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Trillions Gained and Lost: Estimating the Magnitude of Growth Episodes.

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Abstract

We propose and implement 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. The magnitude of the gain or loss from a growth episode combines (a) the difference between the post-break growth rate versus a counter-factual 'no break' growth rate and (b) the duration of the episode to estimate the difference in output per capita at the end of an episode relative to what it would have been in the 'no break' scenario. We use three 'counter-factual' growth rates that allow for differing degrees of regression to global average growth: 'no change' (zero regression to the mean), 'world episode average' (full regression to the mean) and 'unconditional predicted growth' (which uses a regression for each growth episode to predict future growth based only on past growth and episode initial level). We can also calculate the net present value at the start of an episode of the gain or loss in output comparing the actual evolution of output per capita versus a counter-factual. This method allows us to place dollar figures on growth episodes. The top 20 growth accelerations have a Net Present Value (NPV) magnitude of 30 trillion dollars—twice US GDP. The top 20 growth decelerations account for 35 trillion less in NPV of output. Paraphrasing Lucas, once one begins to think about what determines growth events that cause the appearance or disappearance of output value equal to the total US economy, it is hard to think about anything else.

Keywords: growth magnitude; growth episode; acceleration; deceleration; net present value

JEL Classification: C18, O11, O47

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1. Introduction

> "Is there some action a government of India could take that would lead the Indian economy to grow like Indonesia's or Egypt's? If so, *what,* exactly? If not, what is it about the 'nature of India' that makes it so? The consequences for human welfare involved in questions like these are simply staggering: Once one starts to think about them, it is hard to think about anything else."
>
> (Lucas 1988: 5; italics in original)

Why there are such significant and persistent differences in living standards across countries is one of the most important and challenging areas of development policy. Much of the focus in the academic and policy literature on 'growth' has been on steady-state or long-run average rate of growth of output per capita, or equivalently, comparing *levels* of income. But the focus on *one single* growth rate for a particular country misses the point that most countries observe dramatic fluctuations in growth of per capita income. Following Pritchett (2000), it has been increasingly recognised that differences in 'steady state' growth rates account for a relatively small part of the observed cross-national differences in medium to long-run economic growth among developing countries[1]. 'Steady state' growth rates are bounded below by zero (as otherwise the economy reaches negative output in finite time) and historical observation on the economically leading countries suggests 2 percent per annum (ppa) as an upper bound. Yet the variance in decadal growth rates in developing countries is much larger, with countries experiencing both very high growth rates and very sharp contractions (Jones and Olken, 2008).

The combination of the large variance in medium to long term growth rates combined with the lack of growth persistence and strong regression to the mean (e.g. Easterly *et al*., 1993) suggests that developing country output growth is not well described by a 'business cycle' around a 'steady state' growth rate but rather is an 'episodic' phenomena with countries undertaking discrete shifts from periods of low to periods of high growth and vice versa (Pritchett, 2000), 'the cycle is the trend' (Aguiar and Gopinath, 2007) or 'start-stop' growth (Jones and Olken, 2008).

Since Ben-David and Papell (1998), several papers have estimated the structural breaks in the growth process (and their correlates). Some of these papers focus on accelerations/takeoffs (Hausmann *et al.*, 2005; Aizenmann and Spiegel, 2010), others on decelerations/depressions (Rodrik, 1999; Hausmann *et al.,* 2006; Arbache and Page, 2007; Breuer and McDermott, 2013). While most focus on the magnitude of growth *rate* differences, recently Berg *et al.* (2012) estimated the duration of growth episodes and its correlates.
However, none of these studies provide estimates of growth magnitudes during episodes of accelerations and decelerations - the cumulative impact on per capita income during a

[1] In the first wave of growth theory Hicks (1965) pointed out that since, almost by definition, a steady state dynamic equilibrium had to have constant ratios (e.g. in sector composition of output and labour force, capital-output ratios, etc.) and the process of 'development' was precisely about such issues, that growth theory was the domain of economics perhaps of *least* relevance to development.

growth episode combining both growth rate differences before and after the start of an episode and the duration of the episode. In this paper, we provide estimates of the magnitude of income gains and losses during growth episodes. By doing so, we provide a quantitative context for policy reforms, and an assessment of the nature of income gain or loss we may expect with policy or institutional reforms in developing countries. The importance of 'institutions' in determining *levels* of national output per capita combined with the persistence of the long-run structural, historical and political factors that shape institutions suggests there may be no feasible '*what,* exactly' that will change economic outcomes.[2] Yet, as we document here, there are cases in which identifiable accelerations and decelerations of economic growth cause spectacular gains and losses in output.

Our estimation of the *magnitude* of countries' growth accelerations and decelerations builds from the identification of the structural breaks in the GDP per capita growth process using the latest version of the Penn World Tables (PWT7.1) using a combination of Bai-Perron (1998) and a magnitude filter for 'true' breaks based on the difference in growth rates (Kar *et al.,* 2013). The definition of the magnitude of growth episodes allows us to decompose the total change in GDP per capita into the sum of the magnitude of the positive and negative contributions of each episode.

We propose both a flow and a stock measure of the magnitude of a growth episode. The flow measure 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. The stock measure computes the total net present value of the difference between the actual trajectory of output during the episode and the predicted trajectory. These definitions of magnitude combine in an intuitive way the change in the growth rate due to the episode and the duration of the episode. An acceleration to a modest growth rate which is sustained over decades will have a larger magnitude than a large but short-lived burst.

Making these definitions operational requires an estimate of the 'counter-factual' growth rate. For each growth episode we implement three counter-factuals: (a) the country's growth rate in its previous episode, (b) the world average growth rate and (c) an 'unconditional predicted' growth rate. The 'unconditional predicted' 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.

In 1988, when Lucas wrote, many thought the 'nature of India' condemned it to a modest 'Hindu rate of growth'. But, according to our estimates, GDP per capita growth in India accelerated in 1993 to 4.23 per cent per annum (ppa) versus a predicted rate of 2.34 ppa and then accelerated again in 2002 to 6.29 ppa versus a predicted rate of 2.91. The net

[2] Acemoglu and Robinson (AR, 2012) and North *et al.* (NWW, 2009) both argue for the importance of institutions ('inclusive' for AR and 'open access orders' for NWW) in determining levels of national output adding to the econometrics of 'institutions rule' (Rodrik *et al.,* 2004; Easterly and Levine, 2003). Comin *et al.* (2010) take this to the extreme of showing that patterns of technological adoption in 1000 BC affect levels of the GDP per capita today.

present value (at a 5 percent discount rate) of the additional output from the 2002 growth acceleration was 2.65 *trillion* dollars (PPP) adding to the 1.05 *trillion* dollar Net Present Value (NPV) of output gain from the 1993 acceleration for a total NPV gain from growth accelerations 1993 of 3.7 trillion dollars.

Conversely, Brazil's was a 'miracle' country from 1967 to 1980 growing at 5.16 ppa. But growth decelerated sharply in 1980 to essentially zero and stayed low until 2002. We estimate the NPV of the lost output from this slowing of growth relative to its prediction to be 7.3 *trillion* dollars.

We document 30 cases of NPV gains from growth accelerations that are more than triple initial GDP per capita and 32 cases where the NPV of losses from decelerations exceeded three times the initial GDP per capita. These *changes* in growth are much harder to explain as pre-determined—by history or institutions or otherwise—as often quite similarly situated countries launch into new paths, different from their own history and from their neighbours.

In this paper, we do not provide a causal explanation of the growth episodes we document, nor what explains the size of these episodes in terms of income gains and losses. By documenting the magnitude of gains and losses, we set the stage for examining 'what, *exactly'* can be done, which remain the most consequential research question in development economics.

The rest of the paper is in four sections. In Section 2, we first outline the procedure we use to identify structural breaks in growth rates. We then describe our proposed method of estimating the 'flow' and 'stock' magnitudes of growth episodes, and provide examples of the method, as applied to selected countries. In Section 3, we show how our method allows us to decompose country growth experiences in a different way than is usually done in the literature using average growth rates. We provide a detailed characterisation of the growth accelerations and decelerations that we identify. Section 4 discusses the estimates of greatest NPV gains and losses, as measured by unconditional predicted growth rate counter-factual. Section 5 concludes.

2. Estimating the magnitude of a growth episode

To identify episodes of growth accelerations and decelerations, we adopt a procedure for identifying structural breaks in economic growth that uses the Bai-Perron (BP, 1998) procedure of maximising 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 then the second stage is the application of a filter to the breaks identified in the first stage.[3]

[3] 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 a unified approach to identifying growth episodes (see Kar *et*

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 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.[4] Application of this procedure to the PWT7.1 data for 125 countries[5] for 1950-2010 identified 316 structural breaks in growth, with some countries having no breaks (e.g. USA, France, Australia) and others having four breaks (e.g. Argentina, Zambia). Table A1 in the Appendix provides a list of every country with any structural breaks with the timing and magnitude of each break (see Appendix Table 5 for the list of country codes).

al., 2013 for an explanation of why the unified approach avoids the pitfalls of pure statistical and filter-based approaches).

[4] 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.

[5] 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).

2.1. Estimating the 'Flow' Magnitude of Growth Accelerations and Decelerations

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

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

The three obvious counter-factual growth rates depend on what is assumed about regression to the mean.

'No change': 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.[6] In this case the magnitude of the total gain/loss from the episode is:

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

'World Average': Growth during the episode is world average growth during the episode. Alternatively, complete regression to the mean assumes the growth rate during the episode would have been the world average growth during the same period.[7]

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

'Unconditional predicted': Growth during the episode is predicted from past growth. The awkward phrase 'unconditional predicted' growth means that we want to 'predict' the growth rate of a country during the period of the episode without using any information about the country – e.g. region, geography, institutions, policies – other than its own past output. We want a clean separation between the *measurement* of the magnitude of the growth episode and potential correlates or causal *explanations* of the growth episode.

The unconditional predicted 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.

[6] The 'counter-factual' growth rate is the coefficient from an OLS regression of ln(GDPPC) on a time trend over the pre-break period.
[7] 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 of the 'unconditional predicted' 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 have different dynamics that the slowing of accelerations), with the 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')[8]. The error term of the regression is given by ε^{j}.

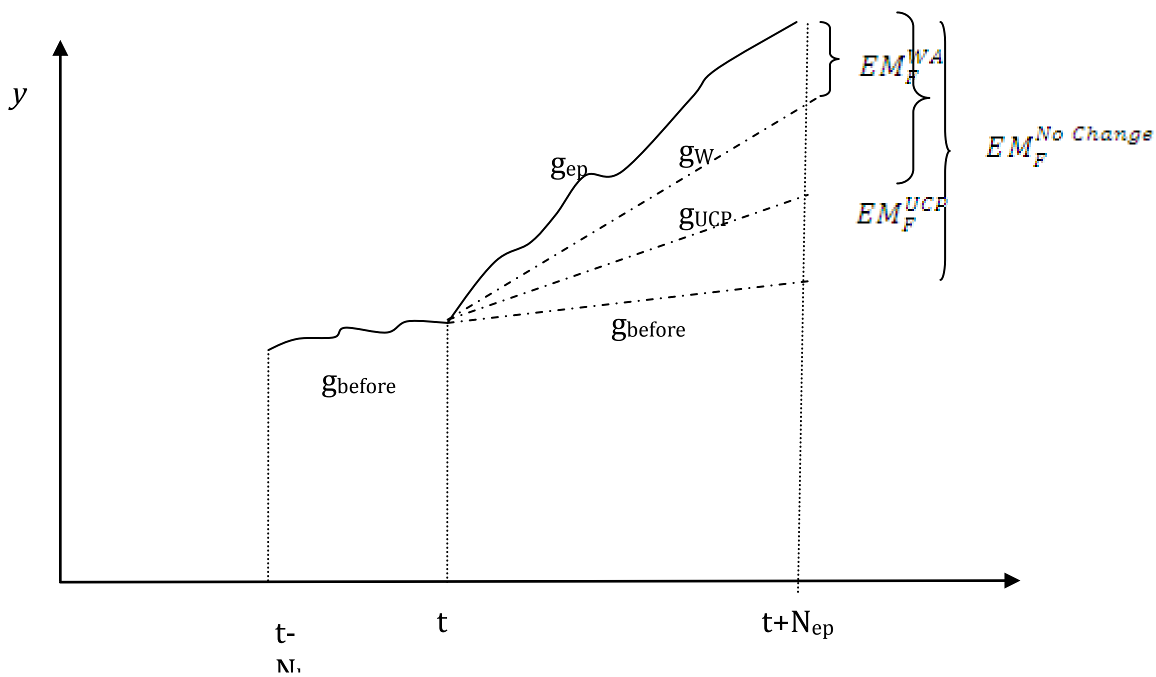
The magnitude of a growth episode, using the 'unconditional predicted' growth as the counter-factual growth rate, is given by:

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

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 change' counter-factual implies a very large magnitude, the 'world average' counter-factual a small magnitude (as the post-acceleration growth is not much higher than the world average). The unconditional prediction 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 WA or UCP counter-factual a growth acceleration could have a negative magnitude (or a growth deceleration a positive magnitude).

8 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.

Figure 1: Illustration of the alternative definitions of the magnitude of an episode depending on the specification of the counter-factual growth rate (for an acceleration from stagnation)



Our preferred specification uses the UCP counter-factual. Zero regression to the mean (No Change) or full regression to the mean (World Average), while easy to understand, impose strong and empirically unsupported assumptions about the actual dynamics of growth which is strongly, but not fully, mean reverting.

Table 1 summarises the regressions for calculating the unconditional predicted growth rate (the results for each episode are in Appendix – Table A2). The regression constant, not surprisingly, shows substantial variability over time, as the 'predicted' growth rate was positive from 1958 (the first possible growth break as spells have to be at least 8 years) to 1975, negative from 1975 to 1995 and then strongly positive from 1995 to 2002 (by construction the last growth break) as there was exceptionally strong growth.

The spline shows strong, and modestly asymmetric, regression to the mean. Countries with below world median growth show almost no persistence—the average coefficient on previous growth is only .175 while those with above average growth tended to have more persistence—but still show strong regression to the mean. Since each country/episode regression is for different periods of 'before' and 'after' we adjust to a 'standard' of the persistence coefficient for an episode 10 years in duration, starting after an episode of 10 years duration in 1980. We see the asymmetry is, if anything, stronger with very near zero persistence of slow growth (.12) and substantial (but far from full) persistence of .388 for rapid growth.

Table 1: Summary of the 314 country/episode specific regressions used to compute 'unconditional predicted' growth rates

		Regression constant	Coefficient on level of ln GDPPC at beginning of episode	Persistence coefficient (previous growth below world median)	Persistence coefficient (previous growth above world median)
Average		0.77%	0.001	0.171	0.338
'Standardized' persistence (impact of past growth on predicted growth) of an episode beginning in 1980, following an episode of 10 years and lasting 10 years				0.125	0.388
Std. Deviation		3.81%	0.0038	0.348	0.319
Before	1975	1.16%			
Between	1975 and 1995	-1.25%			
After	1995	7.37%			

Source: based on regressions reported in Appendix Table A2.

2.2. Estimating the 'Stock' Magnitude of Growth Accelerations/ Decelerations

Once the flow magnitude of a growth episode (acceleration or deceleration) is defined as above it is easy to define the stock or net present value (NPV) magnitude of the episode. The 'stock' estimate of the total gain, discounted to the beginning of the episode, is simply the sum of the discounted differences in annual output from the beginning to the end of the episode (equation 6). This NPV of additional GDP is expressed in the same units as GDP and hence in this instance in constant units of purchasing power. The counter-factual output series can be calculated from the beginning to end of the growth episode with any of the three counter-factual growth rates.

$$6)\ Episode\ Magnitude_{NPV}^{NC,WA,or\ UCP} = \sum_{n=1}^{n=N_{ep}} \left((\delta^n)\left(y_{t+n}^{Actual} - y_{t+n}^{Counter\ factual}\right)\right)$$

Where the discount factor is the standard $\delta^n=1/(1+r)^n$.

