs and Meltdowns” (Ben-David and Papell, 1998) examined post-war growth experiences for 74 countries and showed that many countries had experienced major breaks in their trend rate of growth, many of them negative. Pritchett (2000) allowed for the possibility of multiple breaks allowing a grid search over growth up to N growth episodes of minimum length T using simple maximization of the F-statistic to identify the timing of the changes in trend. Jones and Olken (2008) documented the “start-stop” nature of growth.

A very sophisticated literature has developed to test the statistical significance of multiple growth breaks the trends in time series like GDP per capita as, while the identification of the optimal dating of a break in a series is straightforward (if computationally intensive) whether or not such a break is “statistically significant” is complex as the distribution of a test statistic that is chosen as the maximum of a search is not straightforward. Bai and Perron (2003a, 2003b) discuss hypothesis tests of zero versus multiple structural breaks and provide the critical values of the tests under a variety of assumptions. However, as we discuss below it is not clear for either

descriptive or research purposes the standard hypothesis testing approach is the only, or even most appropriate approach to identifying growth breaks.

This line of research looked at definitions of growth accelerations or decelerations to investigate the correlates of the timing of the onset growth episodes. For instance, Hausmann et al (2006) identify growth accelerations using a filter that identified the timing of growth episodes and then classified as "accelerations" those for which (a) growth increased by more than 2 ppa, (b) the growth rate after the acceleration was high (>3.5 ppa) and positive (to avoid a classifying a deceleration from a negative rate of growth to a negative rate as an "acceleration"), and (c) the end of the growth acceleration episode *level* was higher than its previous peak (to avoid identifying bounce-back recoveries as accelerations). They show that there are many growth accelerations (more than 80) in the data but that the timing of the growth accelerations is not well predicted by the standard policy correlates of growth.

Other papers identify "growth collapses" (Hausmann et al. (2006) who identify extended episodes of negative growth) or "depressions" (Breuer and McDermott (2013) suggest a threshold of 20 percent cumulative decline sustained for three years as a "depression") and investigate the correlates of those episodes. Arbache and Page (2007) show that African growth was slow not because there were fewer growth accelerations but because there were more growth decelerations that lasted longer.

II.B) Duration of growth episodes

One feature of the early literature is that while the *minimum* length of a growth episode was methodologically fixed at a length to distinguish shifts in trend growth from a "cycle" the *duration* of the growth episode could vary tremendously. Obviously the longer countries spent

in episodes of rapid growth the bigger the episode and (all else equal) the larger the impact of the positive growth episode. Arbache and Page (2007) show that the much of the slower than average African growth is accounted for not by more but by longer episodes of slow/negative growth.

Berg et al. (2012) explore the determinants of the *duration* of positive growth episodes and show that democratic institutions, lower inequality, and export structure are associated with longer duration of growth acceleration episodes.

II.C) Estimating the magnitude of growth episodes: Methods

Recent work (Sen et al 2013, Kar et al 2014, Pritchett et al 2016) combines the dating of the *timing* of growth episodes by the *magnitude* of the change in the growth rate and hence and their classification into accelerations and decelerations with the work on the *duration* and a *counter-factual* growth rate to produce estimates of the *magnitude* of growth accelerations. That is, suppose we know that Brazil had a growth deceleration in 1980 that lasted until 2002—what is the metric by which we can measure whether this growth deceleration was "big"? One plausible definition of the magnitude of a growth episode is how much different GDPPC is at any given time relative to what it would have been in the absence of the initiation of the growth episode. This produces two intuitive metrics: (a) that the magnitude of a growth episode is the difference between actual and counter-factual *level* of GDPPC at the last year of the episode or (b) the magnitude of the growth episode is the NPV of the cumulative differences between actual and counter-factual GDPPC over the life of the episode.

Choosing growth episodes. The Kar et al (2014) method of choosing growth episodes begins with a standard Bai-Perron (2003) search over possible growth episodes with the number of candidate breaks adjusted for the total length of data availability as each episode is constrained to be at least 8 years long. But we do not use the Bai-Perron tests of statistical

significance because of concerns about varying statistical power across countries. If one chooses a fixed size (type I error probability) for a number of countries then *exactly the same* magnitude of change in growth (say, 2 ppa) could "reject" the null of no break in one country and "fail to reject" in another country. Imposing a fixed type I error produces very different type II errors across countries. It is not at all obvious that, as a *descriptive* exercise the framing of "hypothesis testing" and the desire to avoid a type I error is primordial.

Our approach is to choose common growth rate thresholds across all countries with a filter of a candidate break based on the change in growth. The filter was that the absolute value of the change in the growth rate after a candidate break had to be:

- 2 ppa if it was the first break in a country's time series,

- 3 ppa if the candidate break was of the opposite sign of the previous break (an acceleration that followed a deceleration had to have accelerated growth by more than 3 ppa to qualify as a break or vice versa), and

- 1 percentage point if the BP potential break was of the same sign as the previous break, an acceleration that directly followed an acceleration (or deceleration that followed a previous deceleration) only had to be larger than 1 ppa to qualify as a break.

Counterfactual growth rate. Making this definition operational requires a definition of the counter-factual of what growth would have been in the absence of the break in trend (acceleration or deceleration) that was observed. We want this counter-factual to be based exclusively on the behavior of the GDPPC series, that is, we do not want to sneak conjectures about the causal determinants of growth or growth episodes into the measurement of their magnitude. So we want no "conditioning" variables defining the counter-factual for our *measurement* purposes.

There are three plausible candidates for the counterfactual growth rate for an episode lasting from t to $t+N_{ep.}$

No change: growth would have continued at the same pace as it before the growth break.

World average: The country would have grown at the same rate as all other countries in the world over the period t to $t+N_{ep.}$

Partial regression to the mean: The country would have grown at the same pace as all other countries that (i) had the same growth rate from $t-N_b$ (the period from the previous growth break to the beginning of the episode) and (ii) had the same GDPPC relative to the USA in year t (to capture (period specific) unconditional convergence)).

Estimates of the partial regression to the mean (PRM) predicted growth rate require a separate regression for each country episode of country *k* starting in period *t* that lasts N_{ep} years

where the previous episode lasted N_b years:

$$g_{t,T+N_{ep}}^{j\neq k} = \alpha + \rho * g_{t,t-N_b}^{j\neq k} + \lambda * \left(\frac{y_j}{y_{USA}}\right)_t^{j\neq k} + \epsilon_{t,T+N_{ep}}^{j\neq k}$$

The estimated parameters are then substituted in to "predict" growth for country k during this period:

$$g_{t,T+N_{ep}}^{PRM,k} = \hat{\alpha} + \hat{\rho} * g_{t,t-N_b}^{k} + \hat{\lambda} * (\frac{y_k}{y_{USA}})_t$$

This is computationally intensive as it requires a regression per growth episode but is conceptually simple—it is just the growth country *k* would be predicted to have if its dynamics were like a country with its growth before the break and level at start of the episode relative to the US-- and is flexible as all parameters are specific to the exact period of the growth episode.

One simple way to think about the three alternatives is that the three choices assume different things about the counterfactual growth rate:

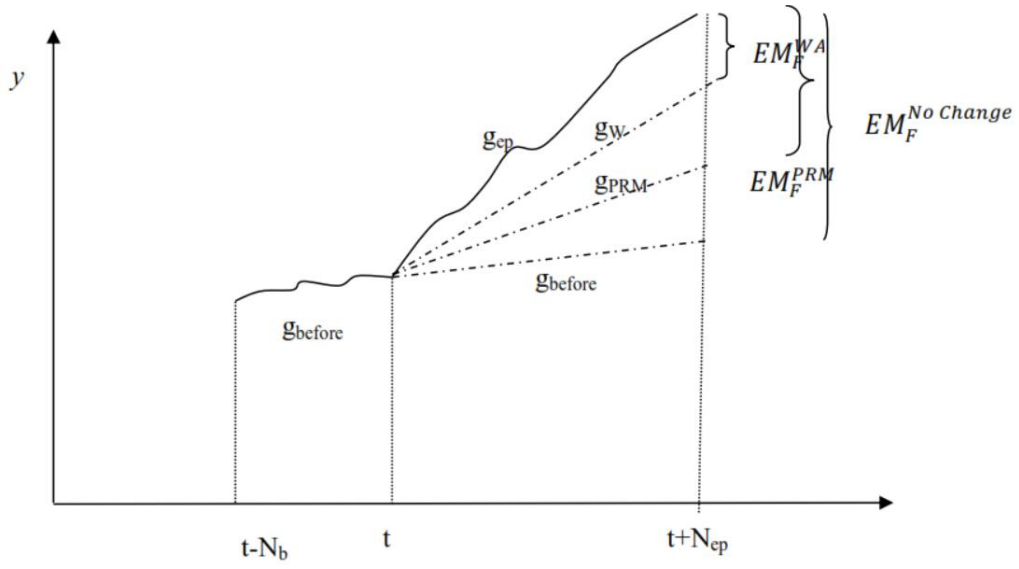
$$No\ Change: \rho = 1, \alpha = 0, \lambda = 0$$

$$World\ Average: \rho = 0, \lambda = 0, \alpha\ is\ world\ average\ for\ the\ period$$

$$Partial\ Regression\ to\ the\ Mean: \rho = \hat{\rho}, \alpha = \hat{\alpha}, \lambda = \hat{\lambda}\ for\ the\ period\ specific\ regression$$

Hence the main difference is how the different approaches treat regression to the mean. "No change" assumes full persistence (no regression to the mean), "World Average" assumes zero persistence (full regression to the world mean), while "Partial regression to the mean" allows the degree of persistence to be estimated for each country episode separately (as both zero and full regression to the mean are not generally correct as estimates of ρ are typically neither 1 nor 0) and allows unconditional convergence (which varies substantially over time).