This is a 'gross' not 'net' concept of NPV. For instance, if growth is higher because people save and invest, thereby raising the capital stock which in turn raises output, we do not deduct out the cost of the savings in assessing the NPV. This is therefore not (yet) directly comparable to NPVs as used in cost-benefit analysis of specific projects or policies.[9]

[9] In continuous time, the counter-factual path of income per capita is $y_{cf}(t) = y_0 e^{g_{cf}(t)}$, where g_{cf} is the counter-factual growth rate (however measured). There are, then, two measures of income gain and

This calculation of the total (NPV) magnitude of growth episodes is purely descriptive. We allow the data to say 'something happened in year t that changed the trend rate of growth of GDPPC that lasted for N years'. We then calculate the total (NPV) of the difference in output between what happened over those years relative to a counter-factual series of output and this is the total (NPV) of the output that existed (or did not exist) because of what happened in year *t*. This does not prejudge in any way, shape, or form what it was that happened in year t – a terms of trade improvement, a shift in animal spirits, a policy shift, a shift in expectations due to a political regime shift, a transmission of a global shock, technological innovation – to cause this growth shift.

2.3. Illustrative cases of estimates of the magnitudes of growth episodes

Our method is easily understood graphically. Figure 2 shows the results for Brazil with UCP results in the top and bottom panels on the left side and World Average results in the top and bottom panels on the right side.

The upper panel shows the evolution of GDPPC and of the fitted values of the spline regression. Our method identifies three structural breaks in the GDPPC series: (i) an acceleration in 1967 in which growth increased from 4.16 to 5.16 ppa (accelerations are marked with a green vertical line and upward arrow); (ii) a deceleration in 1980 of 5.20 ppa from 5.16 to -0.05 ppa (decelerations are marked with a red vertical line and a downward arrow); (iii) an acceleration in 2002 of 3.20 ppa from -.05 to 3.15 ppa. These acceleration and deceleration years create four episodes of growth (1950-1967, 1967-1980, 1980-2002 and 2002-2010). The colours along the bottom indicate the range of the growth rate during each episode: bright green is rapid growth (above 4 ppa), light green for moderate growth (between 2 and 4 ppa), beige for slow growth (0 to 2 ppa) and red for negative growth[10]. The red line shows the counter-factual evolution of GDPPC had growth in each of the episodes been exactly the UCP growth.

The lower panel of Figure 2 shows the calculated flow magnitude of each growth acceleration and deceleration. For instance, growth from 1967 to 1980 was 5.16 ppa whereas UCP growth was 2.87 ppa so the excess of the growth during this episode was 2.29 ppa and the episode lasted for 13 years so the level of GDPPC in 1980 due to the acceleration of 1967 is .30=(.0516-.0287)*13. (Almost) equivalently, GDPPC in Brazil in 1967 was \$3,166 and $3{,}166*(1.0516)^{13}=6{,}086$ is the level of GDPPC had Brazil grown at exactly its least squares growth rate whereas $3{,}166*(1.0287)^{13}=4{,}573$ is the level if had growth at exactly its UCP growth rate and ln(6,086)-ln(4,573)=8.71-8.42=.29.

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loss – the flow measure and the stock measure. Letting y(t) be the actual path of output per capita during the episode, the flow measure is the log of the ratio $y(T)/y_{cf}(T)=(g-g_{cf})*T$, where g is the actual growth rate of y and T the length of the episode in question. The stock measure is the integrand of the discounted difference between the actual path y(t) and counter-factual path $y_{cf}(t)$.

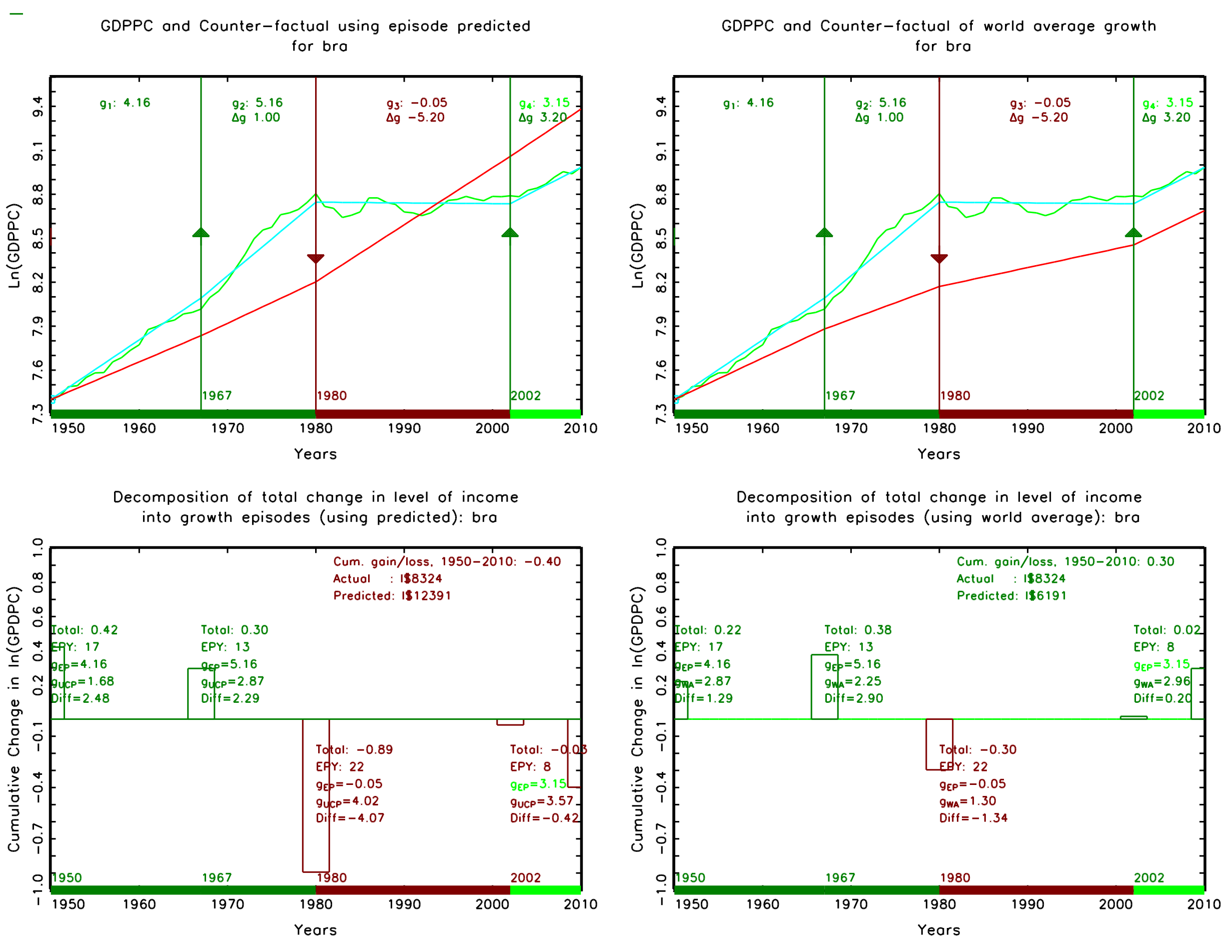
[10] Since the average growth rate is roughly 2 ppa and the standard deviation is roughly 2 ppa these categories are roughly one standard deviation above (light green) and below (brown) the mean and more than one standard deviation above (bright green) or below the mean (red). Our view is that the 'focal point' advantage of rounding to 2 trumps the exactness of using exactly the mean and standard deviation.

The deceleration in 1980 slowed growth to -0.05 ppa whereas the UCP growth was 4.02 ppa. This implies the level of GDPPC in 2002 was lower by (-.05-4.02)*22=.89 natural log units. Rather than $6,885 from the actual growth rate at the UCP counter-factual GDPPC would have been $16,653—140 percent higher.

The bottom panel shows the magnitude of each episode and the cumulative gain/loss of the country over the entire period compared to growing at the UCP counter-factual in each episode. Brazil's GDPPC in 2010 was $8,324 whereas its UCP output was $12,391so the cumulative total loss relative to the UCP counter-factuals is -.40.

The right hand panels follow exactly the same format but use the WA growth rate. These differ in predictable ways. The UCP growth was 4.02 for the period 1980-2002 based on some predicted persistence of the rapid growth of 1967-1980 so the loss was larger. In contrast WA growth was only 1.3 ppa in the 1980 to 2002 period so loss from the growth deceleration in 1980 looks considerably smaller. Also, since the counter-factual of WA growth is lower in each period the WA assumptions show Brazil in 2010 .30 ln units above the cumulated WA counter-factual.

Figure 2: Illustrating the calculation of the magnitude of growth accelerations/ deceleration episodes, Brazil



Source: Authors' calculations with PWT7.1 data.

The NPV calculations for the Brazilian episode illustrate the method and its variations (Table 2). Our 'base case' is the UCP counter-factual with a 5 percent discount rate. This gives a total loss of 7.5 trillion dollars. Intuitively, this loss is larger with a lower discount rate: 10 trillion at 3 percent whereas it is only 3.9 trillion at 10 percent. As can be seen from the figure the UCP growth rate is in between the World Average of 1.3 ppa and the No Change extrapolation of the previous period of 5.16 ppa. Obviously the loss (at 5 percent) using the World Average counter-factual is lower at 'only' 2.1 trillion and is much larger using the No Change counter-factual, 10.46 trillion.

Table 2: NPV of the total magnitude of the loss in output during the Brazilian growth episode, 1980-2002, billions of dollars.			
Discount rate:	Counter-factual growth series (actual growth=--0.05)		
	Unconditional Prediction (g=4.02)	World Average (g=1.30)	No Change (g=5.16)
.05	-7,547	-2,107	-10,459
.03	-10,062	-2,786	-13,991
.10	-3,937	-1,122	-5,408
Source: Authors' calculations			

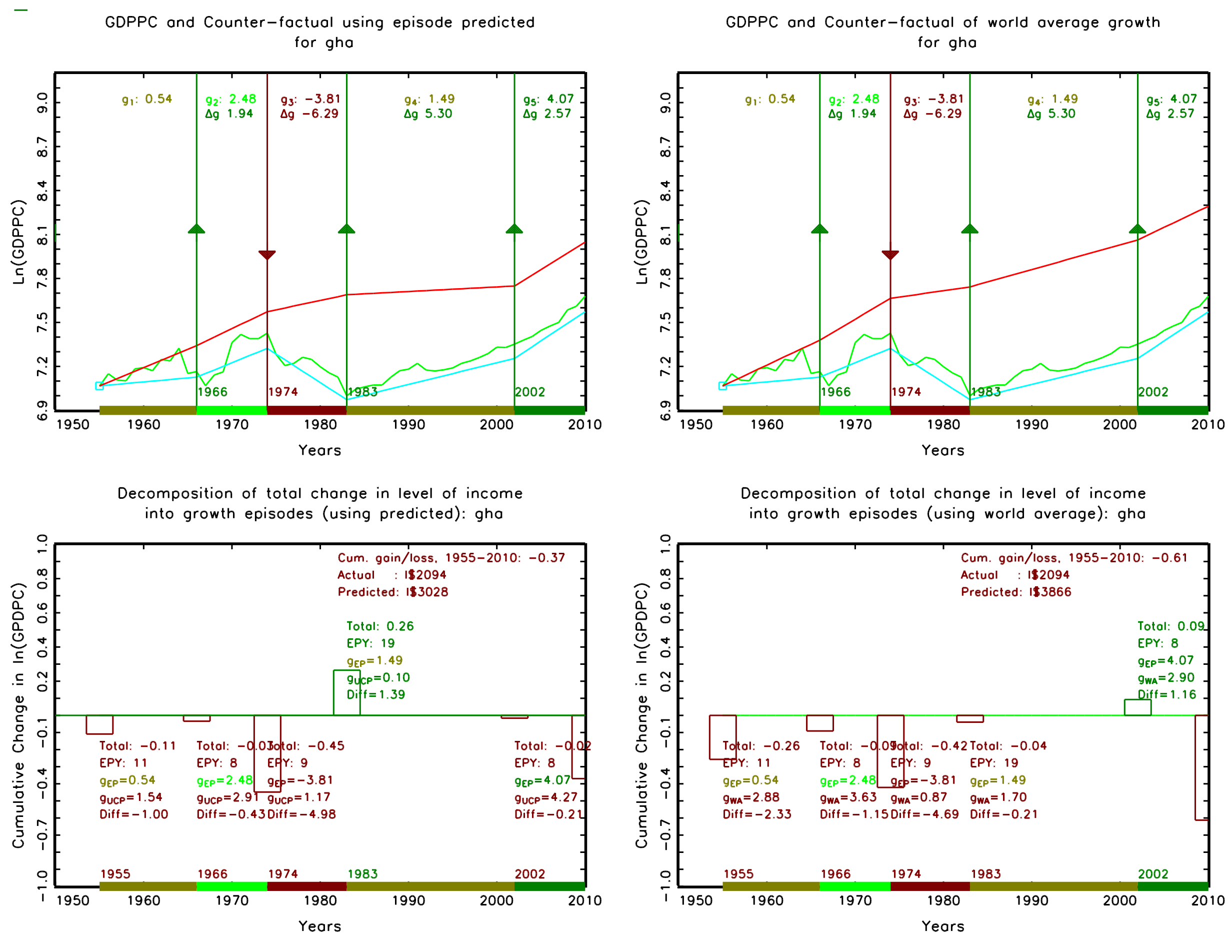
Figure 3 shows the same graphs for Ghana, which breaks Ghana's growth experience into five episodes (four breaks), 1955-1966 at .54 ppa, acceleration from 1966 to 1974 to 2.48 ppa[11], a massive deceleration to -3.81 ppa from 1974 to 1983, a recovery in 1983 but to growth of only 1.49 ppa, and finally an acceleration in 2002 to 4.07 ppa.

Ghana illustrates two aspects of our method. First, using the World Average counter-factual the growth acceleration in 1983 has a negative magnitude. The world average growth was 1.70 ppa from 1983 to 2002 so the growth acceleration in 1983, even though it is a massive acceleration in growth rates of 5.30 ppa (from -3.81 to 1.49) is estimated to be of negative magnitude as the magnitude of growth of 1.49 is still below the world average growth of 1.70. Since the UCP allows for some persistence the UCP counter-factual is growth of only .10 ppa so the growth episode magnitude is positive.

Table 3: NPV of the total magnitude of the gain/loss in output during the Ghanaian growth episode, 1983-2002, in billions of dollars.			
Discount rate:	Counter-factual growth series (actual growth=1.49)		
	Unconditional Prediction (g=0.10)	World Average (g=1.70)	No Change (g=-3.81)
.05	29.4	-5.4	91.2
.03	37.7	-6.95	115.9
.10	16.7	-3.1	52.8
Source: Authors' calculations			

[11] Ghana illustrates that our choice of a minimum 8 year period for growth episodes does force the timing of some breaks as visually it appears the recovery started in 1967 but our method cannot place breaks at 1967 and 1974.

Figure 3: Illustrating the calculation of the magnitude of growth accelerations/ deceleration episodes, Ghana

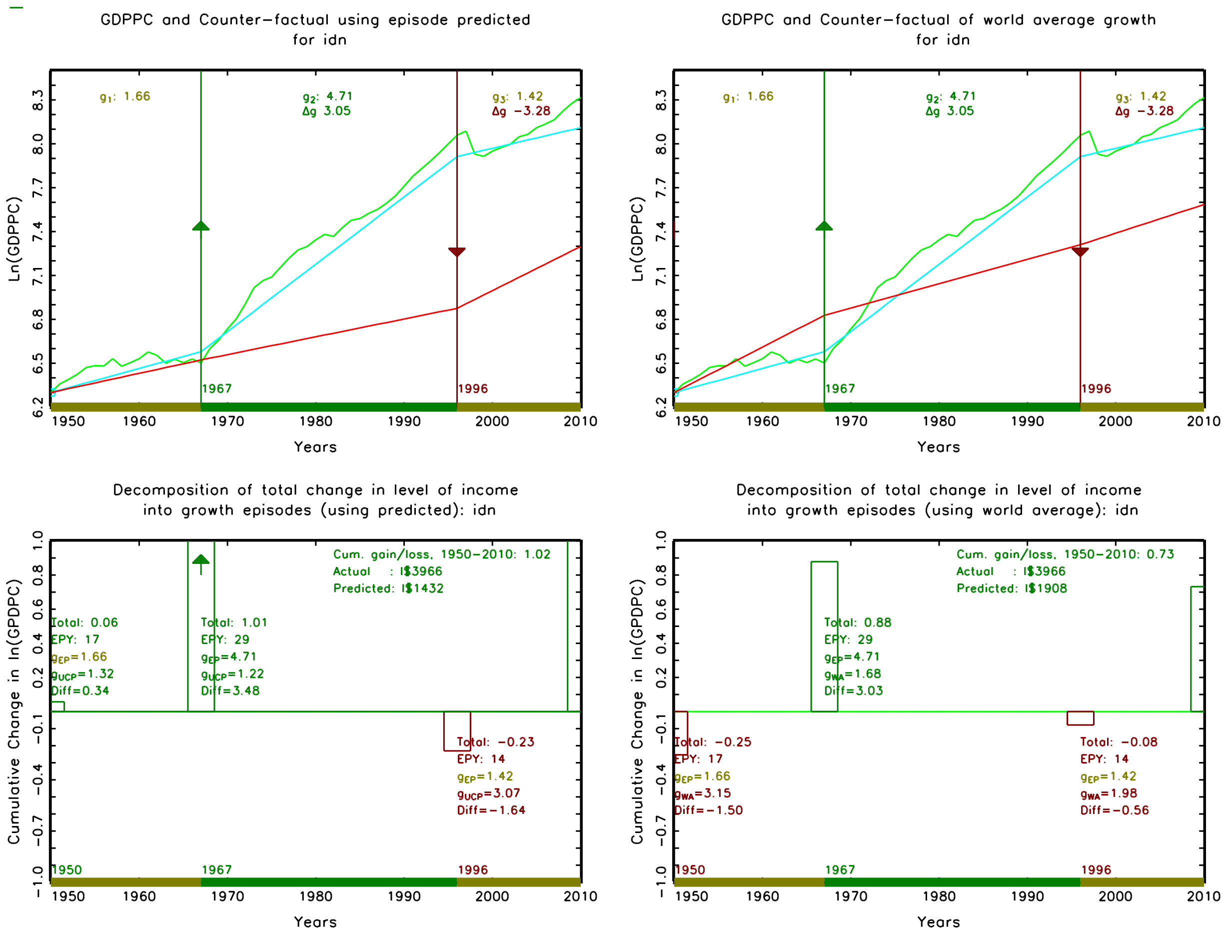


Source: Authors' calculations with PWT7.1 data.