Figure 6: Three alternative counterfactuals for defining the episode magnitude (EM) after a growth break: *no change, world average,* and *partial regression to the mean*



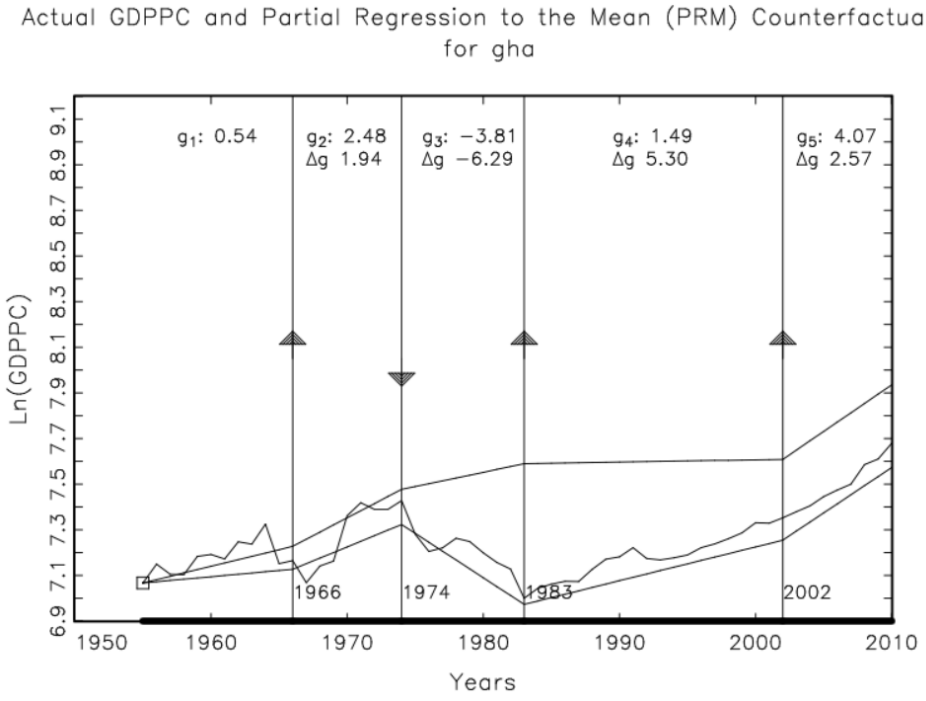
Source: Pritchett et al, 2016.

The perhaps most obvious choice for defining the counterfactual: "no change" suffers from related conceptual and empirical problems. The conceptual problem is that we know that "regression to the mean" implies the "natural" or "expected" thing is for growth to do is to slow if fast and accelerate if slow and hence "no change" as a counterfactual is not a good predictor of future growth. The empirical problem is that if one uses the "no change" counter factual is that by this definition many of the "biggest" growth accelerations are when countries that were in an episode of steep decline and hence negative growth rates stop declining. Suppose growth was falling at negative 6 percent per annum for 10 years and then stopped falling but remained stagnant (zero growth in GDPPC) for another 10 years in a period in which the world average growth was 2 percent and the persistence coefficient was .3. The estimate of $EM_{No\ Change}$ would by .62, while $EM_{World\ Average}$ would be *negative .*2 (as the counter-factual growth was 2 ppa and the actual was 0 ppa so the episode, in spite of an acceleration produced lower end of episode GDPPC than the counter-factual in spite of the big change in growth) whereas EM_{PRM} is almost zero. I therefore only report the results of the PRM or the World Average method, with preference for PRM.

II.D) Estimates of the magnitude of growth episodes: Results

The first result is just a consistent set of episode dating with growth rates during each episode for all countries. Figure 7a shows the results for Ghana showing the beginning date of each episode (1966, 1974, 1983, and 2002), the growth rate in each episode and the change from the previous episode (e.g. in 1983 growth accelerated by 5.3 ppa from -3.81 to 1.49). The actual GDP and the splined growth series (the average growth in each period) and the PRM counter- factual are shown over the whole period. (All of these type of graphs in this paper have the same vertical range so the visual slope in each graph represents the same growth rate).

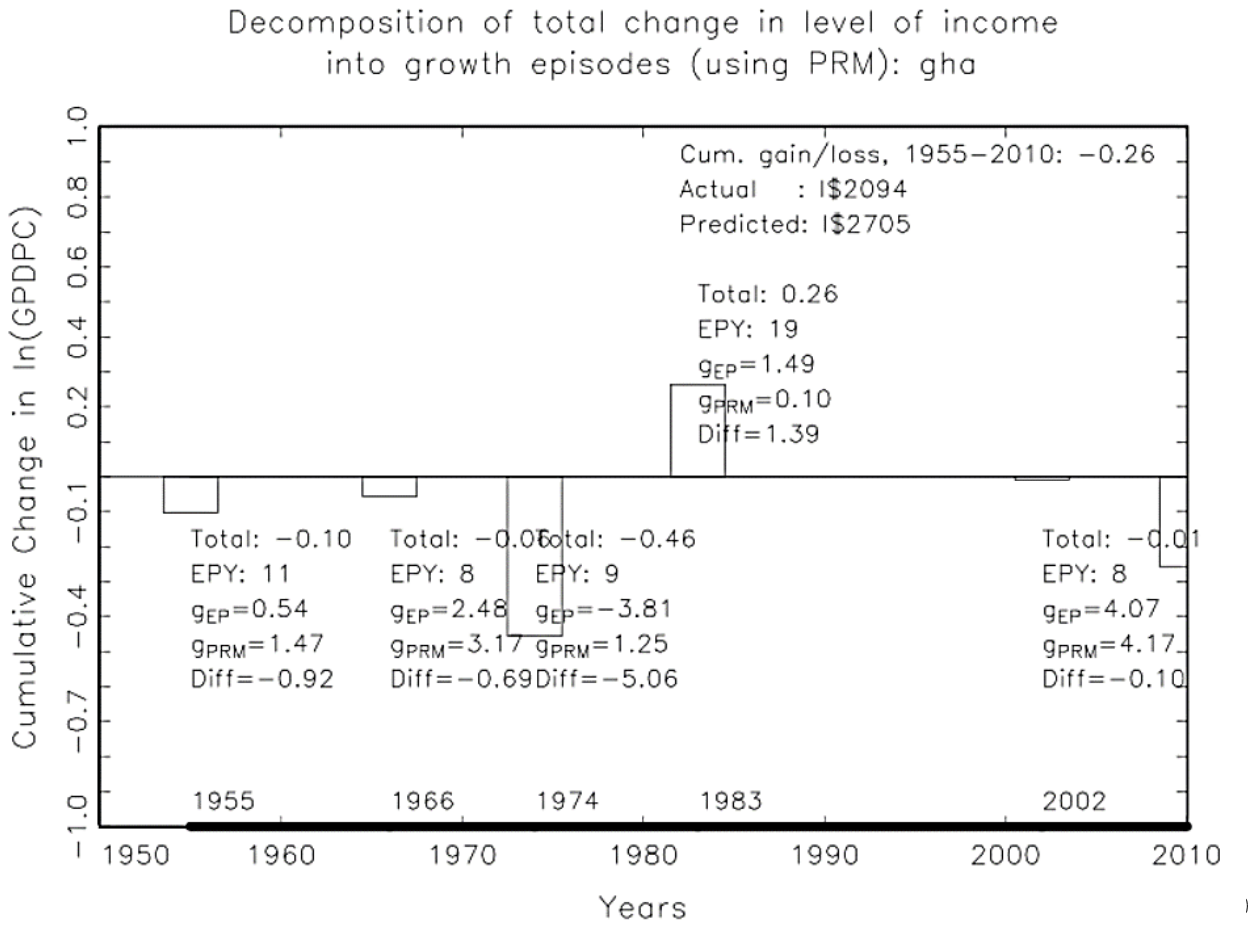
Figure 7a: Decomposing GDPPC into growth episodes versus the partial regression to the mean (PRM) counter-factual: Example of Ghana



Source: http://www.effective-states.org/wp-content/uploads/other_publications/final-pdfs/handbook.pdf

Figure 7b shows the decomposition of Ghana's growth into episodes with the episode magnitude for each displayed. For instance, a growth acceleration happened in 1983 and the PRM predicted growth for Ghana was .10 ppa and the actual growth was 1.49 ppa so the 19 year (1983-2002) growth episode has a total magnitude of .26 (in natural log units). In contrast the collapse from 1974 to 1983 has a total magnitude of -.46 (a growth difference of actual from PRM counterfactual of 5.01 ppa for 9 years).

Figure 7b: Decomposition of Ghana's overall growth into the positive and negative contributions of each growth episode relative to a partial regression to the mean counter-factual



Source: http://www.effective-states.org/wp-content/uploads/other_publications/final-pdfs/handbook.pdf

We produce a graph like this for each of 125 countries and these are available in a visual handbook (Kar et al. (2014)) at http://www.effective-states.org/handbook/.

The overall results across the PWT7.1 data on real GDPPC produce 153 episodes of growth acceleration and 161 episodes of growth deceleration on the sample of 125 countries. Only six

countries of the 125 with adequate data had no breaks at all. Many OECD countries had only one break (generally a deceleration after the post WWII rapid growth). The typical developing country therefore had on average three growth episodes.

II.E) Growth Episodes: Biggest Total Gains

Based on this decomposition of growth of each country we can report on the biggest episodes of growth acceleration (all results are based on EM_{PRM} but the results are quite similar using the world average counter-factual).

Table 2 shows the break out of all growth acceleration episodes by the episode magnitude into large, medium, small and negative and by whether the acceleration was a "recovery" or not (a growth acceleration is a "recovery" if it begins with GDPPC less than 85 percent of the previous peak).