The second aspect Ghana illustrates is that the No Change counter-factual tends to produce massive estimates of the gains from growth accelerations that are 'recoveries' from negative growth. No Change extrapolates rapid decline into the future so the gain from the recovery – even to slow or even less negative growth rates – produces large absolute estimates. Table 3 shows that using the same 5 percent discount rate the growth acceleration in 1983 either produced a 29 billion dollar gain with the UCP growth of .10, a 5.4 billion *loss* relative to the counter-factual with the World Average or a 91 billion dollar gain relative to the counter-factual that rapid decline continued. This is a major reason why we rarely use the No Change counter-factual as the data strongly reject that the projection of continued rapid decline is an empirically plausible counter-factual.

The experience of Indonesia, a country that had a very large magnitude growth acceleration, is illustrated in Figure 4. The method produces three growth episodes with an acceleration in 1967 and a deceleration in 1996. In 1967 growth accelerated from 1.66 to 4.71 for the 1967 to 1996 period. Since the UCP growth over that period was 1.22 the growth episode flow magnitude is 1.01 (since the absolute magnitude of the vertical scale is constant across all countries this does slightly off the top of the figure, as indicated by the arrow). The very sharp recession during the East Asia Crisis followed by a modest recovery produces a deceleration to growth of 1.42 ppa from 1996 to 2010 of magnitude -.23. The net result is that UCP predicted GDPPC was I$1432 whereas actual GDPPC in 2010 was $3966.

Figure 4: Illustrating the calculation of the magnitude of growth accelerations/ deceleration episodes, Indonesia



Source: Authors' calculations with PWT7.1 data.

Table 4 illustrates that the methods can agree as all three counter-factuals agree that the NPV of the gain from the growth acceleration in 1967 was around 1 trillion dollars. This is because over the long period of 29 years the unconditional predicted and world average growth are close (1.22 vs 1.68) so that the cumulative gain is 100 billion higher for the UCP and it just happens to have accelerated from previous growth of 1950 to 1967 also very near that magnitude.

Table 4: NPV of the total magnitude of the gain in output during the Indonesian growth episode, 1967-1996, in billions of dollars.			
Discount rate:	Counter-factual growth series (actual growth=1.49)		
	Unconditional Prediction (g=1.22)	World Average (g=1.68)	No Change (g=1.66)
.05	1,119	1,009	1,015
.03	1,648	1,489	1,498
.10	472	424	426
Source: Authors' calculations			

2.4. Basic summary statistics on growth episode magnitudes

Table 5 gives the summary statistics for each of the three counter-factuals, by all growth episodes (314) and accelerations and decelerations separately. The estimates of growth episode magnitude are differences in natural log units of changes in GDP per capita of end of episode actual versus counter-factual.

This table illustrates the importance of allowing for regression to the mean in the counter-factual. Our definition of an 'acceleration' or 'deceleration' is a Bai-Perron potential break that passes a threshold of magnitude in growth change. The median magnitude with the No Change counter-factual is .426 for accelerations and -.439 for decelerations as it presumes that, say, negative growth rates would stay negative rather than revert to, say, the world average. Once we allow for regression to the mean using either UCP or World Average the episode magnitudes are much smaller, UCP .206 and WA .187 for accelerations and UCP -.245 and WA -.205 for decelerations.

Table 5: Summary statistics of growth episode magnitude estimates (in units of natural log of GDP per capita)				
Counter-factual used		All	Only accelerations	Only decelerations
		314	153	161
Unconditional prediction	Median	-0.030	0.206	-0.245
	Std Dev	0.394	0.291	0.310
World Average	Median	0.000	0.187	-0.205
	Std Dev	0.380	0.310	0.332
No Change	Median	-0.062	0.426	-0.439
	Std Dev	0.709	0.486	0.390

The second point evident in Table 5 is the large variability in the magnitude of growth episodes. Taking UCP estimates the median is .206 with a standard deviation of .291 so the 'large' episodes are .497 or larger, implying gains in GDPPC of about 2/3 – larger than the gap between say Indonesia and an upper middle income country like Tunisia. Similarly, growth decelerations lead to some very large losses.

In Figures A1 and A2 of the Appendix, we show the correlations of growth magnitude – UCP with growth magnitude – No Change (NC), and growth magnitude – World Average (WA) respectively. The UCP and WA measures are highly correlated (.89) which is not surprising as the strong 'regression to the mean' in the regression estimates of predicted growth implies that UCP as a weighted average of past growth and the period world average with more weight on world growth. In contrast, there is weaker correlation between the UCP and NC measures. In Figures A4 and A4 in the Appendix, we present scatter plots of growth magnitudes – UCP against growth duration (number of years of a growth episode) and the log of level of initial per capita income. While there is a weak positive correlation between the UCP measure and growth duration, there are many large growth magnitudes (in either direction) that are small in duration. Therefore, UCP growth magnitudes are driven mostly by differences in actual growth rates and UCP growth rates, and less by the duration of the episode. From Figure A4, we find little evidence of large magnitude episodes (in either direction) are correlated levels of initial per capita income, though the variance of these episodes tends to fall with higher levels of initial per capita income. This suggests that while accelerations and decelerations occur at all levels of income, the magnitude of these episodes tend to be smaller as a country gets richer. We return to this finding in the next section, where we look at accelerations and decelerations in more detail.

3. Decomposing country growth experiences into episodes of accelerations and decelerations

These estimates of the magnitude of growth episodes allow a different characterisation of countries' growth experiences. The average growth rate is often inadequate as a representation of country's growth experience over an extended period. This is particularly true for countries with moderate growth. Rapid growth requires substantial time in episodes of rapid growth. Very slow growth requires substantial time in episodes of negative or slow growth. However there are two entirely different paths to 'moderate' growth. Some countries with moderate growth spent most time in episodes of moderate growth. Other countries with moderate growth were 'boom and bust' countries which had both large positive episodes and large negative episodes.

Table 6 classifies the 119 countries with at least structural break into four categories based on the results of the calculations of the flow magnitude of episodes using the world average counter-factual.

There are 30 countries which are 'high growth' defined as having their total gain in (ln) GDPPC over their available data relative to world average growth of .4 units or higher. This implies a 2010 level of GDPPC 50 percent higher than had the country grown at the world average pace in each of its growth episodes. Strikingly, of these 29 all but six (Trinidad and

Tobago, Panama, Dominican Republic, Oman, Egypt, and Botswana) are from the OECD/Eastern Europe or Asian regions. There are two clear regional concentrations of high growth: East/Southeast Asia (China, Taiwan, Singapore, Korea, Hong Kong, Japan, Vietnam, Malaysia, Laos, Thailand, Indonesia) and the periphery of Europe (Bulgaria, Spain, Greece, Ireland, Finland, Romania, Cyprus).

Table 6 divides the 46 countries with 'middle growth' – which are countries than gained less than .4 but also did not lose relative to the world average more than -.4 – into 'stable' and 'boom and bust' countries. The 19 'boom and bust' countries are those whose largest single episode was bigger than .25 *and* whose smallest episode was loss of more than -.34. The rest are 'stable'. The *average* growth rates of the two categories of 'middle growth' countries are exactly the same – 2.0 ppa but the *pattern* of growth is entirely different. This is clear from Figure 5, which compares four middle growth countries – two steady growers (Colombia and Turkey) with two 'boom and bust' countries (Chile and Iran).

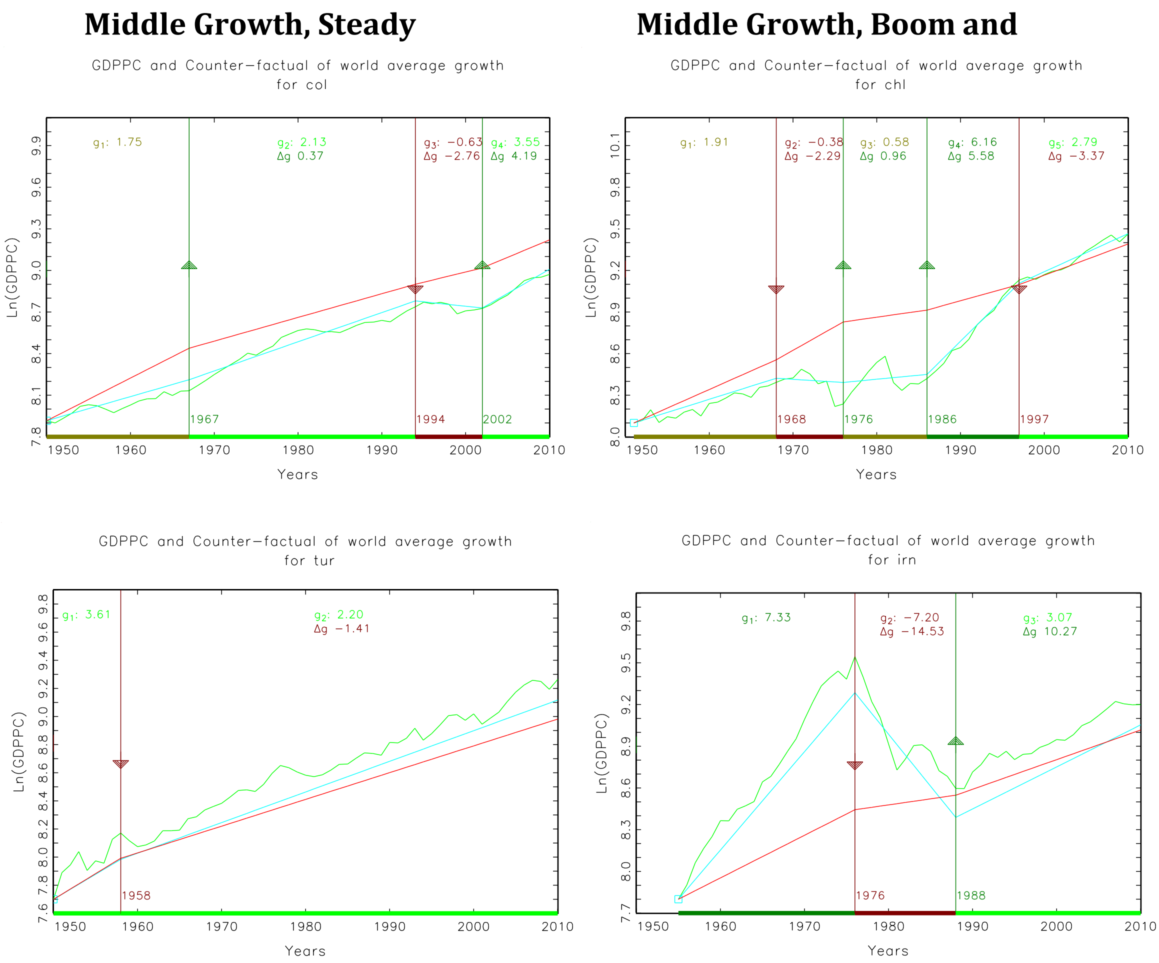
The clear pattern is that nearly all of the 'core' OECD countries fall into the 'middle income, stable' category (Italy, Belgium, Denmark, Netherlands, Great Britain, Australia, New Zealand, Switzerland). Particularly if one includes the six countries with no structural breaks (USA, Canada, Sweden, Norway, France, Germany) it is clear that the (old) OECD countries were nearly all very stable growers and the periphery of Europe was mostly rapid or stable (Albania is the only exception).

Table 6: Countries classified based on their overall growth relative to world average growth and by the magnitude of their largest and smallest growth episodes

	N	Region/Country (countries are listed within their region from most to least rapid growth within that category (e.g. so Sri Lanka is slower than Indonesia but faster than Pakistan)		Median size of largest episode	Median size of smallest episode	Average rate of growth
High growth (total above .40)	29	OECD/EE	BGR, ESP,GRC,AUT,IRL, ISR, FIN, ROM, CYP,	0.621	-0.104	0.033
		ASIA	CHN,TWN,SGP,KOR,HKG,JPN,VNM,MYS, LAO,THA, IND,IDN, LKA,			
		LAC	TTO, PAN, DOM,			
		MENA	OMN, EGY,			
		SSA	BWA			
Middle growth, not boom and bust	27	OECD/EE	ITA,POL,BEL, DNK, NLD, HUN,GBR,AUS, NZL, CHE	0.175	-0.194	0.020
		ASIA	PAK,NPL,PHL,FJI			
		LAC	MEX, CRI, COL, ARG			
		MENA	TUN, TUR, SYR, DZA			
		SSA	TZA, SDN, LSO, NAM, MLI			
Middle growth, boom and bust (max>.25, min<-.34)	19	OECD/EE	ALB	0.492	-0.424	0.020
		ASIA	MNG,KHM			
		LAC	BRA, CHL, GUY, ECU			
		MENA	MAR, IRN, IRQ			
		SSA	MRT, SWZ,AGO, MUS, MOZ,COG, GAB,SLE,TCD			
Low growth (total less than -.40)	43	OECD/EE		0.127	-0.544	0.004
		ASIA	PNG, BGD,AFG			
		LAC	PER, SLV, GTM, URY, PRY, JAM, VEN, HND, HTI,BOL, NIC			
		MENA	JOR, LBN			
		SSA	BFA,ZAF,RWA,MWI,BEN,ETH,CIV,CMR, BDI, GHA,UGA, MB,NGA,GNB,SEN,TGO, GIN,ZMB, KEN,ZWE,SOM,MDG,CAF, NER,LBR,ZAR			

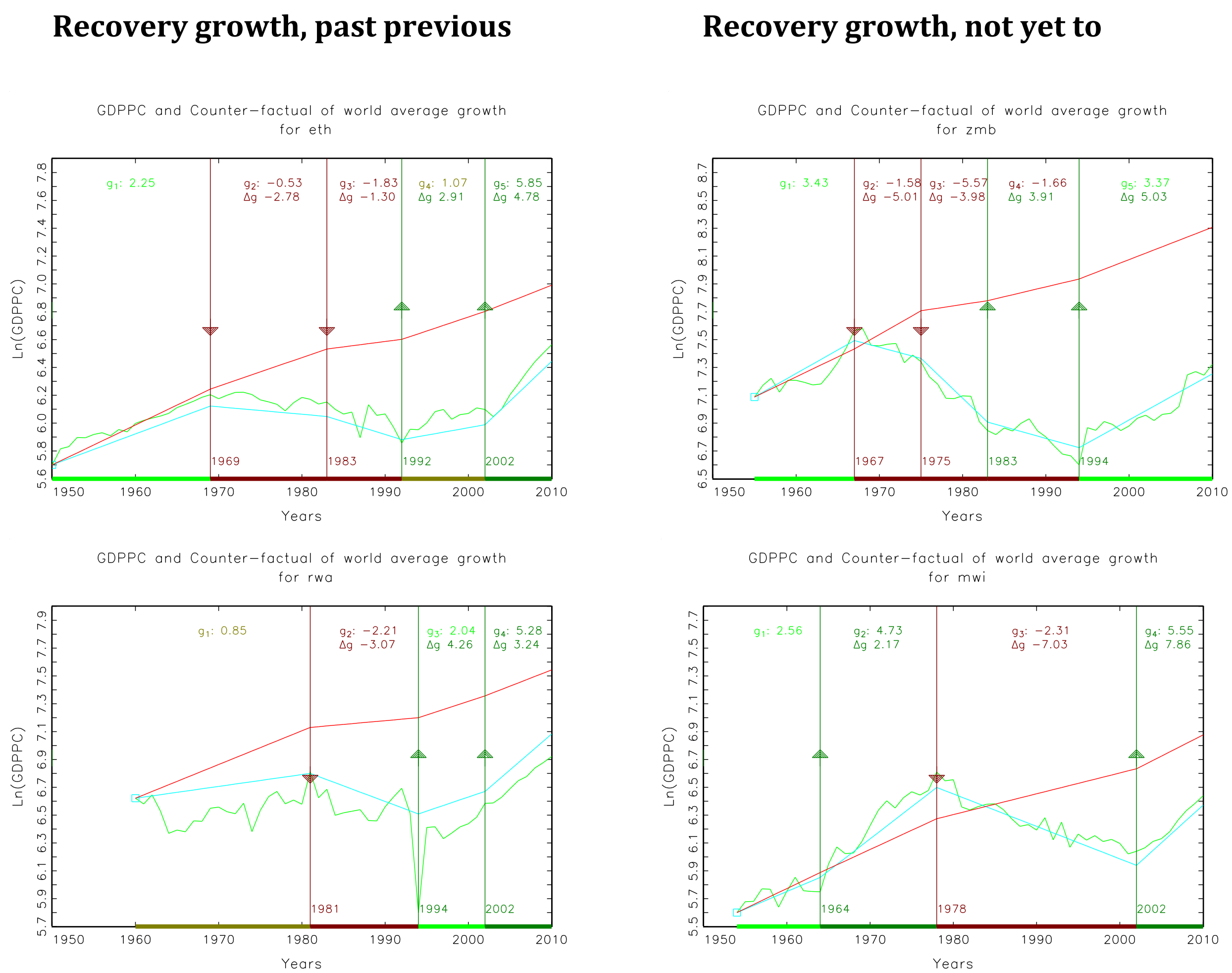
The 'boom and bust' countries are an interesting collection. Some, like Brazil and Chile, are middle income countries that experienced either a large slow down (Brazil 1980-2002) or had a sharp crisis (Chile's episode magnitude from 1968 to 1976 was -.308) but also extended booms with Chile's episode from 1986 to 1997 was a gain of .493. Others are natural resource countries like Ecuador, Congo and Gabon, with booms and busts. Others conflict countries like Iraq, Sierra Leone, Mozambique, Cambodia with declines and recoveries. Finally others, like Guyana and Mauritius have extended periods of decline followed by sustained growth.

Figure 5: The trajectories of output per capita of middle growth countries comparing steady growers (Colombia, Turkey) with 'boom and bust' (Chile, Iran)



The 'low growth' countries are dominated by Sub Saharan Africa (SSA) (26 of 43) and Latin America and the Caribbean (LAC) (11 of 43). One interesting feature of the growth episodes is that 11 of the 26 SSA countries in the 'low growth' category have growth accelerations as their most recent episode. Figure 6 illustrates that some recoveries were starting from a very low base after a long period of decline and countries have yet to achieve the pre-growth peak. Zambia for instance had negative growth episodes from 1967-75, 1975-83, and 1983-94 (a growth acceleration to negative growth) and hence even growth of 3.57 ppa since 1994 has yet to being Zambia back to the 1967 peak. Ethiopia, in contrast, had less negative growth from 1969 to 1992 and then modest positive growth 1992 to 2002 so the post 2002 acceleration to rapid growth has brought it above the 1969 peak.

Figure 6: Comparing growth accelerations that are recoveries that push past the previous all time peak GDPPC (e.g. Ethiopia 2002-2010) versus episodes that recover from previous contractions but not (yet) past a previous peak (e.g. Zambia 1994-2010)



3.1. Accelerations: Take-offs and Recoveries

What are the characteristics of growth accelerations? We classify the 153 identified growth accelerations in our 125 countries into by two criteria: magnitude and whether the acceleration was a 'recovery' from a previous fall and whether the recovery reached the previous peak or not (see Appendix – Table A3).

The first distinction is that 31 of the growth acceleration episodes have negative episode magnitude, of which 22 are recoveries and of those 16 are recoveries that fail to reach the previous peak. These are often 'accelerations' of the 'even dead cats bounce' sort in which a sharp fall is followed by either a less sharp fall (e.g. Venezuela a fall of -3.39 ppa from 1977-85 was followed by an episode from 1985-2002 with growth of -.07) or a sharp fall is followed by a modest growth rate (e.g. Haiti's GDPPC fell from 1980-94 then had growth of .55 ppa from 1994 to 2010). While it is conceivable that the same causal factors stop output declines as cause output accelerations of already positive growth rates, this a hypothesis to be tested, not assumed.

The second distinction is between the 39 episodes which are 'recoveries not reaching the peak' (including the 16 mentioned above that were of negative magnitude) and all others. These are often countries bouncing back from the end of an armed conflict (e.g. Cambodia 1982, Iraq 1991, Uganda 1980, Lebanon 1982, Liberia 1994, Rwanda 1994) or achieving political stability (not necessarily democratically) after political turmoil (Iran 1988, Ghana 1983, Zaire 2000, Chile 1976). Again, the causes of these 'recovery accelerations' are unlikely to be the same as those of economies accelerating from already positive growth or already at a historic high GDPPC.

That leaves 99 growth accelerations in which the level of GDPPC was higher than at the end than at the beginning of the episode. There are two possible divisions of these. 60 are not 'recoveries' in that GDPPC was already more than 85% of its previous peak when the episode began whereas 39 are 'recoveries' in which GDPPC at the beginning of the episode was less than 85% of previous peak.

Alternatively, episodes classified by size produces 29 'large' UCP magnitude episodes more than .406 (implying GDPPC was more than 50 percent higher than predicted at the end of the episode), 33 episodes are 'medium' in that GDPPC was more than 25 percent larger than predicted (but less than 50 percent), and 37 episodes are 'small' in that the UCP episode magnitude was positive but less than a 25 percent gain in GDPPC.

Of 18 large non-recovery episodes (the large, non-recovery plus Thailand 1958-1987), 10 are the well-studied and prominent East Asian growth episodes mostly with the common dating (e.g. Indonesia 1967, Korea 1962, Taiwan 1962, Vietnam 1989, Singapore 1968, Thailand 1958[12] particularly when multiple episodes of accelerations are combined (China 1977-91, 1991-2010, Malaysia 1970-79, 1987-1996)[13]. The rest are a mix: Egypt 1976-992, Ireland 1987-2002, Chile 1986-1997, Puerto Rico 1982-2000, Panama 1959-1982, Gabon 1968-1976, Cambodia 1998-2010 and Laos 1979-2002.

3.2. Decelerations: Depressions to Slow Downs

Growth decelerations similarly fall into very different magnitudes of growth episode (large, medium, small, and positive) and types. With decelerations we classify not into recoveries

[12] HPR (2006) table 2.3 classifies their 69 growth accelerations by whether the accelerations are sustained with above average growth in the ten years after the seven years that defined the acceleration. Most of the 18 'large non-recoveries' in Table 6 dated before 1986 (the cut-off for having data episode plus 17 years in HPR) are identified with acceleration years either the same or within one year.

[13] For instance the Growth Commission headed by Michael Spence identified 13 country/ periods of high growth including (alphabetically): Botswana, Brazil, China, Hong Kong, Indonesia, Japan, Korea, Malaysia, Malta, Oman, Singapore, Taiwan, Thailand. The countries not in our list are often because the rapid growth began with the data so is not an 'acceleration' or 'deceleration' (e.g. Botswana, Hong Kong, Japan, Oman) or excluded due to small size (Malta).

or non-recoveries based on the start of the episode but on the absolute level of GDPPC at the end of the episode relative to the start (see Appendix – Table A4).

Some decelerations move countries into negative growth rates and hence produce losses in output, not just relative to a counter-factual, but in absolute terms. We follow Breuer and McDermott (2013) in defining 'depressions' as episodes with losses in GDPPC from beginning to end larger than 20 percent. We find that 54 of the 161 growth decelerations were depressions. Of these, 30 had a 'large' negative UCP magnitude (less than .405 or larger than 50 percent relative to UCP counter-factual)[14]. As with the 'large non-recovery' growth accelerations, most of these are well known declines, often associated with political turmoil, conflict, and/or outright civil war (e.g. Iran 1976, Afghanistan 86-94, Zaire 1989-2000, Nicaragua 1987-1995, Sierra Leone 1990-99, Uganda 1969-80, Ghana 1974-83, Somalia 1978-2010) or transition from central planning (e.g. Romania, Bulgaria, Albania). Some were extended slides into poverty (Malawi 1978-2002, Cote d'Ivoire 1978-2010). Zambia has three periods of depression, a deceleration in 1967, another deceleration to even more negative growth in 1975 and the only depression which was the result of a growth acceleration – to growth of -1.66 ppa from 1983 to 1994.

Other growth decelerations are slow-downs where although the growth decelerates, it decelerates to positive levels so that GDPPC is higher at the end of the growth deceleration episode. 72 of the growth decelerations are slow-downs with positive GDP gains. Some of these are large UCP negative magnitude. Honduras decelerated in 1979 from 1970-79 growth of 3.19 ppa to 1979-2010 growth of .13 ppa and hence had a UCP magnitude of -.62 ((1-exp(-.62)=46 percent loss) but GDPPC was 6.4% higher in 2010 than 1979. Some of these slow-down growth decelerations have positive UCP episode magnitude and large GCPPC gains. Turkey, for instance, experienced a growth deceleration in 1958 from 3.61 ppa to 2.20 ppa versus a UCP of 1.41 ppa so had a large positive episode magnitude (.339 or exp(.339)=46 percent gain) and from 1958 to 2010 had a 200 percent gain in GDPPC (and no other structural growth breaks).

The decelerations reveal large discrepancies between the magnitudes of four possible hypothetical or counter-factual growth rates: No Change, World Average, UCP, and Zero growth. So Brazil in 1980-2002 shows a very large UCP magnitude deceleration of -.898 (-59 percent loss). The absolute loss, which implicitly uses zero growth as a hypothetical, was only 1.5 percent, which might make the magnitude of the growth break in 1980 seem inconsequential. Conversely, using the No Change scenario with the implicit counter-factual of continuation of the 51.6 ppa growth from 1967 to 1980 produces even larger estimates of the magnitude of the 1980 slow-down. We believe this shows the strength of our method as the 'magnitude' of the slow-down in Brazil in 1980 is neither the naïve extrapolation of past growth nor the comparison with the arbitrary standard of zero growth.

[14] In spite of the different methodologies and filters 34 of our 54 'depressions' have the same dating (to within plus or minus 2 years) as in Breuer and McDermott (2013) Table 1 and all but two countries with depressions in Appendix – Table A4 are not identified with some depression (Albania and Mongolia).

One stylised fact (as emphasised for instance by North *et al*., 2009) this method confirms is that ‘developed economies’ are at much, much less risk of large growth decelerations and especially of negative decelerations. If we examine the 89 growth decelerations with negative losses only two of these (Finland 1985 loss -1.3% and Italy 2001 loss of -2.5%) are rich industrial countries. Conversely, of the 90 ‘large’ or ‘medium’ magnitude decelerations (with UCP magnitude larger than -.223 hence loss larger than 25 percent) there are only six OECD episodes, nearly all slow-downs to moderate growth rates with large magnitude due to long duration (e.g. Greece 1973-2010, Spain 1974-2010, Austria 1979-2010, Switzerland 1974-2010).

4. Cumulative estimates of the magnitude of growth episodes

Table 7 shows the NPV of growth episodes using the UCP counter-factual for the 10 largest growth episodes, defined in two different ways. The first four columns of Table 7 show the absolute gain which is a product of total GDP and hence is affected by the size of country population. There are 8 growth episodes with more than a *trillion* dollars in NPV gain. Obviously a number of these are the world’s largest countries with China’s accelerations in 1977 and 1991 on the list plus India’s growth acceleration in 2002. Countries with high levels of output per person such as Great Britain in 1981 and Australia 1969 also make the list as total GDP is large.

To adjust for population and initial income we also sort the largest gains by the ratio of NPV of the episode to initial GDPPC. This brings the smaller East Asian Dragons to the fore. The accelerations in Taiwan 1962, Indonesia 1967, Thailand in 1958, Korea 1962 and Vietnam 1989 plus Egypt 1976 and China 1991 all have NPV/GDPPC over eight. Interestingly, the growth accelerations in Uganda in 1988 and Mozambique in 1995 make the list of the top 21.

Table 7: Biggest growth episode gains in NPV (using UCP magnitude)

Sorted by absolute dollar size					Sorted by ratio of end to beginning GDPPC				
Country	Year	Size (billions of PPP$)	Ratio NPV gain to initial GDPPC	NPV gain per person	Country	Year	Ratio NPV gain to beginning GDPPC	Size (billions of PPP$)	NPV gain per person
CHN	1991	11,786.52	8.14	10,129.3	TWN	1962	36.67	877.15	73,593.2
JPN	1970	2,815.56	1.96	26,983.2	IDN	1967	15.05	1,119.03	9,711.9
CHN	1977	2,655.71	6.36	2,807.0	THA	1958	14.73	309.17	11,962.2

IND	2002	2,523.38	1.19	2,425.7	KOR	1962	9.53	421.17	15,941.3
GBR	1981	2,498.77	2.67	44,318.2	VNM	1989	8.17	455.44	6,914.4
IDN	1967	1,119.03	15.05	9,711.9	EGY	1976	8.15	332.25	8,804.2
IND	1993	1,097.62	0.86	1,237.8	CHN	1991	8.14	11,786.52	10,129.3
POL	1991	1,048.22	3.68	27,402.1	LAO	1979	7.02	14.56	4,455.5
IRN	1988	881.76	3.15	16,275.1	TUR	1958	6.80	630.97	23,805.0
TWN	1962	877.15	36.67	73,593.2	PAK	1970	6.80	441.11	6,535.8
BRA	1967	631.80	2.27	7,175.5	CHN	1977	6.36	2,655.71	2,807.0
TUR	1958	630.97	6.80	23,805.0	PAN	1959	6.33	12.71	11,396.7
VNM	1989	455.44	8.17	6,914.4	KHM	1982	5.92	21.76	2,982.1
PAK	1970	441.11	6.80	6,535.8	UGA	1988	5.36	45.85	2,834.5
AUS	1969	425.93	1.69	34,406.8	IRL	1987	5.12	273.88	77,368.4
KOR	1962	421.17	9.53	15,941.3	SGP	1968	4.98	59.04	29,344.2
ROM	1994	408.57	3.43	17,972.7	LSO	1986	4.97	5.38	3,390.6
JPN	1959	371.56	0.80	3,982.6	MOZ	1995	4.68	24.25	1,526.2
EGY	1976	332.25	8.15	8,804.2	ALB	1992	4.64	32.45	10,562.0
NGA	1987	323.54	3.71	3,618.8	NPL	1983	4.58	42.84	2,718.6

Table 8 shows the biggest growth episode NPV losses sorted in the same two ways. The NPV of losses is in this case dominated by countries that started with high income per capita and had long-lasting slow downs (e.g. Japan 1991, Greece 1973, Spain 1974, Austria 1979, Switzerland 1974) including Italy in 2001 and 1990.

The list of NPV loss to initial GDPPC finds overlap and some new countries. The growth slowdown in Brazil, a big deceleration (5 percentage points) that was long (22 years) in a country of upper middle income and large population is high on both lists the magnitude of the loss was 7.5 *trillion* dollars or 61,353 dollars per person for a ratio of loss to GDPPC over 8. The growth deceleration in Iran that lasted from 1976 to 1988 is particularly striking as it cost each citizen $146,643, a loss 11 times initial GDPPC and over 5 trillion dollars.

Using the ratio also emphasizes the losses for smaller and poorer countries. The growth decelerations in the 1970s/early 1980s were costly in Africa (Malawi 1978, Cote d'Ivoire 1978, Somalia 1978, Madagascar 1974) and Latin America (Brazil 1980, Honduras 1979, Ecuador 1978). When starting from a low base these are particularly tragic. The growth deceleration in Malawi that began in 1978 cost each person cumulatively almost 10,000 dollars.