Table 2: Categorization of all growth acceleration episodes by the magnitude of the episode and whether the start of the episode was a recovery or not (with a single example of an episode in each category)

	Total	Non-recoveries	Recoveries	
			End of episode past peak	End of episode not past peak
Big EM>.406 (50 percent)	30	17 Indonesia '67-96 (1.01)	12 Mozambique '95-2010	1
Medium .406>EM> .223 (25 percent)	45	22 Ecuador '70-78 (.335)	11 Sudan '96-2010	12 Iraq '91-2010
Small (0<EM<.223)	47	21 Colombia '67-94	16 El Salvador '87-2010	10 Zambia '94-2010
Negative (EM<0)	31	9 Ghana '02-2010	6 Mexico 1989-2010	16 Venezuela '02-2010
Total	**153**	**69**	**45**	**39**

The categorization in Table 2 already reveals several advantages of the episode magnitude approach.

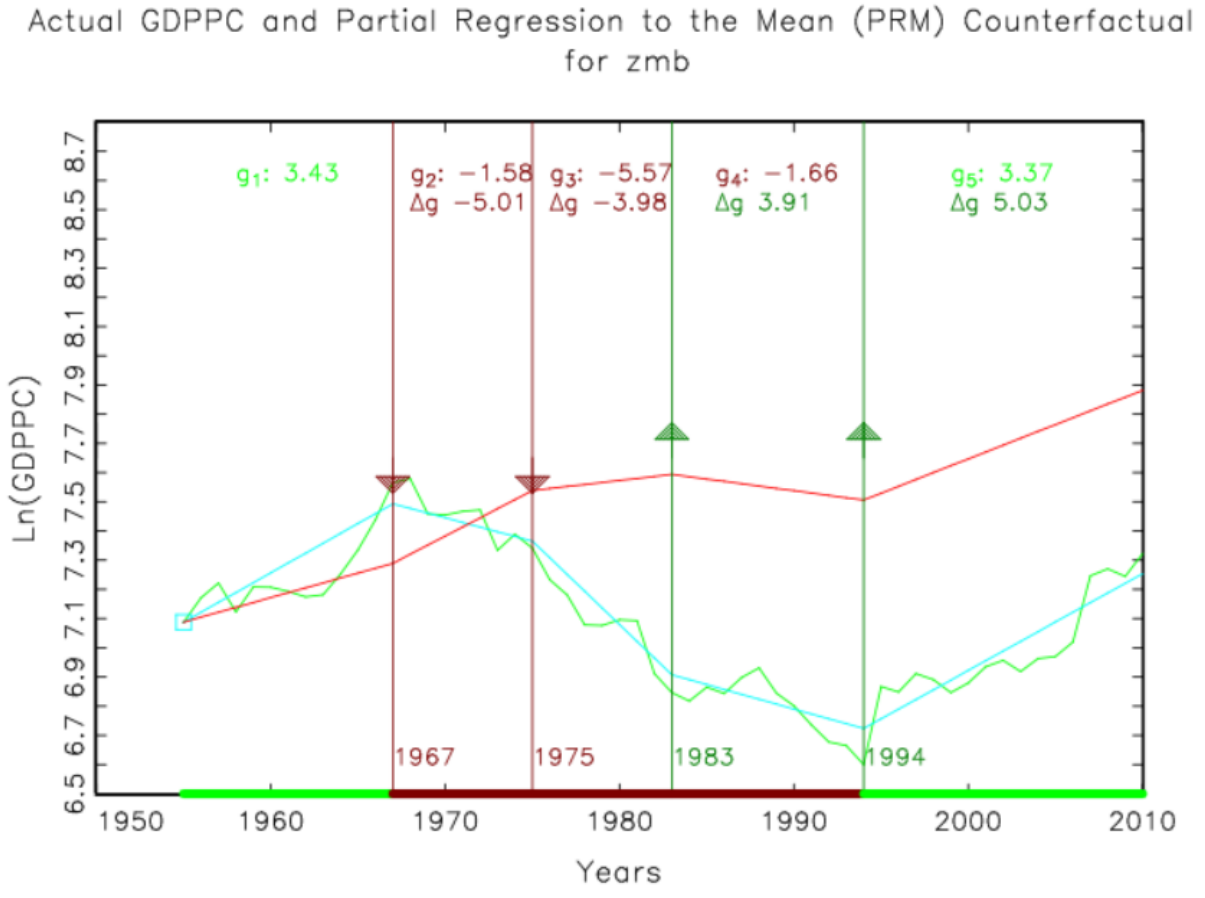
One is that a growth acceleration to positive growth can lead to a *negative* estimate of episode magnitude if the post-acceleration growth was slower than the PRM counter-factual. For instance, Ghana accelerated to growth of 4.07 ppa from 2002 to 2010 but that period was a period of high growth and convergence for many countries so the PRM counter-factual growth was 4.17 ppa and hence growth was *slower* than counter-factual and hence the episode

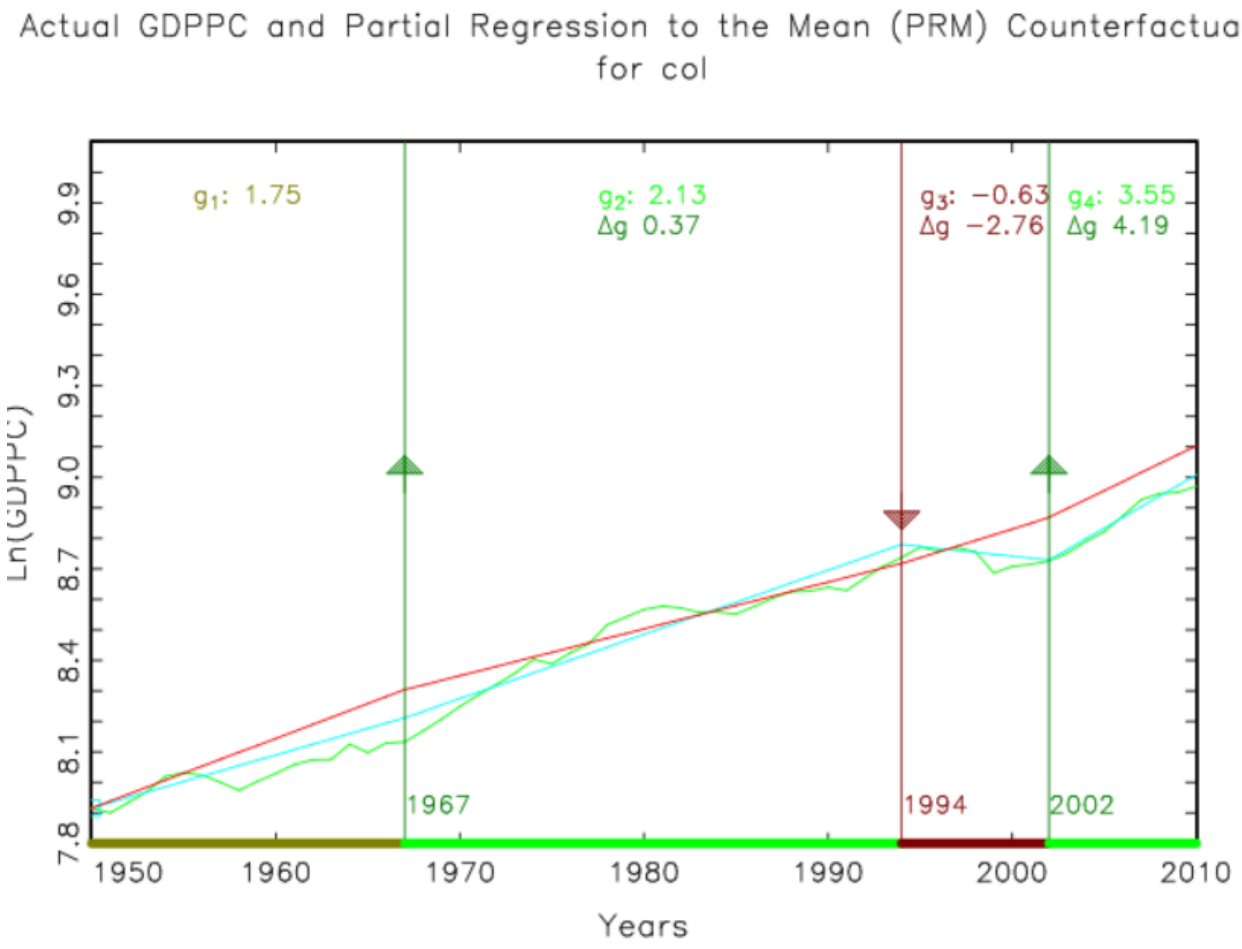
magnitude estimate was negative. A focus on growth in Ghana alone might have set researchers to investigate why Ghana had such rapid growth in 2002-2010 but the use of the counter-factual emphasizes that globally favorable conditions for poorer countries in that period might have been more important than country specific factors.

The second advantage is that is naturally combines the magnitude of the change in the growth rate and the duration of the episode into a total. For instance, growth accelerated in Ecuador in 1970 from 1.59 to 6.55, roughly 5 ppa. In Indonesia in 1967 growth accelerated from 1.66 to 4.71. about 3 ppa. But the growth episode lasted only 8 years in Ecuador hence the EM was only .33 while it was 1.01 in Indonesia because the episode lasted nearly 30 years.

A third advantage is to separate "recovery" accelerations from "non-recovery" accelerations. Figure 8 shows the growth episode decomposition graph for Zambia. The acceleration in 1994 was big, 5.03 ppa, and lasted 16 years until 2010 (end of the data) but GDP per capita never recovered to Zambia's previous peak in 1968 of P$1958 or even to the level at the start of the second deceleration in 1957 of P$1545. Colombia's 1967-1994 growth was very steady but at only slightly higher than the counter-factual rate so the total magnitude is roughly that of Zambia's 1994-2010 episode but we suspect there is something quite different about a growth process that leads to GDPPC at 1.8 of previous peak (Colombia) versus a recovery from a growth deceleration that never exceeds previous peak (Zambia).

Figure 8: Comparing two cases of similar episode magnitude, one recovery (Zambia) one non-recovery (Colombia)





Source: http://www.effective-states.org/handbook/

Table 3 presents the information on the 29 largest episodes in which GDPPC was more than 50 percent higher at the end of the episode than the counter-factual partial regression to the mean would have predicted, divided into 17 episodes that did not being as “recoveries” and 12 that began as recoveries.

Not surprisingly, the list of the biggest growth episodes magnitudes contains most the East Asian “miracle” countries: Taiwan (62-94), Indonesia (67-94), China (two distinct episodes 77-91, 1991-2010), Singapore (68-80), Malaysia (87-96 and 70-79), Thailand (58-87). In addition there are late comer East Asian countries: Vietnam (89-2010), Laos (1979-2002), Cambodia (1998-2010). Obvious high growth countries like Hong Kong and Botswana are missing because they were growing fast from the beginning of the data and hence their growth acceleration is not observed.

Two key features of the East Asian growth experiences is that the growth episodes were (a) much longer than typical (the median episode duration for rapid growth was only 9 years when, by construction, the minimum was 8 years) and (b) the ends of episodes were followed by further accelerations (Korea 1982, China 1991), or mild slowdowns to still rapid growth (Taiwan 1994 to 3.48 ppa, Singapore 1980 to 4.2 ppa).

But there as six other country episodes of big, non-recovery, episodes: Egypt (76-92), Ireland (87-2002), Chile (86-97), Puerto Rico (82-2000), Gabon (68-76) and Panama (59-82), which are certainly a mixed bag.

Table 3: Largest growth episodes, non-recovery and recovery, all with total gain relative to counter-factual greater than 50 percent

Non-recovery accelerations			Recoveries to past previous country peak		
Country	Years of episode	Percent gain in GDPPC during episode over the counter-factual PRM gain	**Country**	Years of episode	Percent gain in GDPPC during episode over the counter-factual PRM gain
Taiwan	62-94	447.1%	**Thailand**	58-87	116.2%
Indonesia	67-96	174.5%	**TTO**	02-10	86.2%
Egypt	76-92	148.0%	**Albania**	92-10	81.3%
China	77-91	117.2%	**Angola**	01-10	78.1%
Korea	62-82	113.4%	**Lesotho**	86-10	71.0%
Vietnam	89-10	104.8%	**Mozambique**	95-10	70.4%
Singapore	68-80	100.9%	**Romania**	94-10	69.4%
Ireland	87-02	98.6%	**Poland**	91-10	62.6%
Laos	79-02	97.0%	**Cyprus**	75-84	61.5%
China	91-10	83.3%	**Guyana**	90-10	56.1%
Chile	86-97	77.4%	**Jordan**	74-82	54.7%
Puerto	82-00	63.6%	**Uganda**	88-10	50.7%
Gabon	68-76	62.0%			
Malaysia	87-96	62.0%			
Panama	59-82	60.9%			
Malaysia	70-79	56.9%			
Cambodia	98-10	52.1%			

Source: Author's calculations.

The large growth accelerations that began as recoveries do seem to be a distinct group as there are several that are post socialist (Albania, Romania, Poland) and several that are post conflict (Angola, Mozambique, Uganda, Cyprus, and Jordan whose episode is both post and pre conflict).

The cut-off points between "large" and "moderate" magnitude growth episodes is of course arbitrary at 50 percent. Table 4 presents the 45 total growth episodes that produced gains relative to PRM of greater than 25 percent (but less than 50). Here again the distinction between non-recovery and

recovery (especially that do not reach pre episode peak) appears important as the "recovery not to previous peak" include many post-conflict countries. Hence any research that investigated episodes of growth acceleration would find, not to anyone's surprise, that ends of conflicts were associated with the onset of growth accelerations.

The list of moderately sized non-recovery growth episodes presents a variety of growth experiences both across decades and across regions.

Table 4: Growth acceleration episodes with moderate total magnitude (>25 percent)

Non-Recoveries			Recoveries					
			Past previous peak			Not to previous peak		
Country	Years of episod	% gain	Country	Years of episod	% gain	Country	Years of episod	% gain
Nepal	83-10	48.3%	Morocc	60-68	48.3%	Iraq	91-10	49.0%
Congo	76-84	48.0%	Sudan	96-10	44.7%	Sierra	99-10	46.9%
UK	81-02	43.0%	Mali	74-86	41.7%	Nigeria	87-10	43.2%
Paragua	71-80	42.2%	Bulgari	97-10	36.3%	Uganda	80-88	39.8%
Ecuador	70-78	39.7%	PNG	84-93	35.7%	Banglades	82-96	37.5%
Cameroo	76-84	39.7%	Urugua	85-94	32.9%	Iran	88-10	36.8%
DR	91-10	39.4%	Chad	00-10	32.8%	Chad	80-00	35.6%
Botswan	82-90	39.2%	Mauriti	71-79	31.3%	Lebanon	82-91	33.5%
Laos	02-10	37.8%	Cuba	95-10	29.1%	Jamaica	86-94	33.5%
Sri	73-81	33.8%	Syria	89-98	27.7%	TTO	89-02	33.4%
Brazil	67-80	33.4%	Peru	92-10	26.0%	Ghana	83-02	30.2%
Tanzania	00-10	32.2%				Mozambiq	86-95	25.3%
Malawi	64-78	31.9%						
Ireland	58-79	31.9%						
Hong Kong	02-10	31.4%						
Portugal	85-00	30.5%						
India	02-10	29.3%						
Lesotho	70-78	28.8%						
Guatema	62-80	28.3%						
Belgium	59-74	27.9%						
Greece	60-73	25.7%						
DR	**68-76**	**25.7%**						

II.F) Growth Episodes: Biggest Total Losses

There are slightly more growth decelerations than accelerations. As with accelerations, decelerations vary widely in their total magnitude. Table 5 lists the 54 episodes in which the loss in GDPPC over the period was more than 20 percent. This table clearly illustrates the nature of

developing country growth and the propensity to enter and stay in episodes that produce cumulatively massive losses.

Some of these are long, slow declines. For instance, from 1978 to 2010 the method says Cote D'Iviore was in one long episode. The cumulative reduction in from a negative .87 percent growth rate is 26.6 percent and since the counter-factual growth rate for Cote D'Ivoire over that period is 1.3 ppa the EM_{PRM} is 50.1. Malawi 1978-2000, Madagascar 1974-2002, Haiti 1980-1994, Jamaica 1972-1986, and Togo 1979-1993, Somalia 1978-2010, Zaire (DRC) 1974-1989 spent 14 or more years in a negative growth episode.

Others are sudden precipitous drops, often from conflict or unstable political transitions (in the top of the list of negative episode magnitude are Iran 1976-1988, Afghanistan 1986-1994, Zaire (DRC) 1989-2000 (following a previous long decline), Iraq 1979-1991. Of course this needn't imply the growth collapse was caused by conflict as both may have been themselves jointly caused by "weak institutions."

As suggested in the descriptive section above these kinds of large negative growth episodes are absent from developed countries in the post war period. (From the massive crisis the fall in GDPPC from 2007 to 2015 (an eight year period) has been 26 percent in Greece but 12 percent in Italy and only 5 percent in Spain).

Table 5: All episodes with fall in GDPPC greater than 20 percent							
Large negative episode magnitude				**Moderate negative episode magnitude**			
Country	Period	Percent loss relative to PRM predicted	Percent loss start to finish, actual	**Country**	Period	Percent loss relative to PRM predicted	Percent loss start to finish, actual
lrn	76-88	-82.7%	-61.3%	**nga**	60-68	-32.1%	-28.3%
Afg	86-94	-69.9%	-71.5%	**zmb**	67-75	-31.6%	-20.1%
mwi	78-02	-69.7%	-43.4%	**moz**	76-86	-29.7%	-29.7%
zar	89-00	-66.2%	-71.1%	**jam**	72-86	-29.6%	-27.3%
irq	79-91	-65.4%	-77.1%	**per**	81-92	-28.7%	-31.3%
jor	65-74	-63.1%	-34.0%	**guy**	81-90	-28.5%	-38.1%
tto	80-89	-61.6%	-45.6%	**nam**	74-85	-27.8%	-26.1%
jor	82-91	-60.5%	-36.4%	**zar**	74-89	-27.4%	-25.3%
som	78-10	-57.7%	-46.7%	**nic**	67-79	-27.3%	-34.6%
nga	76-87	-56.7%	-48.4%	**ven**	77-85	-25.8%	-29.7%
cmr	84-94	-51.3%	-41.9%	**gnb**	70-81	-25.1%	-25.1%
gab	76-87	-50.9%	-53.2%	**pol**	79-91	-24.8%	-20.0%
sle	90-99	-50.2%	-50.3%	**zwe**	91-02	-24.4%	-32.9%
civ	78-10	-50.1%	-26.6%	**ner**	79-87	-23.2%	-39.4%
rom	86-94	-47.4%	-30.8%	**tgo**	79-93	-23.0%	-44.8%
mdg	74-02	-44.5%	-42.6%	**slv**	78-87	-21.4%	-24.9%
cub	84-95	-44.1%	-29.9%	**rwa**	81-94	-21.3%	-63.7%
gnb	97-10	-44.1%	-31.0%	**lso**	78-86	-19.4%	-24.2%
uga	69-80	-43.2%	-35.0%	**caf**	86-96	-18.0%	-34.0%
bdi	92-00	-40.7%	-35.5%	**syr**	81-89	-17.8%	-22.3%
png	73-84	-39.6%	-28.3%	**mus**	63-71	-16.7%	-22.7%
alb	82-92	-39.4%	-39.3%	**bol**	77-86	-12.9%	-23.8%
zmb	75-83	-39.4%	-39.1%	**gmb**	82-95	-12.9%	-25.3%
bgr	88-97	-39.4%	-21.4%	**Eth**	83-92	-1.1%	-25.6%
hti	80-94	-37.6%	-34.2%				
nic	87-95	-37.1%	-39.3%				
gha	74-83	-36.6%	-34.8%				
cog	84-94	-35.2%	-27.6%				
Mng	82-93	-35.0%	-33.9%				
Tcd	71-80	-33.8%	-35.4%				
Source: Author's calculations.							