Table 8: Biggest growth episode losses in NPV (using UCP magnitude)

Sorted by absolute dollar size					Sorted by ratio of NPV loss to beginning GDPPC				
Country	Year	Size (billions of PPP$)	Ratio NPV loss to initial GDPPC	NPV loss per person	Country	Year	Ratio NPV loss to beginning GDPPC	Size (billions of PPP$)	NPV loss per person
JPN	1991	-9,379.01	-2.65	-75670	MWI	1978	-12.36	-56.50	-9608
BRA	1980	-7,547.67	-8.82	-61353	KEN	1967	-11.48	-135.49	-13294
IRN	1976	-5,055.57	-11.00	-146643	IRN	1976	-11.00	-5,055.57	-146643
ESP	1974	-3,274.15	-6.11	-93057	BRA	1980	-8.82	-7,547.67	-61353
GRC	1973	-1,078.03	-7.73	-120733	CIV	1978	-8.71	-121.05	-15218
ITA	2001	-994.50	-0.59	-17167	HND	1979	-8.59	-94.72	-28886
IDN	1996	-922.53	-1.50	-4587	GRC	1973	-7.73	-1,078.03	-120733
AUT	1979	-906.28	-5.41	-120046	SOM	1978	-7.57	-30.69	-6559
ITA	1990	-898.18	-0.64	-15837	OMN	1985	-6.89	-162.17	-108314
MEX	1981	-749.44	-0.98	-10711	ESP	1974	-6.11	-3,274.15	-93057
CHE	1974	-581.51	-2.84	-90017	ECU	1978	-5.51	-204.00	-27239
MEX	1989	-521.25	-0.69	-6253	JOR	1965	-5.50	-21.52	-20275
KOR	1991	-468.41	-0.85	-10808	AUT	1979	-5.41	-906.28	-120046
NGA	1976	-449.57	-3.58	-6771	MDG	1974	-5.34	-46.13	-6214
TWN	1994	-443.19	-1.20	-21011	ISR	1975	-5.30	-279.51	-83330
POL	1979	-434.73	-1.33	-12330	IRQ	1979	-4.89	-348.06	-27260
BEL	1974	-405.51	-2.20	-41515	PAN	1982	-4.74	-54.69	-26816
MYS	1996	-386.74	-2.04	-18543	SWZ	1989	-4.72	-14.86	-17497
ROM	1986	-348.54	-2.04	-15422	JOR	1982	-4.67	-48.20	-20533
IRQ	1979	-348.06	-4.89	-27260	ZAR	1989	-4.03	-94.79	-2503

The calculation of the total gain in constant PPP dollar terms is mainly a mechanism for converting our estimates of the gains and losses from growth accelerations and decelerations into figures that are comparable with estimates of the gains from other proposed interventions in development. For instance, in deciding on research priorities there is a balance between what it might cost to find the right answer, how hard it might be sure the answers found are right and the value of the right answer. It may well be that precision and rigour can be had using certain techniques at relatively low cost for certain questions, but that these questions also have low total potential benefit. In contrast, we argue it may be difficult to have precision and rigor on questions of what might promote economic growth but the consequences of getting it right (or avoiding getting it wrong) as so massive that, as Lucas says, it is hard to think about anything else.

5. Conclusions

In this paper, we estimate the *magnitude* of countries' growth accelerations and decelerations. We propose a flow and stock measure of the magnitude of a growth episode. The flow measure 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. The stock measure computes the total net present value of the difference between the actual trajectory of output during the episode and the predicted trajectory. To calculate the 'counter-factual' growth rate, we first use two options: (a) the country's growth rate in its previous episode, and (b) the world average growth rate. We argue that neither option is satisfactory, and propose an alternate method of calculating counter-factual growth: an "unconditional predicted" growth rate, which 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. Using this method, we place dollar figures on growth episodes. The top 20 growth accelerations have a NPV magnitude of 30 trillion dollars – twice US GDP. Conversely, the collapse in output in Iran between 1976 and 1988 produced an NPV loss of $143,000 per person. The top 20 growth decelerations account for 35 trillion less in NPV of output.

'What, exactly' can countries do to initiate an episode of sustained (and not subsequently reversed) growth? 'What, exactly' can countries do to avoid a period of sustained stagnation? 'What, exactly' can countries do to avoid a depression? We have obviously not answered any of these questions in this paper, much less 'exactly'. But we have attempted to lay an empirical foundation of the magnitude of growth changes and a classification that clarifies and provides a measure of what it is to be explained. The gains in income gains and losses that we document are too large to be explained by 'comparative static' microeconomics that gives small Harberger 'welfare change' triangles for even large distortions. Neither can they be explained by changes in 'steady states' as in the new growth economics, or by fundamental determinants of long-run per capita income such as institutions, which by their nature are slow-moving and sticky. What explains such 'staggering' gains and losses in income over relatively short periods is the key question that future research on economic growth should try and address.

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Appendix

Table A1: Estimates of the cumulative magnitude of the gain/loss from each of 314 growth transitions using three counter-factual growth rates: Continuation of previous trend, world period average, and regression predicted growth

Country	Beginning of episode	Counter-factual		
		No change	World average	Unconditional Prediction
AFG	1986	-1.525	-1.238	-1.201
AFG	1994	3.095	0.266	0.027
AGO	1993	0.358	0.156	0.206
AGO	2001	0.540	0.576	0.577
ALB	1982	-0.761	-0.496	-0.502
ALB	1992	1.809	0.563	0.595
ARG	1977	-0.323	-0.222	-0.189
ARG	1985	0.336	0.018	0.106
ARG	1994	-0.107	-0.127	-0.147
ARG	2002	0.331	0.166	0.177
AUS	1961	0.020	-0.129	-0.085
AUS	1969	-0.112	0.112	0.129
AUT	1979	-0.761	0.093	-0.515
BDI	1992	-0.712	-0.591	-0.522
BDI	2000	0.776	-0.157	-0.184
BEL	1959	0.310	0.189	0.246
BEL	1974	-0.819	0.139	-0.217
BEN	1978	0.127	0.175	0.179
BEN	1986	-0.278	-0.202	-0.141
BEN	1994	0.333	-0.169	-0.173
BFA	1971	0.065	0.037	0.059
BFA	1979	-0.247	-0.200	-0.066
BGD	1967	0.279	-0.398	-0.346
BGD	1982	0.324	0.074	0.319
BGD	1996	0.222	0.114	0.109
BGR	1988	-0.716	-0.306	-0.501
BGR	1997	1.019	0.315	0.310
BOL	1958	0.780	-0.338	-0.250
BOL	1977	-0.347	-0.271	-0.138
BOL	1986	0.966	-0.122	0.011
BRA	1967	0.130	0.368	0.288
BRA	1980	-1.145	-0.304	-0.898
BRA	2002	0.256	0.017	-0.034
BWA	1973	-0.372	0.403	0.174
BWA	1982	0.057	0.498	0.331
BWA	1990	-0.769	0.186	-0.127
CAF	1986	-0.226	-0.367	-0.199
CAF	1996	0.399	-0.374	-0.347
CHE	1974	-0.766	-0.350	-0.337

CHL	1968	-0.183	-0.308	-0.264
CHL	1976	0.096	-0.028	0.030
CHL	1986	0.614	0.493	0.573
CHL	1997	-0.439	0.066	-0.028
CHN	1960	-0.198	-0.205	-0.247
CHN	1968	0.322	0.123	0.110
CHN	1977	0.460	0.909	0.776
CHN	1991	0.193	1.207	0.606
CIV	1978	-1.176	-0.702	-0.695
CMR	1976	0.229	0.306	0.334
CMR	1984	-0.995	-0.643	-0.719
CMR	1994	1.119	-0.078	0.008
COG	1976	0.208	0.422	0.392
COG	1984	-0.782	-0.285	-0.434
COG	1994	0.298	-0.326	-0.261
COL	1967	0.100	0.109	0.157
COL	1994	-0.221	-0.170	-0.202
COL	2002	0.335	0.080	0.045
CRI	1958	-0.193	-0.062	-0.067
CRI	1979	-0.415	-0.189	-0.230
CRI	1991	0.670	0.087	0.121
CUB	1984	-0.965	-0.421	-0.581
CUB	1995	1.126	0.257	0.255
CYP	1967	-0.097	-0.079	-0.114
CYP	1975	0.324	0.460	0.479
CYP	1984	-0.179	0.211	-0.287
CYP	1992	-0.368	-0.062	-0.110
DNK	1958	0.274	0.144	0.158
DNK	1969	-1.203	0.089	-0.009
DOM	1960	-0.162	-0.173	-0.239
DOM	1968	0.411	0.254	0.228
DOM	1976	-0.792	-0.010	-0.061
DOM	1991	0.533	0.316	0.332
DZA	1971	0.260	0.175	0.200
DZA	1979	-0.738	-0.212	-0.390
DZA	1994	0.406	-0.031	0.033
ECU	1970	0.396	0.312	0.334
ECU	1978	-1.458	-0.368	-0.610
ECU	1999	0.361	0.031	-0.002
EGY	1965	-0.122	-0.219	-0.213
EGY	1976	0.707	0.732	0.908
EGY	1992	-0.500	0.114	-0.121
ESP	1974	-1.198	0.157	-0.485
ETH	1969	-0.389	-0.366	-0.365
ETH	1983	-0.117	-0.234	-0.012
ETH	1992	0.291	-0.095	0.071

ETH	2002	0.382	0.278	0.062
FIN	1974	-0.085	0.193	0.102
FIN	1985	-0.250	-0.098	-0.276
FIN	1993	0.301	0.142	0.109
FIN	2001	-0.177	-0.051	-0.019
FJI	1979	-0.453	-0.153	-0.233
FJI	1988	0.461	0.106	0.196
FJI	2000	-0.202	-0.194	-0.229
GAB	1968	0.442	0.492	0.483
GAB	1976	-1.311	-0.342	-0.710
GAB	1987	0.505	-0.504	-0.432
GBR	1981	0.171	0.346	0.358
GBR	2002	-0.116	-0.129	0.028
GHA	1966	0.155	-0.096	-0.055
GHA	1974	-0.566	-0.427	-0.456
GHA	1983	1.008	-0.044	0.264
GHA	2002	0.206	0.094	-0.008
GIN	2002	0.144	-0.060	-0.179
GMB	1982	-0.324	-0.252	-0.138
GMB	1995	0.244	-0.297	-0.245
GNB	1970	-0.590	-0.275	-0.289
GNB	1981	0.055	-0.198	-0.001
GNB	1997	-0.263	-0.602	-0.581
GRC	1960	0.285	0.487	0.229
GRC	1973	-2.027	-0.064	-0.653
GTM	1962	0.512	0.158	0.250
GTM	1980	-0.535	-0.251	-0.467
GTM	1988	0.980	-0.134	-0.063
GUY	1981	-0.437	-0.348	-0.336
GUY	1990	1.522	0.359	0.445
HKG	1981	-0.229	0.555	-0.010
HKG	1994	-0.337	-0.110	-0.245
HKG	2002	0.305	0.165	0.273
HND	1970	0.244	0.112	0.141
HND	1979	-0.951	-0.462	-0.619
HTI	1972	0.379	0.134	0.161
HTI	1980	-0.800	-0.423	-0.471
HTI	1994	0.449	-0.244	-0.179
HUN	1978	-0.753	-0.035	-0.151
IDN	1967	0.885	0.878	1.010
IDN	1996	-0.460	-0.078	-0.230
IND	1993	0.193	0.309	0.177
IND	2002	0.165	0.278	0.257
IRL	1958	0.548	0.188	0.277
IRL	1979	-0.343	-0.060	-0.241
IRL	1987	1.036	0.686	0.686

IRL	2002	-0.482	-0.168	0.018
IRN	1976	-1.744	-0.969	-1.755
IRN	1988	2.260	0.201	0.314
IRQ	1979	-1.972	-0.931	-1.061
IRQ	1991	2.136	0.329	0.399
ISR	1967	-0.001	0.159	0.038
ISR	1975	-1.115	0.006	-0.340
ITA	1974	-0.363	0.176	-0.006
ITA	1990	-0.071	-0.001	-0.131
ITA	2001	-0.149	-0.212	-0.148
JAM	1961	-0.269	-0.134	-0.456
JAM	1972	-0.578	-0.468	-0.350
JAM	1986	0.451	0.191	0.289
JAM	1994	-0.703	-0.448	-0.512
JOR	1965	-1.061	-0.800	-0.996
JOR	1974	1.089	0.531	0.436
JOR	1982	-1.128	-0.494	-0.928
JOR	1991	1.229	-0.022	0.079
JPN	1959	0.303	0.582	0.103
JPN	1970	-1.173	0.419	0.213
JPN	1991	-0.494	-0.219	-0.389
KEN	1967	-0.057	-0.664	-0.619
KHM	1982	1.499	0.497	0.706
KHM	1998	0.301	0.439	0.420
KOR	1962	1.074	0.714	0.758
KOR	1982	0.193	0.684	0.033
KOR	1991	-0.439	0.242	-0.139
KOR	2002	-0.090	0.063	0.026
LAO	1979	0.166	0.492	0.678
LAO	2002	0.358	0.332	0.321
LBN	1982	0.837	0.262	0.289
LBN	1991	-0.102	0.070	0.006
LBR	1994	0.883	0.159	0.188
LBR	2002	-0.332	-0.288	-0.327
LKA	1959	0.656	0.017	0.168
LKA	1973	0.088	0.285	0.291
LKA	1981	-0.265	0.555	0.189
LSO	1970	0.242	0.193	0.253
LSO	1978	-0.532	-0.130	-0.215
LSO	1986	1.134	0.340	0.536
MAR	1960	0.616	0.308	0.394
MAR	1968	-0.306	0.112	0.176
MAR	1977	-0.530	-0.040	-0.091
MAR	1995	0.306	0.098	0.066
MDG	1974	-0.612	-0.783	-0.589
MDG	2002	0.147	-0.213	-0.272

MEX	1981	-0.362	-0.108	-0.249
MEX	1989	0.572	-0.115	-0.081
MLI	1974	0.326	0.196	0.348
MLI	1986	-0.105	0.069	0.099
MNG	1982	-0.912	-0.398	-0.431
MNG	1993	1.029	0.084	0.115
MOZ	1976	-0.479	-0.355	-0.353
MOZ	1986	0.378	0.023	0.225
MOZ	1995	0.639	0.533	0.533
MRT	1968	-0.684	0.001	-0.173
MRT	1976	-0.747	-0.344	-0.260
MRT	2002	0.277	0.027	-0.005
MUS	1963	-0.013	-0.399	-0.183
MUS	1971	0.536	0.321	0.273
MUS	1979	-0.525	0.643	0.084
MWI	1964	0.304	0.270	0.277
MWI	1978	-1.688	-0.915	-1.195
MWI	2002	0.629	0.197	-0.022
MYS	1970	0.354	0.454	0.450
MYS	1979	-0.492	0.079	-0.206
MYS	1987	0.466	0.433	0.482
MYS	1996	-0.642	-0.033	-0.268
NAM	1974	-0.583	-0.339	-0.326
NAM	1985	0.448	-0.148	-0.032
NAM	2002	0.276	0.099	0.105
NER	1968	-0.114	-0.405	-0.346
NER	1979	-0.324	-0.411	-0.264
NER	1987	1.076	-0.519	-0.390
NGA	1960	-0.337	-0.377	-0.388
NGA	1968	0.553	0.197	0.101
NGA	1976	-1.347	-0.824	-0.838
NGA	1987	2.109	0.104	0.359
NIC	1967	-0.359	-0.322	-0.319
NIC	1979	-0.281	-0.304	-0.198
NIC	1987	-0.154	-0.559	-0.463
NIC	1995	1.115	-0.009	0.068
NLD	1974	-0.529	0.049	-0.062
NPL	1983	0.427	0.222	0.394
NZL	1958	-0.209	-0.233	-0.220
NZL	1974	-0.083	-0.111	0.125
OMN	1985	-1.048	0.000	-0.487
PAK	1960	0.407	0.054	0.151
PAK	1970	-0.723	0.250	0.379
PAN	1959	0.459	0.359	0.476
PAN	1982	-0.538	0.021	-0.486
PAN	2002	0.354	0.219	0.196