III) Episodic growth and slow moving variables

There is the very obvious econometric observation that it is very difficult to explain a squiggly line with a straight one. Or, alternatively put, it takes variation to explain variation.

This is obviously important when it comes to economic *growth* which, as I have just documented in a number of technical senses (lack of persistence, high medium run volatility, episodic) is very squiggly. While the relative *levels* of economic prosperity, which is the cumulative result of processes of growth, might be stable over time this is not true of "growth."

This implies that if measures of "institutions" tend to quite stable in most places and at most time, subject to either complete stability or gradual evolution, then it will be very difficult to make "institutions" explain much, if any, of the *variation* in economic growth, particularly over time within countries.

Table 6 makes this point at its most mechanical. Take four commonly used measures of "institutions"—bureaucratic quality, (lack of) corruption, law and order, and democratic accountability. The *level* of institutional quality on *level* of GDPPC is uniformly impressive at about .47.[5] However if one examines the R2 of the *level* of institutions on the growth over the 20 year period from 1985 to 2005 the R2 plummets from .47 to .07. That is, if I were predicting in 1985 which country would grow fast or slow over the next 20 years knowing the country's 1985 level of institutional quality would be of some, but not overwhelming, use.

Table 6: Strong correlation between the *level* of income and 'institutions' but almost no connection between growth and institutions and even less of growth and changes in institutions, even over a 20 year period

Dynamics:	Bureaucratic Quality	Corruption	Law and Order	Democratic Accountability	Average
	R-Squared of regressing either level or growth in GDPPC 1985-2005 on the level or change in "institutions"				
Level of income on level of	0.457	0.434	0.464	0.476	0.472
Growth of GDPPC on *initial*	0.094	0.064	0.077	0.058	0.074
Growth of GDPPC on	0.027	0.001	0.014	0.016	0.016
Number of countries (non-	92	92	89	89	
Initial Year	1985	1985	1985	1985	
Duration	20	20	20	20	

Source: Pritchett and Werker 2012, Table 8. GDPPC data from Penn World Tables 6.3, ICRG rankings for 'institutions'

[5] The similarity of the R2 across these four measures does raise the question of whether they are each measuring different things or are a proxy for the same thing (or load in the same way on the "principal component" of some underlying unobserved variable).

Moreover, the *change* in institutional quality has almost exactly zero predictive content for predicting economic growth. Countries whose institutions got "better" over this period tended to have no better *growth* than countries that did not.

A modestly more sophisticated version of this point is made by Hausmann et al who runs 10 year growth rates for 119 countries on log initial GDPPC, export performance, economic complexity index and the opportunity value (measures of the "product space" see below for the description of the product space). The incremental R2 of adding any of the six World Governance Indicators to this regression is less than .007 (from .461 to .468) and the incremental unadjusted R2 from adding all six is .024.

This also implies that attempt so explain the timing of accelerations (or decelerations) on the basis of "institutions" is bound to fail as there is just too little movement of the right type and timing in the usual measures to explain the massive changes in growth rates.

There is a deep tension between the methods and papers that are attempting to establish that "institutions" *cause* higher levels of economic productivity and the policy relevance of such research. That is, what most "policy makers" (and more broadly those engaged in whatever form in national policy dialogue) want is advice about how to initiate and sustain episodes of rapid growth and how to avoid sharp collapses and/or extended periods of stagnation. However, using events or factors that are immutable or were determined hundreds of years ago that create valid instruments for arguing that causality runs from institutions to prosperity cannot be directly relevant to most policy discourse for three reasons.

One, this persistence itself is suggestive that "institutions" are not easy to change. Dell (2010) brilliant paper showing that the imposition in the Spanish Empire from 1537-1812 of the *mita* has large persistence impacts today suggests that at least some "institutional" features that have negative impacts on outcomes have persisted for over 200 years. To the extent that an instrument determined hundreds of years ago (in the functional if not specifically econometric sense) has a good "first stage" fit (again, metaphorically in addition to literally) this implies there is a great deal of time series persistence, more like a "characteristic" (like height) than a "condition" (like being bored). The implication of the survival rates of colonialists being a good first stage instrument for quality of institutions is that institutions might only change at "critical junctures" and not easily (if at all) through volitional actions of current actors.

Two, obviously the timing of growth episodes can only be weakly predicted by slow moving variables—even if "institutional" characteristics do predict the average *propensity* for events of a certain type. So "weak institutions" may explain *that* country growth rates will be volatile or that a county is at high risk of a bad growth episode this doesn't mean that it can explain the timing.

A useful analogy might be earthquakes. Very long-run features of a place's conditions can explain a *propensity* for earthquake activity versus another place. However, this may not be at all predictive or provide guidance for actions to avoid quakes. That is, while being near a fault like increases the likelihood of an earthquake there is very little prediction of the timing (even to within decades) of such events or their magnitude. Neither does a prediction of a propensity lead to useful advice about how to avoid an earthquake. Of course one can mitigate the damage of an earthquake through purposive action—like strict and strictly enforced building codes—and hence institutions predict damage from earthquakes even if not earthquakes or how to avoid them

(Kahn (2005), Raschky (2008)).

Three, a common inference from empirical work about economic growth and "institutions" cannot be justified. That is, suppose one posits a linear regression model which relates the level of economic productivity (output per labor) to a measure of institutions. Then one establishes the "causality" of that relationship by using a valid instrument for institutions. The frustrating part of this is that a valid instrument is almost by definition some empirical fact or feature that is not in the volitional control of current agents (e.g. the *mita,* comparative advantage for sugar plantations, colonialist survival rates). But to move to recommendations one has to maintain that an action capable of producing changes in institutions would have the same impact on outcomes as the changes in institutions caused by the instrument. This is the assumption that the model is truly linear with respect to the "institution" measure. But there is typically no reason at all to believe that.

Two issues: *asymmetry* between accelerations and decelerations and what measures of institutions measure and the informal versus formal distinction.

Asymmetry. One of the benefits of taking a transitions approach is that it is obvious that the symmetry of impact imposed in any linear model is unlikely to hold. That is, there is no reason to believe that whatever "institutional" events might be a precipitating factor in initiating a growth acceleration are the exact reverse of those that precipitate an extended negative growth episode. Table 7 just puts the seventeen largest positive growth episodes side by side with the seventeen largest negative growth episodes. Of course if one postulated a model in which some measure of "institutions" has some large positive impact on the likelihood of growth episodes and this were linear then one would expect that the positive episodes had a lot of it (or acquired a lot of it) and the negative episodes lacked it (or lost a lot of it) as precipitating factors in these episodes.

Put another way, if one looks at the negative growth episodes many are associated with conflict. One could say: "Weak institutions are associated with the onset of conflict and conflict is associated with large falls in output." But this doesn't work the other way, one cannot say "Strong institutions are associated with no onset of conflict and the lack of an onset of conflict is associated with a large positive growth episode." The absence of conflict is associated with average growth but almost by construction cannot be associated with rapid growth (as most countries lack conflict and hence growth among countries with no conflict must be near average growth).

Similarly with terms of trade. A number of negative growth episodes appear to be associated with negative shocks to export prices (e.g. Gabon, Trinidad and Tobago, Nigeria) in commodity dependent economies but few of the largest episodes of growth are started with a positive terms of trade shock (as most terms of trade shock initiated positive growth episodes were of limited duration hence small magnitude—which reveals again the importance of distinguishing between episode magnitude and the pure growth acceleration (change in growth)).

Table 7: Seventeen largest positive and seventeen largest negative growth episodes					
Country	**Years of episode**	**Percent gain in GDPPC during episode over the counter-factual PRM gain**	**Country**	**Period**	**Percent gain in GDPPC during episode over the counter-factual PRM gain**
Taiwan	62-94	447.1%	**Iran**	76-88	-82.7%
Indonesia	67-96	174.5%	**Afghanistan**	86-94	-69.9%
Egypt	76-92	148.0%	**Malawi**	78-02	-69.7%
China	77-91	117.2%	**Zaire**	89-00	-66.2%
Korea	62-82	113.4%	**Iraq**	79-91	-65.4%
Vietnam	89-10	104.8%	**Jordan**	65-74	-63.1%
Singapore	68-80	100.9%	**TTO**	80-89	-61.6%
Ireland	87-02	98.6%	**Jordan**	82-91	-60.5%
Laos	79-02	97.0%	**Somalia**	78-10	-57.7%
China	91-10	83.3%	**Nigeria**	76-87	-56.7%
Chile	86-97	77.4%	**Cameroon**	84-94	-51.3%
Puerto	82-00	63.6%	**Gabon**	76-87	-50.9%
Gabon	68-76	62.0%	**Sierra Leone**	90-99	-50.2%
Malaysia	87-96	62.0%	**Cote d'Ivoire**	78-10	-50.1%
Panama	59-82	60.9%	**Romania**	86-94	-47.4%
Malaysia	70-79	56.9%	**Madagascar**	74-02	-44.5%
Cambodia	98-10	52.1%	**Cuba**	84-95	-44.1%

Measurement. The second obvious issue is that perhaps "institutions" do change very rapidly but measures of institutions don't reflect that rapid change. This is a very deep and difficult question. Certainly to a large extent this hinges on the distinction between formal and informal institutions. Just examining the list of large growth accelerations for instance, it is hard to argue that there were positive changes in formal institutions at or around the onset of rapid growth in most of these instances, for two reasons.

One, there was demonstrably little change in formal institutions of governance in China in 1977 or Indonesia in 1967 or Vietnam in 1989 or Egypt in 1976 or Cambodia in 1998. There were announcements of "policy" or more broadly "policy stances" of governments but not "formal institutions."