PER	1959	0.212	0.053	0.110
PER	1967	-0.459	-0.181	-0.155
PER	1981	-0.455	-0.434	-0.338
PER	1992	1.150	0.187	0.231
PHL	1959	-0.141	-0.067	-0.140
PHL	1977	-0.280	-0.085	-0.112
PHL	1985	0.522	-0.156	-0.028
PNG	1973	-0.763	-0.508	-0.505
PNG	1984	0.575	0.205	0.305
PNG	1993	-0.433	-0.262	-0.321
POL	1979	-0.614	-0.182	-0.286
POL	1991	1.025	0.405	0.486
PRI	1972	-0.484	-0.078	-0.244
PRI	1982	0.546	0.455	0.492
PRI	2000	-0.431	-0.294	-0.177
PRT	1964	0.245	0.312	0.117
PRT	1973	-0.643	0.073	-0.174
PRT	1985	0.275	0.301	0.266
PRT	2000	-0.360	-0.247	-0.174
PRY	1971	0.479	0.325	0.352
PRY	1980	-0.495	-0.005	-0.257
PRY	1989	-0.182	-0.352	-0.278
PRY	2002	0.222	-0.036	-0.086
ROM	1978	-0.418	0.223	-0.158
ROM	1986	-0.730	-0.574	-0.642
ROM	1994	1.696	0.407	0.527
RWA	1981	-0.399	-0.358	-0.239
RWA	1994	0.341	0.005	0.121
RWA	2002	0.259	0.234	0.166
SDN	1978	-0.518	-0.200	-0.125
SDN	1996	0.748	0.341	0.369
SEN	1973	0.825	-0.342	-0.106
SGP	1968	0.426	0.739	0.698
SGP	1980	-1.133	0.834	-0.071
SLE	1970	-0.494	0.062	0.066
SLE	1990	-0.864	-0.810	-0.697
SLE	1999	1.548	0.413	0.384
SLV	1978	-0.403	-0.282	-0.241
SLV	1987	1.185	0.120	0.222
SOM	1978	-0.418	-1.061	-0.862
SWZ	1978	-0.556	0.244	0.171
SWZ	1989	-0.541	-0.424	-0.521
SYR	1981	-0.394	-0.146	-0.196
SYR	1989	0.461	0.163	0.244
SYR	1998	-0.295	-0.153	-0.259
TCD	1971	-0.395	-0.454	-0.412

TCD	1980	0.873	-0.003	0.304
TCD	2000	0.486	0.333	0.284
TGO	1969	-0.633	-0.283	-0.322
TGO	1979	-0.268	-0.430	-0.262
TGO	1993	0.276	-0.480	-0.400
THA	1958	1.702	0.755	0.771
THA	1987	0.128	0.490	-0.054
THA	1995	-0.698	-0.070	-0.092
TTO	1961	-0.214	0.308	0.023
TTO	1980	-1.001	-0.639	-0.958
TTO	1989	1.350	0.225	0.288
TTO	2002	0.491	0.590	0.622
TUN	1972	-0.093	0.159	0.158
TUN	1981	-0.320	0.092	0.033
TUR	1958	-0.733	0.146	0.339
TWN	1962	0.756	1.526	1.699
TWN	1994	-0.526	0.270	-0.152
TZA	1971	-1.158	-0.230	-0.123
TZA	2000	0.499	0.305	0.279
UGA	1961	0.358	0.001	0.137
UGA	1969	-0.784	-0.643	-0.566
UGA	1980	0.203	-0.114	0.335
UGA	1988	1.004	0.336	0.410
URY	1977	-0.007	-0.026	0.123
URY	1985	0.316	0.219	0.284
URY	1994	-0.308	-0.150	-0.201
URY	2002	0.319	0.131	0.142
VEN	1977	-0.459	-0.321	-0.298
VEN	1985	0.588	-0.276	-0.197
VEN	2002	0.125	-0.074	-0.095
VNM	1989	0.602	0.805	0.717
ZAF	1981	-0.444	-0.285	-0.269
ZAF	1993	0.712	0.041	0.055
ZAR	1958	-0.260	-0.486	-0.379
ZAR	1974	-0.353	-0.498	-0.321
ZAR	1989	-0.917	-1.347	-1.086
ZAR	2000	1.391	0.103	0.021
ZMB	1967	-0.401	-0.405	-0.380
ZMB	1975	-0.319	-0.518	-0.501
ZMB	1983	0.430	-0.339	-0.095
ZMB	1994	0.805	0.164	0.159
ZWE	1968	0.215	0.065	0.014
ZWE	1983	-0.239	-0.087	-0.008
ZWE	1991	-0.195	-0.450	-0.280
ZWE	2002	-0.066	-0.432	-0.616

Table A2: Regression estimates used to calculate "unconditional predicted" growth rates for each episode (sorted by start of episode, duration of episode and start of previous)

Country	Start of episode	Duration of episode	Start of previous episode	Regression constant (in ppa)	Co-efficient on (ln) initial income	Co-efficient on previous growth (below median)	Co-efficient on previous group (above median)
DNK	1958	11	1950	0.006	0.003	-0.043	0.970
NZL	1958	16	1950	0.004	0.003	-0.079	0.705
ZAR	1958	16	1950	0.017	0.001	0.028	0.732
BOL	1958	19	1950	0.017	0.001	-0.014	0.655
CRI	1958	21	1950	0.015	0.001	-0.042	0.571
IRL	1958	21	1950	0.012	0.001	-0.062	0.608
THA	1958	29	1950	0.002	0.003	-0.179	0.398
TUR	1958	52	1950	-0.003	0.003	-0.179	0.096
PER	1959	8	1950	0.018	0.001	0.020	0.798
JPN	1959	11	1950	0.034	-0.001	0.238	0.897
LKA	1959	14	1950	0.025	0.000	0.226	0.714
BEL	1959	15	1950	0.008	0.002	-0.015	0.725
PHL	1959	18	1950	0.020	0.001	0.066	0.643
PAN	1959	23	1950	0.008	0.002	-0.134	0.486
MAR	1960	8	1950	0.024	0.000	0.257	0.684
NGA	1960	8	1950	0.024	0.000	0.274	0.640
DOM	1960	8	1951	0.026	0.000	0.382	0.686
CHN	1960	8	1952	0.015	0.001	0.358	0.558
PAK	1960	10	1950	0.019	0.001	0.198	0.972
GRC	1960	13	1951	0.028	-0.001	0.225	0.757
AUS	1961	8	1950	0.024	0.000	0.363	1.098
UGA	1961	8	1950	0.028	-0.001	0.533	0.712
JAM	1961	11	1953	0.026	0.000	0.560	0.587
TTO	1961	19	1950	0.015	0.001	0.126	0.520
GTM	1962	18	1950	0.018	0.000	0.186	0.507
KOR	1962	20	1953	0.033	-0.001	0.005	0.401
TWN	1962	32	1951	0.003	0.002	-0.185	0.253
MUS	1963	8	1950	0.034	-0.002	0.825	0.703
PRT	1964	9	1950	0.023	0.000	0.498	0.739
MWI	1964	14	1954	0.039	-0.002	-0.106	0.562
JOR	1965	9	1954	0.023	0.000	0.356	0.366
EGY	1965	11	1950	0.025	-0.001	0.373	0.565
GHA	1966	8	1955	0.022	0.001	0.125	0.568
CYP	1967	8	1950	0.021	0.001	0.159	0.684
ISR	1967	8	1950	0.011	0.001	0.182	0.877
ZMB	1967	8	1955	0.027	0.000	-0.049	0.669
NIC	1967	12	1950	0.016	0.001	0.149	0.514
BRA	1967	13	1950	0.017	0.000	0.130	0.546

PER	1967	14	1959	0.002	0.002	-0.015	0.334
BGD	1967	15	1959	0.014	0.000	0.083	0.073
COL	1967	27	1950	-0.001	0.002	-0.160	0.331
KEN	1967	43	1950	0.003	0.002	-0.172	0.278
CHL	1968	8	1951	0.034	-0.001	-0.044	0.739
DOM	1968	8	1960	0.010	0.004	-0.594	0.504
GAB	1968	8	1960	0.007	0.003	-0.036	0.371
MRT	1968	8	1960	0.007	0.002	0.013	0.309
NGA	1968	8	1960	-0.001	0.005	-0.411	0.328
CHN	1968	9	1960	0.017	0.003	-0.528	0.490
MAR	1968	9	1960	0.001	0.003	-0.253	0.377
NER	1968	11	1960	0.005	0.002	-0.001	0.291
SGP	1968	12	1960	-0.009	0.003	0.072	0.089
ZWE	1968	15	1954	0.034	-0.002	0.120	0.482
IDN	1968	28	1960	-0.011	0.003	0.017	0.060
TGO	1969	10	1960	0.008	0.002	0.003	0.322
UGA	1969	11	1961	0.001	0.003	-0.214	0.328
ETH	1969	14	1950	0.012	0.000	0.213	0.433
DNK	1969	41	1958	0.000	0.002	-0.087	0.275
AUS	1969	41	1961	-0.004	0.003	-0.203	0.271
ECU	1970	8	1951	0.045	-0.003	-0.068	0.690
LSO	1970	8	1960	0.010	0.002	-0.068	0.473
HND	1970	9	1950	0.001	0.002	-0.032	0.673
MYS	1970	9	1955	0.028	-0.001	-0.017	0.345
GNB	1970	11	1960	0.007	0.001	0.036	0.316
SLE	1970	20	1961	-0.002	0.001	0.175	0.167
JPN	1970	21	1959	-0.015	0.004	-0.197	0.381
PAK	1970	40	1960	-0.002	0.002	-0.155	0.304
BFA	1971	8	1959	-0.001	0.002	-0.045	0.223
DZA	1971	8	1960	0.011	0.001	-0.051	0.420
MUS	1971	8	1963	-0.021	0.005	-0.476	0.867
PRY	1971	9	1951	0.035	-0.002	0.125	0.468
TCD	1971	9	1960	0.009	0.001	0.031	0.389
TZA	1971	29	1960	-0.012	0.003	0.044	0.222
HTI	1972	8	1960	0.010	0.001	-0.019	0.382
TUN	1972	9	1961	-0.013	0.002	0.113	0.327
PRI	1972	10	1950	0.018	-0.001	0.135	0.466
JAM	1972	14	1961	0.035	-0.004	0.261	0.563
LKA	1973	8	1959	-0.018	0.003	-0.003	0.699
BWA	1973	9	1960	0.006	0.000	0.088	0.313
PNG	1973	11	1960	0.005	0.000	0.151	0.353
PRT	1973	12	1964	-0.003	0.001	0.032	0.485
GRC	1973	37	1960	0.006	0.001	0.061	0.353
SEN	1973	37	1960	-0.002	0.001	0.043	0.288
JOR	1974	8	1965	0.037	-0.002	-0.174	0.391
GHA	1974	9	1966	0.020	-0.002	0.171	-0.151

FIN	1974	11	1950	0.012	-0.001	0.433	0.310
NAM	1974	11	1960	0.005	-0.001	0.279	0.397
MLI	1974	12	1960	-0.010	0.001	0.286	0.355
ZAR	1974	15	1958	0.002	0.000	0.355	0.439
ITA	1974	16	1950	0.008	0.000	0.197	0.407
MDG	1974	28	1960	-0.009	0.002	0.103	0.336
CHE	1974	36	1950	0.011	-0.001	0.375	0.210
ESP	1974	36	1950	0.011	-0.001	0.375	0.210
NLD	1974	36	1950	0.011	-0.001	0.375	0.210
NZL	1974	36	1958	0.010	-0.001	0.452	0.217
BEL	1974	36	1959	0.009	-0.001	0.420	0.216
ZMB	1975	8	1967	0.025	-0.002	0.147	-0.168
CYP	1975	9	1967	0.000	0.000	0.303	0.071
ISR	1975	35	1967	0.006	0.000	0.260	0.173
CMR	1976	8	1960	0.012	-0.002	0.326	0.380
COG	1976	8	1960	0.012	-0.002	0.326	0.380
MOZ	1976	10	1960	0.010	-0.002	0.410	0.396
CHL	1976	10	1968	-0.004	0.001	0.093	0.308
GAB	1976	11	1968	-0.020	0.002	0.391	0.040
NGA	1976	11	1968	-0.023	0.003	0.422	-1.002
IRN	1976	12	1955	0.002	-0.003	1.328	-0.045
DOM	1976	15	1968	-0.018	0.003	0.132	-0.180
EGY	1976	16	1965	-0.021	0.002	0.507	0.194
MRT	1976	26	1968	-0.016	0.003	0.112	0.239
ARG	1977	8	1950	0.009	-0.003	0.867	0.121
URY	1977	8	1950	0.009	-0.003	0.867	0.121
VEN	1977	8	1950	0.012	-0.003	0.680	0.270
PHL	1977	8	1959	-0.024	0.000	1.025	0.408
BOL	1977	9	1958	-0.021	0.000	0.971	0.384
CHN	1977	14	1968	0.004	0.000	0.408	-0.185
MAR	1977	18	1968	-0.022	0.003	0.299	-0.147
BEN	1978	8	1959	0.029	-0.005	0.965	-0.025
ROM	1978	8	1960	0.006	-0.002	0.433	0.466
LSO	1978	8	1970	-0.034	0.003	0.405	0.091
SLY	1978	9	1950	-0.020	0.001	0.694	0.269
SWZ	1978	11	1970	-0.040	0.005	0.154	-0.049
SDN	1978	18	1970	-0.035	0.005	0.055	0.014
ECU	1978	21	1970	-0.034	0.005	-0.012	0.402
MWI	1978	24	1964	-0.005	0.001	0.263	0.580
CIV	1978	32	1960	0.001	0.001	0.194	0.400
HUN	1978	32	1970	-0.008	0.002	-0.011	0.240
SOM	1978	32	1970	-0.008	0.002	-0.011	0.240
IRL	1979	8	1958	-0.005	-0.003	1.428	0.180
NIC	1979	8	1967	-0.010	0.000	0.623	0.039
NER	1979	8	1968	-0.034	0.003	0.410	0.340
MYS	1979	8	1970	0.002	-0.001	0.453	0.198

FJI	1979	9	1960	0.000	-0.001	0.529	0.579
CRI	1979	12	1958	-0.024	0.000	1.274	0.283
IRQ	1979	12	1970	-0.042	0.005	0.124	-0.026
POL	1979	12	1970	-0.042	0.005	0.124	-0.026
TGO	1979	14	1969	-0.028	0.003	0.305	0.290
DZA	1979	15	1971	-0.030	0.004	0.247	0.197
LAO	1979	23	1970	-0.027	0.004	0.022	0.198
AUT	1979	31	1950	0.010	-0.001	0.824	0.072
HND	1979	31	1970	0.002	0.001	0.243	0.336
BFA	1979	31	1971	0.007	0.001	0.097	0.470
MUS	1979	31	1971	-0.001	0.001	0.150	0.436
GTM	1980	8	1962	-0.027	-0.001	1.788	-0.006
UGA	1980	8	1969	-0.026	0.002	1.184	-1.009
TTO	1980	9	1961	0.000	-0.004	1.697	0.090
PRY	1980	9	1971	-0.009	0.001	0.652	-0.123
HTI	1980	14	1972	-0.032	0.004	0.192	0.250
TCD	1980	20	1971	-0.026	0.004	0.094	0.402
BRA	1980	22	1967	-0.014	0.002	0.530	0.392
SGP	1980	30	1968	-0.003	0.001	0.104	0.411
MEX	1981	8	1950	-0.024	0.000	1.217	0.110
SYR	1981	8	1960	0.001	-0.002	0.496	0.716
GUY	1981	9	1970	-0.048	0.006	0.107	0.099
PER	1981	11	1967	-0.022	0.001	1.155	-0.266
ZAF	1981	12	1950	-0.017	0.000	1.063	0.180
HKG	1981	13	1960	-0.009	0.000	0.427	0.657
RWA	1981	13	1960	-0.009	0.000	0.427	0.657
GNB	1981	16	1970	-0.029	0.004	0.147	0.474
GBR	1981	21	1950	-0.005	0.000	0.988	0.129
TUN	1981	29	1972	-0.010	0.002	0.002	0.445
LKA	1981	29	1973	-0.001	0.002	0.129	0.438
BWA	1982	8	1973	-0.045	0.006	0.235	0.252
KOR	1982	9	1962	0.018	-0.004	0.960	1.098
LBN	1982	9	1970	-0.053	0.006	0.024	0.185
JOR	1982	9	1974	-0.044	0.006	0.330	0.377
ALB	1982	10	1970	-0.051	0.006	0.004	0.197
MNG	1982	11	1970	-0.050	0.006	-0.011	0.219
GMB	1982	13	1960	-0.022	0.002	0.352	0.662
BGD	1982	14	1967	-0.022	0.003	0.215	1.077
KHM	1982	16	1970	-0.038	0.005	0.000	0.311
PRI	1982	18	1972	-0.042	0.006	0.154	0.746
PAN	1982	20	1959	-0.005	-0.001	1.069	0.163
ZWE	1983	8	1968	-0.031	0.003	0.312	1.468
ETH	1983	9	1969	-0.016	0.001	0.929	0.745
ZMB	1983	11	1975	-0.056	0.007	0.034	0.732
GHA	1983	19	1974	-0.034	0.005	0.022	0.699
NPL	1983	27	1960	0.004	0.000	0.213	0.515