Two, one could hardly say the typical discussions of "good" formal institutions were adopted any time at or around the onset of rapid growth. That is, if one takes many descriptions of "good" institutions for economic progress they often involve invocations of "protection of private property rights" or institutions that "facilitate market transactions" or "allow for innovation" and these would be embedded in formal institutions like laws and courts and

regulatory agencies and processes. This is almost precisely what *did not* happen (or has not been argued and proved happened) in nearly any of the largest growth episodes. No one has suggested that formal institutions protective of property rights in the usual North or AJR definition got better in a way that kicked off growth in Laos, Cambodia, Korea, Taiwan, Vietnam, Indonesia, China, Egypt, Singapore, etc. Nearly all of these episodes were associated with either the consolidation of power around a narrow but powerful authoritarian regime less than fully constrained by traditional "rule of law" (e.g. Indonesia, Korea, Taiwan) or a signal an existing powerful regime was open to new approaches but in mostly incremental ways rather than "big bang" reforms that impacted formal sector institutions (e.g. China 1977, Cambodia 1998, Vietnam 1989).

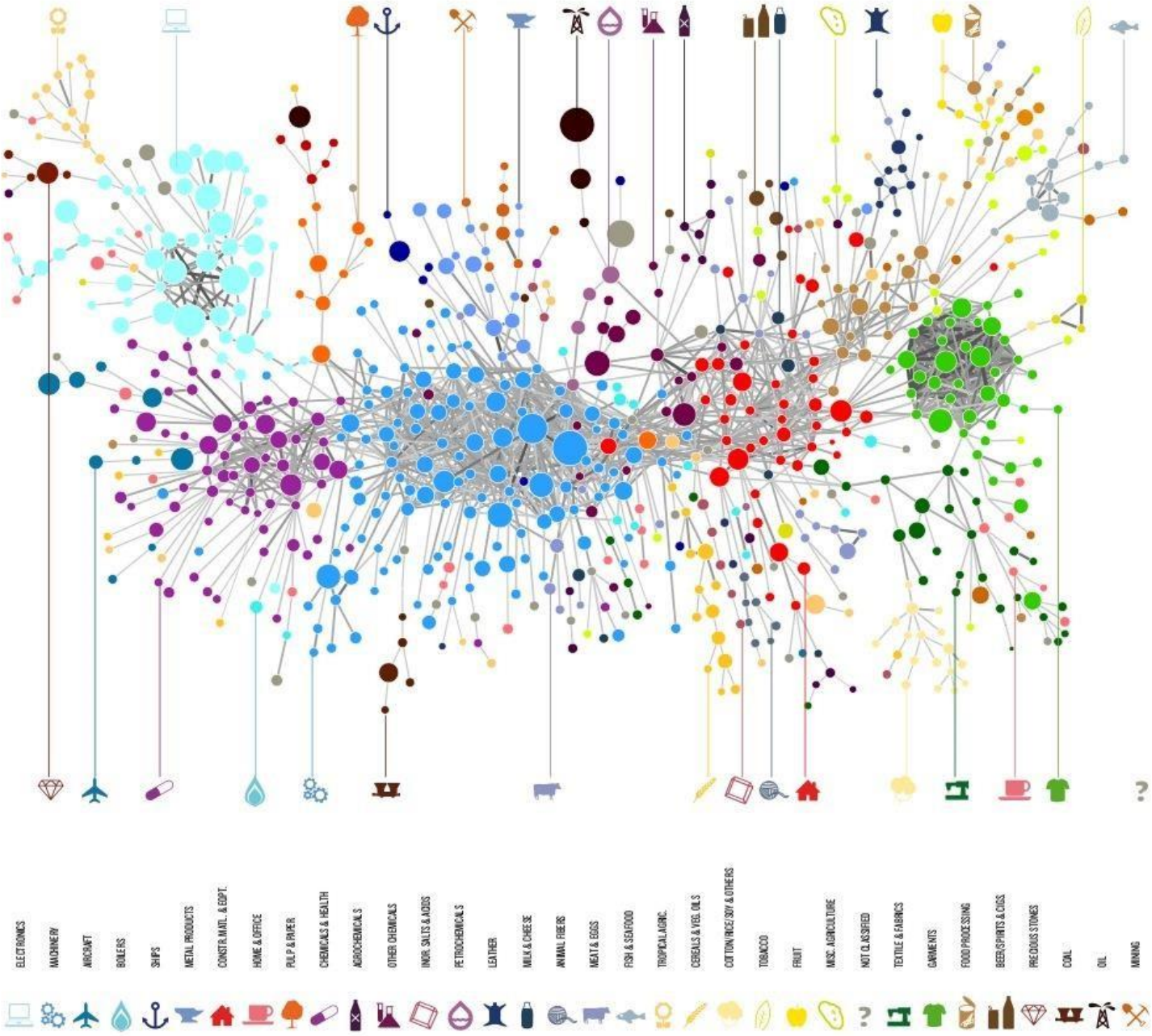
Further research is needed by just eyeballing the data the narratives of "political settlement" or "elite bargain" a la Mushtaq Khan (2010) or the political economy of "effective" states Kunal Sen (2012) or "closed ordered deals" Pritchett and Werker (2012) rather than adoption of "good governance" or "market supporting" formal institutions.

That is, one could argue that around the initiation of positive episodes actions of the governments created widespread changes in the beliefs of agents about the likely profitability of economic investment and innovation because their perception was the "rules of the game" had changed even if the actual policy or formal "institutional" changes were modest or incremental or even non-existent. One could then define a measure of "institutions" that was in fact volatile because widespread beliefs about the "rules of the game" could change even absent any (and forgive the language) "institutionalization" of the changes in the rules of the game. That is, nothing much about the courts or bureaucracy or laws or policies has changed but a powerful signal from a coordinated political settlement about directions or changes unleashes a positive dynamic. The major risks is that this risks circularity based on a definition of "institutions" that is unobservable. Growth episodes were initiated by improvements in institutions because institutions are what initiates growth episodes.

IV) Two possible ways forward for research on institutions and growth

IV.A) The Product Space, Structural Transformation, and Endogenous and Specific Institutions

The work of Ricardo Hausmann and Cesar Hidalgo (with many other authors--Hausmann and Hidalgo (2009),Hidalgo et al. (2007), Hausmann et al. (2013)) produced the idea of the "product space" which is a mapping of the structure of economic production (or exports) based on a network characterization of what exports/products tend to "co-locate." Figure 9 is a visual representation of the product space (the on-line version will naturally provide greater resolution). Each circle is a product where the size is proportional to total global trade and each grey line represents a "strong" connection (correlation) between products.

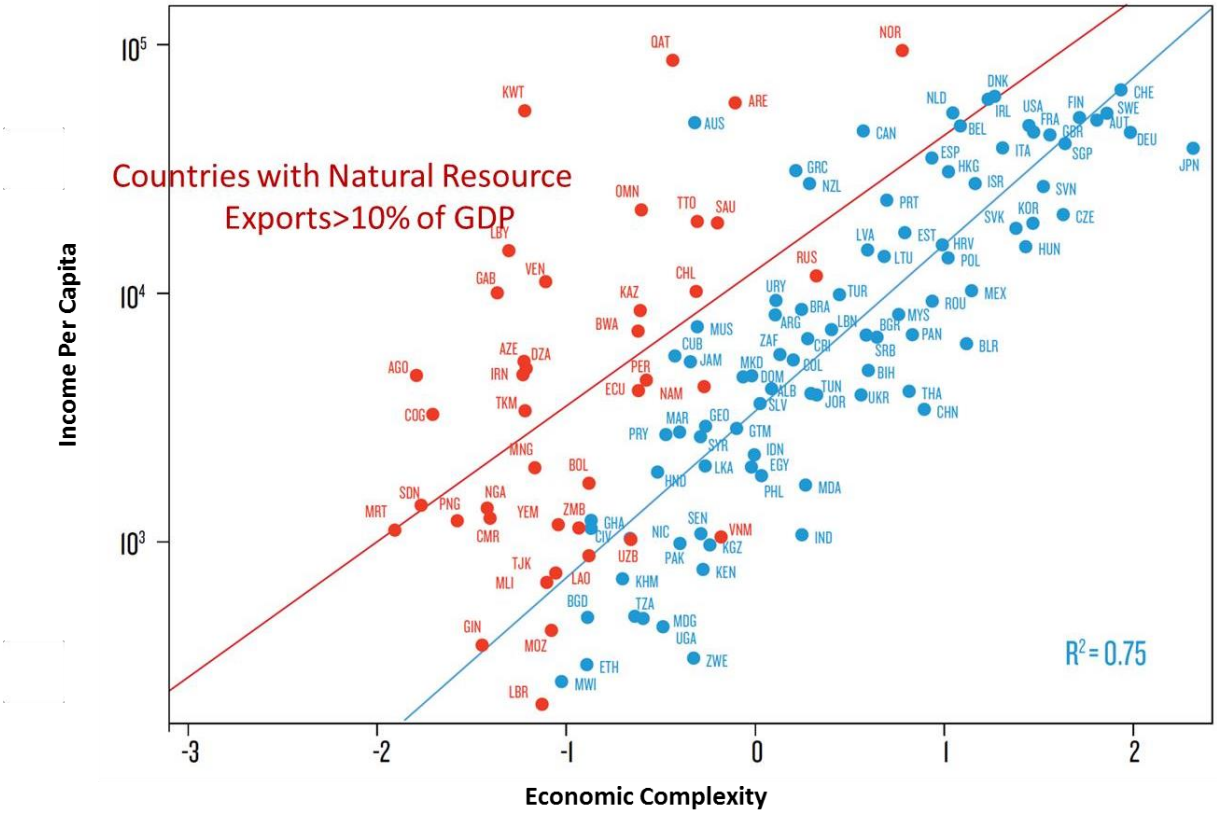

ELECTRONICS
MACHINERY
AIRCRAFT
BOILERS
SHIPS
METAL PRODUCTS
CONSTR.MATL. & EQPT.
HOME & OFFICE
PULP & PAPER
CHEMICALS & HEALTH
AGROCHEMICALS
OTHER CHEMICALS
INOR. SALTS & ACIDS
PETROCHEMICALS
LEATHER
MILK & CHEESE
ANIMAL FIBERS
MEAT & EGGS
FISH & SEAFOOD
TROPICAL AGRIC.
CEREALS & VEG. OILS
COTTON/RICE/SOY & OTHERS
TOBACCO
FRUIT
MISC. AGRICULTURE
NOT CLASSIFIED
TEXTILE & FABRICS
GARMENTS
FOOD PROCESSING
BEER/SPIRITS & CIGS.
PRECIOUS STONES
COAL
OIL
MINING

The product space is a much more data-driven classification of products that the standard sectoral classifications—as one can see from the color mapping in many ways "sectors" in the standard classifications like "garments" cluster together but some items of "garments are actually far in the product space from other garment products.

There are large clusters like "machinery" (blue) but parts of machinery are very near "chemicals" (purple) and others very near "construction materials" (red).

The analysis of country export patterns in the product space creates two easy notions: a country's *diversification* which is how many products a country exports and a product's *ubiquity* which is how many countries export a given product. If one combines these measures one can produce a measure of the *complexity* of each product as a product that has low ubiquity (exported by few countries) and exported by countries with high diversification. With that measure of complexity of each product one can add up the complexity of each country's products to produce a country *economic complexity index.* As Figure 10 shows this economic complexity index is high correlated with a country's GDPPC (particularly if one takes into account resource countries). Moreover, current economic complexity conditional on current GDPPC strongly predicts future economic growth.

Figure 10: Economic complexity index of a country's exports and GDPPC are highly correlated, particularly among non-resource exporters



Source: Hausmann et al. (2013)

A second measure of a country's export structure is a measure of the distance of the country's current export structure from products that it does not yet export. As the distance in the product space is predictive of the likelihood a new product will emerge in the countries export structure this is a measure of the ease of developing new exports and hence a measure of export flexibility. This measure is commonly called "open forest" as, if one visualizes the product space as a set of "trees" then if a country's current exports are in a dense part of the product space there are many nearby trees whereas if a country's export structure is exclusively in products that are far in the product space from other products (e.g. in Figure 9 "tropical agriculture" are in the far northwest) then a country is very far from other products has little "open forest" (nearby export opportunities) and hence little export flexibility.

This product space literature comes together with the growth and institutions literature in three related but distinct ways.

First, it is has long been argued that there is something like a "natural resource curse" (e.g. Sachs and Warner 1995, Auty 1993, Frankel 2010) although there is lingering disagreement both about the very existence of a "resource curse" and its causal mechanisms. Hausmann, Rodriguez and Warter (2006) study "growth collapses" as large negative growth episodes. Their argument is that it is not natural resources per se but having little export flexibility, in the sense of low "open forest" measures, that is associated with natural resources that produces negative shocks to exports which translate into large reductions in growth rates as countries are unable to reallocate factors into new export activities and hence the *duration* of the negative growth episode is longer when a country suffers a shock from a position of little "open forest."

The key question for research is what is the right measure of export structure than explains when a shock will lead to a large negative growth episode.

Second, the product space approach extends and deepens the narratives/models of connections between natural resources, politics, and institutions (e.g. Sokoloff and Engerman (2000)) in which natural resource endowments produce economic institutions adapted to the needs of specific industries and political structures consistent with those economic institutions. Isham et al. (2005) show that "point source" natural resources that generate concentrated rents lead to worse measures of "institutions" (using previous endowments as instruments for export structure).

One of the causal explanations of the structure of the product space are underlying "production functions" for products that are like high dimensional in "capabilities" (rather than low dimensional in aggregated factors like labor and capita) and with low substitutability across capabilities in a Leontief-like way. With this type of production structure products co-locate when there are non-traded capability inputs.

This leads to the question about the specificity of "institutions." That is, if one speaks about "property rights" or "contractual enforcement" there is a notion that these are "institutional" features that are roughly generic to an entire range of economic activities, that "property rights" (and its ancillary legal, policy and enforcement mechanisms) apply to real estate and intellectual property and labor and corporate structures and the property rights for producing/exporting cotton are the same (or same enough) as the property rights for producing/exporting movies or pharmaceuticals or insurance.

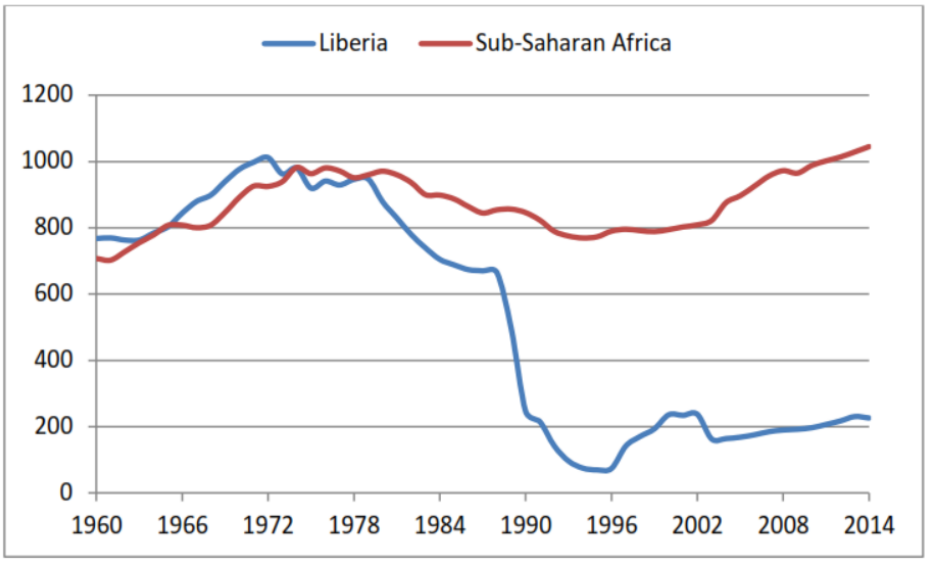
This is intimately related to explanations of the magnitude of growth episodes as *if* (italicizing if as a conjecture not fact) "institutions" are non-traded capabilities that are product specific the size and duration of positive growth episodes will depend on the *dynamics* of institutions during a growth episode. That is, *if* institutions are product specific then sustaining a boom that involves structural transformation in the sense of moving through the product space towards products with greater complexity will involve acquiring news sets of institutional capabilities.

Of course like everything this is in some sense of new instantiation of old ideas like Schumpeter's "creative destruction" applied to the domain of institutions and Hirchmann's idea of "unbalanced growth" producing pressures the responses to which create new possibilities and the literature about how at least part of the success of East Asia was maintaining "embedded autonomy" (Evans (1995), Rodrik (2005), Wade (1990)) such that the state could respond to the needs to emerging industries (but without being entirely captured by old industries).

The key question for research is how some countries manage to create and maintain an "embedded autonomy" that is capable of sustaining extended periods of structural transformation (as are exhibited in many of the large positive episodes) whereas others suffer from "capture" in which existing industries either are indifferent to or deploy economic power to curtail the emergence of capabilities ("institutional" and others) needed for new industries. Many countries rhetorically aim for "embedded autonomy" but end up "in bed with money."

Third, the combination of product space, institutions and politics can perhaps explain the mechanisms of state collapse. For instance, in the 1960s and 1970s Liberia was an above average Sub-Saharan African country in GDPPC and, at least in some ways, appeared to be better "institutionally" as well. Yet from 1979 onwards Liberia descended into economic decline, civil conflict and essentially the disappearance of a Weberian state. This is, tragically, far from a unique experience. Not just very poor states like Somalia or Zaire(DRC) or Yemen have had (or are in) periods of essential statelessness. Syria, for instance, was in the early 2000s a "middle income" country in GDPPC on a par with Indonesia or Egypt and has now descended into conflict and disorder.

Figure 11: Liberia collapse from middle income stated into complete chaos



The conjecture of Werker and Beganovic (2011) about Liberia for instance is that there is a connection between the market structure, the political settlement, and "institutions." In Liberia's case rents from exports such as iron ore provided a political settlement in which rents were translated into government revenue which translated primarily into government jobs for selected groups. This obviously meant that the actual functioning of state institutions played a secondary role to their functional role as buying off sufficient powerful constituencies. Hence there was little or no pressure for improvement of "state institutions" nor pressures for the extension of market institutions as the rents from natural resource exports were sufficient.

This meant that when there was a large negative shock to the rents from exports this not only had economic repercussions but, with a large enough shock eventually undermined the political settlement and the lack of organizations or "institutions" that were functionally justified meant that the existing settlement came completely unraveled—as there was essentially no other "social contract" or agreement on which even the continued existence of a state could be constituted.

A key research question is whether looking at Table 5 many of the instances of very large negative growth episodes were not cases in which some shock caused the basis of the political/institutional settlement to come unraveled (e.g. Iran, Iraq, Zaire/DRC, Somalia, Cote d'Ivoire) and it took a long time for even the most basic of functional political settlements to reconstitute a basis for even a stable "limited access order" that had "order." As such the level of GDPPC that can be sustained at the new, lower, degree of "institutions" is much, much lower than just an 'economic shock' of the magnitude of the loss would suggest.

IV.B) "Deals" economies, investment uncertainty, and political/institutional transitions

The second major path forward is to examine the inter-relationship between the formal or *de jure* regulatory environment and the actual ways in which business is done. As all "policies" or "laws" or "regulations" are mappings from states of the world to actions by specific actors the question arises of the capability of implementation. That is, there are many examples from individual cases studies of taxes (Gauthier and Gersovitz (1997),Khan et al. (2016)), simple regulation like driver's licenses (Bertrand et al. (2007)), or environmental regulation (Duflo et al. (2013)) and extending even to the basic operation of organizations like attendance of employees at health clinics ((Dhaliwal and Hanna, 2013), Banerjee, Duflo, and Glennerster (2008)) or police forces ((Banerjee et al., 2012)) that suggest that organizations in fact have little or no control over the actions of their agents and little or no ability to induce their organizational agents correctly declare the state of the world and act on that state of the world as policies would dictate. In this case the gap between the *de jure* and *de facto* becomes wide, if not complete, and the administrative facts are a complete fiction ((Pritchett, 2013)).