CYP	1984	8	1975	-0.072	0.009	0.091	1.170
PNG	1984	9	1973	-0.050	0.006	0.017	0.626
CMR	1984	10	1976	-0.052	0.007	-0.052	0.495
COG	1984	10	1976	-0.052	0.007	-0.052	0.495
CUB	1984	11	1970	-0.053	0.007	-0.072	0.422
FIN	1985	8	1974	-0.037	0.004	0.362	1.108
ARG	1985	9	1977	-0.040	0.005	0.165	0.756
URY	1985	9	1977	-0.040	0.005	0.165	0.756
PRT	1985	15	1973	-0.039	0.006	0.170	0.849
NAM	1985	17	1974	-0.029	0.004	-0.008	0.540
VEN	1985	17	1977	-0.041	0.006	0.036	0.499
OMN	1985	25	1970	-0.001	0.001	-0.008	0.495
PHL	1985	25	1977	0.002	0.002	0.048	0.305
AFG	1986	8	1970	-0.071	0.008	-0.167	0.607
JAM	1986	8	1972	-0.068	0.008	0.071	1.395
BEN	1986	8	1978	-0.067	0.009	-0.069	0.763
ROM	1986	8	1978	-0.064	0.008	-0.184	0.637
MOZ	1986	9	1976	-0.056	0.007	-0.127	0.683
CAF	1986	10	1960	-0.031	0.003	0.279	0.781
CHL	1986	11	1976	-0.043	0.006	0.132	0.624
MLI	1986	24	1974	-0.004	0.002	-0.014	0.515
BOL	1986	24	1977	0.005	0.001	0.064	0.304
LSO	1986	24	1978	-0.003	0.002	-0.075	0.429
THA	1987	8	1958	-0.023	-0.001	1.688	0.428
NIC	1987	8	1979	-0.063	0.008	-0.075	0.766
MYS	1987	9	1979	-0.053	0.007	-0.042	0.794
IRL	1987	15	1979	-0.038	0.006	-0.027	0.456
GAB	1987	23	1976	-0.001	0.002	-0.062	0.473
NGA	1987	23	1976	0.013	0.000	0.116	0.240
SLV	1987	23	1978	0.005	0.001	0.049	0.277
NER	1987	23	1979	-0.002	0.002	-0.074	0.442
BGR	1988	9	1970	-0.056	0.007	-0.025	0.611
FJI	1988	12	1979	-0.039	0.006	-0.070	0.534
IRN	1988	22	1976	0.010	0.001	-0.003	0.492
GTM	1988	22	1980	0.011	0.001	0.033	0.212
UGA	1988	22	1980	0.012	0.001	0.032	0.170
SYR	1989	9	1981	-0.049	0.007	-0.049	0.523
ZAR	1989	11	1974	-0.031	0.005	0.307	0.538
PRY	1989	13	1980	-0.026	0.005	0.072	0.372
TTO	1989	13	1980	-0.029	0.005	0.061	0.338
VNM	1989	21	1970	0.009	0.001	0.063	0.492
SWZ	1989	21	1978	0.010	0.000	0.020	0.403
MEX	1989	21	1981	0.009	0.001	-0.001	0.202
SLE	1990	9	1970	-0.048	0.006	-0.034	0.637
ITA	1990	11	1974	-0.033	0.005	0.283	0.407
GUY	1990	20	1981	0.010	0.001	-0.018	0.364

BWA	1990	20	1982	0.008	0.001	-0.024	0.353
KOR	1991	11	1982	-0.023	0.005	0.070	0.417
ZWE	1991	11	1983	-0.020	0.004	0.108	0.391
JPN	1991	19	1970	0.025	-0.001	0.328	0.243
DOM	1991	19	1976	0.019	0.000	0.123	0.218
CHN	1991	19	1977	0.027	-0.001	0.093	0.448
CRI	1991	19	1979	0.018	0.000	0.068	0.176
IRQ	1991	19	1979	0.015	0.000	-0.013	0.403
POL	1991	19	1979	0.015	0.000	-0.013	0.403
JOR	1991	19	1982	0.030	-0.001	0.061	0.330
LBN	1991	19	1982	0.013	0.000	-0.046	0.354
BDI	1992	8	1960	-0.038	0.005	0.160	0.468
ETH	1992	10	1983	-0.018	0.004	0.153	0.089
EGY	1992	18	1976	0.027	-0.001	0.168	0.116
PER	1992	18	1981	0.024	0.000	0.063	0.081
ALB	1992	18	1982	0.015	0.000	-0.070	0.359
CYP	1992	18	1984	0.028	-0.001	0.080	0.055
AGO	1993	8	1970	-0.042	0.006	-0.178	0.438
FIN	1993	8	1985	-0.024	0.005	0.212	0.036
IND	1993	9	1950	-0.010	-0.001	1.910	-0.708
TGO	1993	17	1979	0.014	0.000	0.001	0.392
ZAF	1993	17	1981	0.020	0.000	-0.008	0.118
MNG	1993	17	1982	0.017	0.000	-0.097	0.364
PNG	1993	17	1984	0.015	0.000	0.012	0.313
COL	1994	8	1967	-0.026	0.004	0.546	0.071
LBR	1994	8	1970	-0.032	0.005	-0.210	0.360
HKG	1994	8	1981	-0.022	0.005	-0.006	0.250
RWA	1994	8	1981	-0.022	0.005	-0.006	0.250
ARG	1994	8	1985	-0.020	0.004	0.201	0.033
URY	1994	8	1985	-0.020	0.004	0.201	0.033
TWN	1994	16	1962	0.027	-0.002	0.493	0.082
DZA	1994	16	1979	0.018	0.000	0.022	0.371
HTI	1994	16	1980	0.018	0.000	0.017	0.364
ZMB	1994	16	1983	0.042	-0.002	0.083	0.306
CMR	1994	16	1984	0.019	0.000	0.041	0.316
COG	1994	16	1984	0.019	0.000	0.041	0.316
AFG	1994	16	1986	0.019	0.000	-0.130	0.301
BEN	1994	16	1986	0.042	-0.003	0.133	0.216
JAM	1994	16	1986	0.042	-0.002	0.067	0.272
ROM	1994	16	1986	0.021	0.000	0.075	0.252
MAR	1995	15	1977	0.035	-0.001	0.097	-0.016
GMB	1995	15	1982	0.017	0.000	-0.041	0.328
CUB	1995	15	1984	0.023	0.000	-0.153	0.331
MOZ	1995	15	1986	0.023	-0.001	0.067	0.277
NIC	1995	15	1987	0.046	-0.003	0.153	0.001
THA	1995	15	1987	0.032	-0.001	-0.025	0.082

IDN	1996	14	1968	0.020	-0.001	0.082	0.377
SDN	1996	14	1978	0.029	-0.001	-0.090	0.326
BGD	1996	14	1982	0.037	-0.002	-0.065	0.341
CAF	1996	14	1986	0.021	0.000	-0.028	0.284
MYS	1996	14	1987	0.058	-0.004	0.170	0.237
GNB	1997	13	1981	0.030	-0.001	0.049	0.296
CHL	1997	13	1986	0.053	-0.003	0.142	0.027
BGR	1997	13	1988	0.030	-0.001	-0.184	0.329
KHM	1998	12	1982	0.037	-0.002	-0.177	0.307
SYR	1998	12	1989	0.043	-0.003	0.200	0.356
ECU	1999	11	1978	0.057	-0.003	-0.015	-0.103
SLE	1999	11	1990	0.042	-0.002	0.005	0.306
TZA	2000	10	1971	0.041	-0.002	0.021	0.205
TCD	2000	10	1980	0.049	-0.003	0.112	0.195
PRI	2000	10	1982	0.073	-0.005	-0.035	-0.302
PRT	2000	10	1985	0.077	-0.006	0.035	-0.277
FJI	2000	10	1988	0.055	-0.004	0.216	0.362
ZAR	2000	10	1989	0.087	-0.007	0.182	-0.272
BDI	2000	10	1992	0.044	-0.002	0.019	0.206
ITA	2001	9	1990	0.102	-0.009	0.216	-0.380
AGO	2001	9	1993	0.054	-0.003	-0.184	0.402
FIN	2001	9	1993	0.096	-0.008	0.178	0.240
GIN	2002	8	1959	0.093	-0.008	0.005	0.257
MDG	2002	8	1974	0.060	-0.004	-0.024	0.046
MRT	2002	8	1976	0.065	-0.004	0.100	0.037
MWI	2002	8	1978	0.100	-0.008	-0.220	0.160
LAO	2002	8	1979	0.074	-0.005	-0.165	0.081
BRA	2002	8	1980	0.102	-0.008	-0.130	-0.604
GBR	2002	8	1981	0.092	-0.006	-0.324	-0.495
PAN	2002	8	1982	0.100	-0.007	-0.203	-0.508
GHA	2002	8	1983	0.112	-0.009	-0.081	0.167
NAM	2002	8	1985	0.068	-0.005	0.134	0.225
VEN	2002	8	1985	0.114	-0.010	0.126	-0.582
IRL	2002	8	1987	0.113	-0.010	0.163	-0.425
PRY	2002	8	1989	0.107	-0.009	0.126	0.026
TTO	2002	8	1989	0.110	-0.010	0.134	-0.133
KOR	2002	8	1991	0.113	-0.010	0.182	0.533
ZWE	2002	8	1991	0.113	-0.010	0.187	0.565
ETH	2002	8	1992	0.107	-0.010	0.143	0.213
IND	2002	8	1993	0.107	-0.008	-0.055	-0.295
ARG	2002	8	1994	0.107	-0.009	0.083	0.270
COL	2002	8	1994	0.113	-0.009	0.117	-0.289
HKG	2002	8	1994	0.060	-0.005	0.249	0.391
LBR	2002	8	1994	0.056	-0.004	-0.195	0.393
RWA	2002	8	1994	0.060	-0.005	0.249	0.391
URY	2002	8	1994	0.107	-0.009	0.083	0.270

Table A3: Classification of all growth accelerations by the episode UCP flow magnitude (large, medium, small, negative) and whether the acceleration was a recovery and whether the recovery surpassed previous peak GDPPC															
Total	Non-recoveries					Recoveries passing the peak					Recoveries not passing the peak				
153	69					45					39				
	Country	Years of episode	Percent gain in GDPPC during episode over UCP gain	Percent gain in GDPPC during episode (absolute)	Ratio of episode end to previous peak	Country	Years of episode	Percent gain in GDPPC during episode over UCP gain	Percent gain in GDPPC during episode (absolute)	Ratio of episode end to previous peak	Country	Years of episode	Percent gain in GDPPC during episode over UCP gain	Percent gain in GDPPC during episode (absolute)	Ratio of episode end to previous peak
Large	TWN	62-94	447.1%	776.1%	8.8	THA	58-87	116.2%	299.1%	3.22	KHM	82-98	102.6%	76.0%	0.85
	IDN	67-96	174.5%	374.1%	4.4	TTO	02-10	86.2%	105.3%	1.61					
	EGY	76-92	148.0%	165.3%	2.3	ALB	92-10	81.3%	190.6%	1.73					
	CHN	77-91	117.2%	181.9%	2.8	AGO	01-10	78.1%	133.2%	1.96					
	KOR	62-82	113.4%	241.0%	3.3	LSO	86-10	71.0%	104.6%	1.55					
	VNM	89-10	104.8%	228.4%	3.3	MOZ	95-10	70.4%	139.5%	1.90					
	SGP	68-80	100.9%	161.4%	2.6	ROM	94-10	69.4%	79.2%	1.24					
	IRL	87-02	98.6%	144.0%	2.4	POL	91-10	62.6%	124.5%	1.80					
	LAO	79-02	97.0%	130.8%	2.2	CYP	75-84	61.5%	125.5%	1.53					
	CHN	91-10	83.3%	473.0%	5.7	GUY	90-10	56.1%	124.5%	1.33					
	CHL	86-97	77.4%	103.4%	1.7	JOR	74-82	54.7%	80.6%	1.19					
	PRI	82-00	63.6%	116.1%	2.0	UGA	88-10	50.7%	108.2%	1.34					
	GAB	68-76	62.0%	168.5%	2.7										
	MYS	87-96	62.0%	96.2%	1.8										
	PAN	59-82	60.9%	214.4%	2.8										
	MYS	70-79	56.9%	95.2%	2.0										
	KHM	98-10	52.1%	113.3%	1.8										
30	17					12					1				

Total	Non-recoveries					Recoveries passing the peak					Recoveries not passing the peak				
Medium	NPL	83-10	48.3%	92.8%	1.8	MAR	60-68	48.3%	86.7%	1.59	IRQ	91-10	49.0%	255.6%	0.81
	COG	76-84	48.0%	69.7%	1.5	SDN	96-10	44.7%	95.6%	1.59	SLE	99-10	46.9%	96.2%	0.92
	GBR	81-02	43.0%	91.2%	1.9	MLI	74-86	41.7%	62.7%	1.24	NGA	87-10	43.2%	73.8%	0.89
	PRY	71-80	42.2%	74.2%	1.7	BGR	97-10	36.3%	78.5%	1.40	UGA	80-88	39.8%	-1.2%	0.64
	ECU	70-78	39.7%	69.5%	1.7	PNG	84-93	35.7%	44.7%	1.03	BGD	82-96	37.5%	24.3%	0.94
	CMR	76-84	39.7%	47.6%	1.4	URY	85-94	32.9%	56.8%	1.15	IRN	88-10	36.8%	82.7%	0.71
	DOM	91-10	39.4%	125.9%	2.1	TCD	00-10	32.8%	83.3%	1.47	TCD	80-00	35.6%	28.3%	0.80
	BWA	82-90	39.2%	92.1%	1.9	MUS	71-79	31.3%	85.5%	1.27	LBN	82-91	33.5%	96.9%	0.58
	LAO	02-10	37.8%	79.0%	1.8	CUB	95-10	29.1%	87.4%	1.31	JAM	86-94	33.5%	36.8%	1.00
	LKA	73-81	33.8%	54.0%	1.5	SYR	89-98	27.7%	46.7%	1.14	TTO	89-02	33.4%	44.1%	0.78
	BRA	67-80	33.4%	119.9%	2.2	PER	92-10	26.0%	98.1%	1.34	GHA	83-02	30.2%	42.3%	0.93
	TZA	00-10	32.2%	62.6%	1.6						MOZ	86-95	25.3%	13.1%	0.79
	MWI	64-78	31.9%	136.6%	2.1										
	IRL	58-79	31.9%	132.2%	2.2										
	HKG	02-10	31.4%	38.0%	1.4										
	PRT	85-00	30.5%	81.3%	1.7										
	IND	02-10	29.3%	70.0%	1.7										
	LSO	70-78	28.8%	75.4%	1.7										
	GTM	62-80	28.3%	91.1%	1.9										
	BEL	59-74	27.9%	96.7%	2.0										
	GRC	60-73	25.7%	179.5%	2.8										
	DOM	68-76	25.7%	72.5%	1.5										
45	22					11					12				