In a set of papers Hallward-Dreimeier and Pritchett (2015, 2010, 2011) show that with weak state capability for policy implementation the basic characterization of the conditions for economic activity are not determined by "rules" but rather are "deals." We regard a "rule" in which the outcome can be roughly completely and reliably predicted from applying the facts to the policy—e.g. if the sales tax is 8 percent and your sales are $100 the tax collected is $8— whereas a "deals" environment the outcome is predominantly influenced by elements not in the formal or de jure policy like influence activities (e.g. bribes) or personal or social connections or just randomness of enforcement.

A conjecture is that countries with “good institutions” are those in which economic actors/investor expectations can be reasonably grounded in rules and this can produce very steady growth. Whereas with “weak institutions” there is a “deals” environment but deals environments can be classified in two dimensions: whether the deal is “ordered” or “disordered” and whether the deals are “closed” or “open.”

An “open ordered deals” environment is one in which everyone who wishes to can engage in the influence activity and achieve a predictable result—that is, everyone might have to pay a bribe to get a passport or driver’s license but everyone can do it (no favoritism) and once received the driver’s license is valid and not ex post revoked.

A “closed ordered deals” environment is one in which deals are “ordered” (a deal, once struck, is only rarely revisited, reneged upon or revoked ex post) but in which access to the favorable deal is limited to specific individuals or entities. This can be described as “crony capitalism” in which favored firms (which could be favored for ethnic, political, or venal reasons) receive substantially favorable treating in contracting and regulatory treatment.

The idea explored in Pritchett and Werker (2012) is that the initiation of many positive growth episodes is not a move from “bad” to “good” formal institutions or even the adoption of “good” policies but rather the onset of a “closed ordered deal” environment in which a sufficient set of investors/actors can act with confidence of high expected returns. The beginning of Indonesia’s growth episode in 1967 is a classic, if not paradigm, case. The Soeharto regime followed a period of unrest and uncertainty under Sokarno and was born in massive and large scale and extended violence. However, once in place, the regime created an environment in which certain actors could invest with confidence.

There are three interesting research questions that flow from this fundamental approach of transitions within “deals” environments and growth episodes.

First, is the question of why some growth episodes are large because growth rates are sustained for many years whereas most are very short. The combination of the “market matrix” and the product space provides a conjecture. The “market matrix” classifies sectors as to whether they are “high rent” or “competitive” and whether they are “export oriented” or “domestic” with various labels as to the actors in each cell: Rentiers, Power-brokers, Magicians, and Workhorses. Many developing country economies are dominated by “closed ordered deals” in the high rent sectors in which political actors or their allies dominate the rent sectors. The “competitive/domestic” sectors are often either “open ordered deals” or “open disordered deals” environments in which the “informal sector” operates below or beneath the radar of formal regulatory enforcement.

Table 6: The Market Matrix: Alignments of Elites into Rentiers, Magicians, Powerbrokers, and Workhorses

	High-rent	Competitive
Export-oriented	RENTIERS Natural resource exporters, agricultural concession exporters	MAGICIANS Manufacturing and service exporters, other agricultural exporters
Domestic market	POWERBROKERS Legislative monopolies or oligopolies, natural monopolies or oligopolies, government services	WORKHORSES Importers, traders, retailers, subsistence farmers, local manufacturers, producers of non-tradeables

Source: Pritchett and Werker (2012)

In this market matrix structure the question is whether there is any space for Magicians—that is firms that have to export in a competitive environment. One conjecture is that growth episodes that create, one way or another, space for Magicians are able to have sustained structural transformation in the product space and hence sustain extended episodes of positive growth. In those cases in which "closed ordered deals" do not provide for Magicians and only live on rents then the nature of growth will be dependent on the existence of the rents, which is often transitory.

The deeper question is why do some political regimes appear to recognize the need for Magicians and are able to discipline themselves and their allies to promote export success whereas others live on the rents until they die (often untimely deaths).

Second, there is the question of the interaction of the political and economic institutions. Whereas "closed ordered deals" environments are consistent with, if not conducive of, rapid economic growth they are clearly more compatible with authoritarian than democratic regimes. Nearly all of the largest growth episodes in Table 3 were initiated and sustained in periods with very weak formal electoral democracy. However, sustaining "closed ordered deals" over extended period is difficult as its balance with political legitimacy (even when not democratic but especially when democratic) is knife edged. This is obviously related to the dynamics of the joint political and economic institutional dynamics of the "why nations fail" (Table 7) or the (North et al., 2009) explanation of why so few "limited access orders" become "open orders."

The key research question is how do growth regimes begun with a transition from "disordered" or "ordered" transition into the sustainable "good" cells in Table 7 of "good institutions" that are both politically and economically inclusive?

Table 7: Dynamics of "Why Nations Fail"

		Economic Institutions	
		Inclusive	Extractive
Political Institutions	Inclusive	↻	←↓
	Extractive	↑→	↻

Source: Acemoglu (2011) http://econ-www.mit.edu/files/6699

This is a particularly pressing question given the evidence that while democracies can obviously sustain economic growth at moderate pace the variance of growth across "democracies" is lower than across democracies which obviously has an upside and a downside. Nearly all rapid transitions to democracy in countries with high economic growth result in very substantial *decelerations* in the growth rate ((Pritchett, 2011).

Third, is the dynamics of state capability for policy implementation as the capability of formal state organizations under various "closed ordered deals" regimes. One of the tensions (one might say "contradictions") is that "closed ordered deals" almost by definition cannot be "institutionalized" in the sense of formally incorporated into the behavior of public sector organizations. This means that there is a potential for a negative dynamic between rapid growth and at least one measure of "institutions" as the very mechanism that sustains rapid growth is a formally illegitimate favoritism towards certain investors which requires that formal organizations do not have the capability for neutral enforcement of laws/regulations. That is, growth promoting closed ordered deals regimes fundamentally cannot promote 'rule of law' in the usual sense.

A key research question that emerges from this is a characterization of the *joint* dynamics of economic climate, political settlement and capability of formal state organizations. That is, the ideal situation might be one in which there is a positive feedback loops from economic structures to political structures to organizational capability. That is, economic actors want "rule of law" of market promoting laws, policies, and regulations that are "institutionalized" in strong organizations of implementation and that these are reinforced by widespread political/democratic acceptance of their legitimacy.

Table 8: Preferred Policy and State Capability of Elites in the Market Matrix

	High-rent	Competitive
Export-oriented	RENTIERS *Policy:* Low tax regime, reduced red tape, non-intervention *State Capability:* good infrastructure (can be cocooned), order, low capability to regulate, negotiate, enforce	MAGICIANS *Policy:* Low taxes, reduced red tape, *State Capability:* Market-friendly intervention (e.g. productivity, de-bottlenecking), good infrastructure (can be cocooned, e.g. Special Economic Zones)
Domestic market	POWERBROKERS *Policy:* Barriers to entry, high tariffs, market distortions *State Capability:* Weak institutions, lack of transparency, no bureaucratic autonomy, order without rule of law	WORKHORSES *Policy:* Low taxes, minimal red tape, good infrastructure (has to be general infrastructure) *State Capability:* Need some governmental capability (e.g. power, roads), would prefer "open order" to reduce costs from "powerbrokers) but will settle for open ordered deals.

Source: Pritchett and Werker (2012)

However, there are just so very many ways in which this can go wrong, which then may itself explain why in spite of the "advantages of backwardness" there has been so few countries maintained sustained convergence. As Table 8 suggests various private sector actors actually have very different interests in both "policy" and "state capability"/formal organizational capability. But a promising research agenda would be working out how, from a particular context, things could do right.

The research agenda of the Effective States for Inclusive Development (ESID) group (Sen 2012, 2014) has been doing case studies of the growth episodes of individual countries to flesh out how this "deals" environment with joint dynamics of politics (political settlements) and institutions play out and have done case studies of Ghana (Osei et al. (2015)), Malawi (Said and Singini (2014)), Rwanda (Behuria and Goodfellow (2016)), with other country studies (e.g. Bangladesh and India underway forthcoming in a book).

Conclusion

This review paper made four points.

One, the “institutions” approach to economic growth has to account for not just one but several fundamental features of growth in developing countries. At the very least an adequate theory should jointly account for:

- (the general lack of (unconditional) convergence in the recent period (as well as perhaps the “great divergence”) or that GDPPC growth rates have not been more rapid on average in countries beginning from a lower base.

- The higher *variability* of growth rates across the initially poorer countries such that the post-WWII period has seen far and away the most rapid growth episodes in all of human history (e.g. Korea, Taiwan, Singapore, China (since 1977)) but also many countries with zero or negative growth rates.

- The higher *volatility* of medium term growth rates (not just “cyclical” in the usual sense) over time within countries.

Two, a basis of research into growth and growth dynamics should begin with a characterizationof a country’s growth experience into episodes with a dating and estimates of the “magnitude” of each episode. One such method is proposed and described.

Three, the “product space” in export/production structure and the characterization of country’s (or regions) export/production structure in terms of its “economic complexity” provide a rich empirical basis for describing “structural transformation” and hence rich hypothesis about how product structure affects and is affected by institutions at a more specific level than economy wide.

Four, a fundamental issue facing countries with “weak institutions” is the gap between de jure and de facto (or “formal” and “informal”—although these terms are used for very (too?) many different concepts) and hence a big research agenda is the joint dynamics of economic growth, political settlements and “institutions” (including the capability of state organizations to implement law/politcy/regulation).

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