Total	Non-recoveries					Recoveries passing the peak					Recoveries not passing the peak				
Small	PAN	02-10	21.7%	58.4%	1.6	SLV	87-10	24.8%	58.2%	1.19	AGO	93-01	22.9%	34.9%	0.85
	IND	93-02	19.4%	42.8%	1.4	DZA	71-79	22.1%	50.0%	1.27	LBR	94-02	20.7%	229.5%	0.38
	LKA	59-73	18.3%	57.4%	1.4	FJI	88-00	21.7%	40.2%	1.13	ZMB	94-10	17.3%	106.0%	0.77
	HTI	72-80	17.5%	36.8%	1.2	BEN	78-86	19.6%	42.9%	1.19	RWA	94-02	12.9%	119.1%	0.80
	DNK	58-69	17.1%	72.3%	1.7	ARG	02-10	19.4%	55.9%	1.31	ETH	92-02	7.4%	27.3%	0.88
	COL	67-94	16.9%	83.2%	1.8	RWA	02-10	18.1%	40.0%	1.11	NIC	95-10	7.0%	25.6%	0.55
	PAK	60-70	16.3%	56.6%	1.5	URY	02-10	15.2%	53.8%	1.28	CHL	76-86	3.0%	20.2%	0.93
	HND	70-79	15.1%	44.4%	1.4	UGA	61-69	14.7%	29.6%	1.09	AFG	94-10	2.8%	142.5%	0.69
	CRI	91-10	12.8%	61.2%	1.4	MNG	93-10	12.1%	86.5%	1.18	ZAR	00-10	2.1%	33.8%	0.29
	PRT	64-73	12.4%	96.9%	2.0	FIN	93-01	11.5%	41.6%	1.17	CMR	94-10	0.8%	21.5%	0.71
	PER	59-67	11.7%	48.4%	1.3	ARG	85-94	11.2%	21.6%	1.00					
	CHN	68-77	11.6%	49.6%	1.3	NGA	68-76	10.6%	70.0%	1.19					
	BGD	96-10	11.5%	71.3%	1.6	JOR	91-10	8.2%	59.5%	1.02					
	NAM	02-10	11.0%	28.3%	1.1	ZAF	93-10	5.7%	46.9%	1.24					
	JPN	59-70	10.9%	176.3%	2.8	ZWE	68-83	1.4%	112.0%	1.70					
	MAR	95-10	6.8%	67.9%	1.5	BOL	86-10	1.1%	47.0%	1.12					
	ETH	02-10	6.3%	59.2%	1.4										
	BFA	71-79	6.1%	35.3%	1.3										
	COL	02-10	4.7%	27.7%	1.2										
	DZA	94-10	3.3%	39.6%	1.2										
	KOR	82-91	3.3%	122.9%	2.2										
47	21					16					10				

Table A4: Classification of all growth decelerations, by magnitude of growth deceleration relative to unconditional predicted growth and size of total loss or gain relative to absolute

Total	Depression (GDPPC loss > 20 percent)					Negative, not depression (GDPPC loss, less than 20 percent)					Slow Down (Positive) (GDPPC gain over episode)				
161	Country	Period	Percent loss relative to UCP predicted	Percent loss start to finish, actual	Ratio end episod e to all time low	Country	Period	Percent loss relative to UCP predicted	Percent loss start to finish, actual	Ratio end episode to all time low	Country	Period	Percent loss relative to UCP predicted	Percent loss start to finish, actual	Ratio end episode to all time low
Large	IRN	76-88	-82.7%	-61.3%	2.22	BRA	80-02	-59.3%	-1.5%	4.01	GRC	73-10	-48.0%	61.5%	6.60
	AFG	86-94	-69.9%	-71.5%	0.46	ZWE	02-10	-46.0%	-3.9%	1.34	HND	79-10	-46.2%	6.4%	1.88
	MWI	78-02	-69.7%	-43.4%	1.55	ECU	78-99	-45.7%	-9.2%	2.17	KEN	67-10	-46.1%	7.6%	1.31
	ZAR	89-00	-66.2%	-71.1%	0.34	SWZ	89-10	-40.6%	-0.4%	2.75	AUT	79-10	-40.2%	73.8%	6.21
	IRQ	79-91	-65.4%	-77.1%	0.48	JAM	94-10	-40.1%	-8.2%	2.02	OMN	85-10	-38.6%	42.4%	4.45
	JOR	65-74	-63.1%	-34.0%	1.52	GTM	80-88	-37.3%	-19.3%	1.72	PAN	82-02	-38.5%	21.1%	4.14
	TTO	80-89	-61.6%	-45.6%	2.38						ESP	74-10	-38.4%	79.3%	7.19
	JOR	82-91	-60.5%	-36.4%	1.74						JAM	61-72	-36.6%	41.0%	2.21
	SOM	78-10	-57.7%	-46.7%	0.62										
	NGA	76-87	-56.7%	-48.4%	0.88										
	CMR	84-94	-51.3%	-41.9%	1.06										
	GAB	76-87	-50.9%	-53.2%	1.86										
Total	Depression (GDPPC loss > 20 percent)					Negative, not depression (GDPPC loss, less than 20 percent)					Slow Down (Positive) (GDPPC gain over episode)				
	SLE	90-99	-50.2%	-50.3%	1.10										
	CIV	78-10	-50.1%	-26.6%	1.35										
	ROM	86-94	-47.4%	-30.8%	3.82										
	MDG	74-02	-44.5%	-42.6%	0.67										
	CUB	84-95	-44.1%	-29.9%	1.37										
	GNB	97-10	-44.1%	-31.0%	1.10										
	UGA	69-80	-43.2%	-35.0%	0.84										

	BDI	92-00	-40.7%	-35.5%	1.35										
	PNG	73-84	-39.6%	-28.3%	1.23										
	ALB	82-92	-39.4%	-39.3%	0.76										
	ZMB	75-83	-39.4%	-39.1%	0.79										
	BGR	88-97	-39.4%	-21.4%	2.09										
	HTI	80-94	-37.6%	-34.2%	0.90										
	NIC	87-95	-37.1%	-39.3%	0.96										
	GHA	74-83	-36.6%	-34.8%	0.94										
	COG	84-94	-35.2%	-27.6%	2.07										
	MNG	82-93	-35.0%	-33.9%	1.08										
	TCD	71-80	-33.8%	-35.4%	0.72										
44	30					6					8				
Medium	NGA	60-68	-32.1%	-28.3%	0.99	DZA	79-94	-32.3%	-13.8%	1.79	JPN	91-10	-32.2%	10.2%	11.29
	ZMB	67-75	-31.6%	-20.1%	1.29	ETH	69-83	-30.6%	-5.2%	1.57	ZAR	58-74	-31.5%	11.8%	1.57
	MOZ	76-86	-29.7%	-29.7%	0.94	NER	68-79	-29.2%	-5.6%	1.08	ISR	75-10	-28.9%	65.6%	5.81
	JAM	72-86	-29.6%	-27.3%	1.60	LBR	02-10	-27.9%	-16.4%	2.85	CHE	74-10	-28.6%	26.1%	2.69
	PER	81-92	-28.7%	-31.3%	1.39	PRY	89-02	-24.3%	-14.1%	2.03	TGO	69-79	-27.5%	7.2%	1.82
	GUY	81-90	-28.5%	-38.1%	0.77	FIN	85-93	-24.1%	-1.3%	3.40	PNG	93-10	-27.4%	7.3%	1.92
	NAM	74-85	-27.8%	-26.1%	1.15	ZAF	81-93	-23.6%	-15.6%	1.59	CYP	84-92	-25.0%	38.6%	5.49
	ZAR	74-89	-27.4%	-25.3%	1.17	CHL	68-76	-23.2%	-14.4%	1.15	MYS	96-10	-23.5%	31.5%	9.44
	NIC	67-79	-27.3%	-34.6%	1.21	MRT	76-02	-22.9%	-12.2%	2.80	SYR	98-10	-22.8%	5.3%	2.50
	VEN	77-85	-25.8%	-29.7%	1.47	MEX	81-89	-22.1%	-16.8%	2.50	PRY	80-89	-22.6%	6.5%	2.37
	GNB	70-81	-25.1%	-25.1%	1.24	CHN	60-68	-21.9%	-10.8%	1.36	HKG	94-02	-21.7%	5.6%	8.55
	POL	79-91	-24.8%	-20.0%	1.24	FJI	79-88	-20.8%	-19.7%	1.54	PRI	72-82	-21.7%	2.5%	3.61
	ZWE	91-02	-24.4%	-32.9%	1.40	CRI	79-91	-20.5%	-14.1%	2.09	IRL	79-87	-21.5%	0.4%	2.50
	NER	79-87	-23.2%	-39.4%	0.73	FJI	00-10	-20.5%	-1.8%	2.12	DOM	60-68	-21.3%	3.0%	1.33
	TGO	79-93	-23.0%	-44.8%	1.00						IDN	96-10	-20.6%	29.6%	7.52
	SLV	78-87	-21.4%	-24.9%	1.38										
	RWA	81-94	-21.3%	-63.7%	0.57										
46	17					14					15				

Total	Depression (GDPPC loss > 20 percent)					Negative, not depression (GDPPC loss, less than 20 percent)					Slow Down (Positive) (GDPPC gain over episode)				
Small	LSO	78-86	-19.4%	-24.2%	1.75	EGY	65-76	-19.2%	-0.6%	1.39	NZL	58-74	-19.7%	56.8%	1.75
	CAF	86-96	-18.0%	-34.0%	0.73	COL	94-02	-18.3%	-1.1%	2.28	BEL	74-10	-19.5%	88.6%	4.47
	SYR	81-89	-17.8%	-22.3%	1.62	URY	94-02	-18.2%	-6.1%	1.68	MYS	79-87	-18.6%	16.0%	3.66
	MUS	63-71	-16.7%	-22.7%	0.86	ARG	77-85	-17.2%	-16.7%	1.39	NIC	79-87	-18.0%	30.1%	1.58
	BOL	77-86	-12.9%	-23.8%	0.99	PRI	00-10	-16.2%	-9.8%	7.04	PRT	73-85	-15.9%	7.7%	4.07
	GMB	82-95	-12.9%	-25.3%	1.09	PRT	00-10	-16.0%	-0.2%	7.37	MRT	68-76	-15.9%	32.2%	3.19
	ETH	83-92	-1.1%	-25.6%	1.17	ITA	01-10	-13.7%	-2.6%	5.42	ROM	78-86	-14.6%	16.3%	5.52
						ARG	94-02	-13.7%	-7.0%	1.58	PER	67-81	-14.3%	17.3%	2.02
						BEN	86-94	-13.2%	-14.6%	1.37	TWN	94-10	-14.1%	82.6%	26.00
						SDN	78-96	-11.7%	-12.4%	1.21	HUN	78-10	-14.1%	46.2%	2.13
						CYP	67-75	-10.7%	-10.2%	1.76	PHL	59-77	-13.1%	58.7%	2.32
						PHL	77-85	-10.6%	-12.9%	2.02	KOR	91-02	-12.9%	61.7%	13.89
						ZWE	83-91	-0.8%	-1.8%	2.08	ITA	90-01	-12.2%	17.6%	5.56
											BWA	90-10	-12.0%	45.0%	14.35
											TZA	71-00	-11.6%	14.1%	1.89
											EGY	92-10	-11.4%	69.5%	6.27
											CYP	92-10	-10.4%	28.7%	7.06
											THA	95-10	-8.8%	32.1%	10.99
											MAR	77-95	-8.7%	2.5%	3.29
											SGP	80-10	-6.9%	262.9%	12.75
											CRI	58-79	-6.5%	74.8%	2.44
											BFA	79-10	-6.4%	38.6%	2.08
											NLD	74-10	-6.0%	74.9%	3.92
											DOM	76-91	-5.9%	12.4%	2.59
											CHL	97-10	-2.8%	39.5%	3.91
											FIN	01-10	-1.8%	12.0%	5.39
											HKG	81-94	-1.0%	81.2%	8.10

											DNK	69-10	-0.9%	93.5%	3.92
											ITA	74-90	-0.6%	50.2%	4.73
49	7					13					29				
Positive						IRL	02-10	1.8%	-5.4%	5.77	LBN	91-10	0.6%	71.5%	3.38
						URY	77-85	13.1%	-10.8%	1.14	TTO	61-80	2.4%	119.9%	4.37
											KOR	02-10	2.7%	29.4%	17.97
											GBR	02-10	2.8%	8.1%	3.81
											TUN	81-10	3.4%	52.5%	3.37
											ISR	67-75	3.9%	74.6%	3.51
											SLE	70-90	6.8%	28.0%	2.22
											MUS	79-10	8.8%	177.4%	5.15
											MLI	86-10	10.4%	52.4%	2.48
											FIN	74-85	10.7%	27.0%	3.45
											NZL	74-10	13.3%	44.3%	2.53
											AUS	69-10	13.8%	101.4%	3.53
											TUN	72-81	17.1%	27.2%	2.21
											SWZ	78-89	18.7%	34.3%	2.76
											BWA	73-82	19.1%	37.9%	5.15
											MAR	68-77	19.2%	57.7%	3.21
											LKA	81-10	20.8%	184.9%	7.21
											JPN	70-91	23.8%	107.1%	10.24
											TUR	58-10	40.3%	198.3%	4.78
											PAK	70-10	46.0%	139.0%	3.77
22	0					2					20				

Total	Non-recoveries					Recoveries passing the peak					Recoveries not passing the peak				
Negative	ECU	99-10	-0.2%	38.8%	1.2	PHL	85-10	-2.7%	57.8%	1.28	GNB	81-97	-0.1%	28.5%	0.96
	MRT	02-10	-0.5%	25.0%	1.1	GTM	88-10	-6.1%	33.7%	1.08	MWI	02-10	-2.2%	49.1%	0.84
	GHA	02-10	-0.8%	38.6%	1.3	MEX	89-10	-7.7%	31.9%	1.10	NAM	85-02	-3.1%	20.4%	0.88
	BRA	02-10	-3.3%	21.4%	1.2	SEN	73-10	-10.0%	29.3%	1.04	ZMB	83-94	-9.1%	-21.8%	0.38
	THA	87-95	-5.3%	88.4%	1.9	BEN	94-10	-15.9%	23.9%	1.05	VEN	02-10	-9.1%	14.5%	0.78
	GHA	66-74	-5.4%	30.0%	1.1	BOL	58-77	-22.1%	30.4%	1.01	HTI	94-10	-16.4%	20.7%	0.79
	AUS	61-69	-8.2%	38.0%	1.3						BDI	00-10	-16.8%	1.7%	0.65
	PRY	02-10	-8.3%	24.6%	1.1						VEN	85-02	-17.9%	-2.7%	0.68
	GIN	02-10	-16.4%	-7.9%	0.8						GMB	95-10	-21.7%	16.7%	0.87
											COG	94-10	-23.0%	11.4%	0.81
											MDG	02-10	-23.8%	5.1%	0.60
											BGD	67-82	-29.2%	-3.9%	0.76
											CAF	96-10	-29.4%	5.9%	0.56
											NER	87-10	-32.3%	-7.4%	0.50
											TGO	93-10	-33.0%	2.4%	0.57
											GAB	87-10	-35.1%	9.0%	0.51
31	9					6					16				

Table A5: Country Codes

COUNTRY	*CODE*	*COUNTRY*	*CODE*
Afghanistan	AFG	Dominican Republic	DOM
Albania	ALB	Ecuador	ECU
Algeria	DZA	Egypt, Arab Rep.	EGY
Angola	AGO	El Salvador	SLV
Argentina	ARG	Ethiopia	ETH
Australia	AUS	Fiji	FJI
Austria	AUT	Finland	FIN
Bangladesh	BGD	France	FRA
Belgium	BEL	Gabon	GAB
Benin	BEN	Gambia, The	GMB
Bolivia	BOL	Germany	DEU
Botswana	BWA	Ghana	GHA
Brazil	BRA	Greece	GRC
Bulgaria	BGR	Guatemala	GTM
Burkina Faso	BFA	Guinea	GIN
Burundi	BDI	Guinea-Bissau	GNB
Cambodia	KHM	Guyana	GUY
Cameroon	CMR	Haiti	HTI
Canada	CAN	Honduras	HND
Central African Republic	CAF	Hong Kong SAR, China	HKG
Chad	TCD	Hungary	HUN
Chile	CHL	India	IND
China	CHN	Indonesia	IDN
Colombia	COL	Iran, Islamic Rep.	IRN
Congo, Rep.	COG	Iraq	IRQ
Congo, Dem Rep.	ZAR	Ireland	IRL
Costa Rica	CRI	Israel	ISR
Côte d'Ivoire	CIV	Italy	ITA
Cuba	CUB	Jamaica	JAM
Cyprus	CYP	Japan	JPN
Denmark	DNK	Jordan	JOR

COUNTRY	*CODE*	*COUNTRY*	*CODE*
Kenya	KEN	Poland	POL
Korea, Rep.	KOR	Portugal	PRT
Lao PDR	LAO	Puerto Rico	PRI
Lebanon	LBN	Romania	ROM
Lesotho	LSO	Rwanda	RWA
Liberia	LBR	Senegal	SEN
Madagascar	MDG	Sierra Leone	SLE
Malawi	MWI	Singapore	SGP
Malaysia	MYS	Somalia	SOM
Mali	MLI	South Africa	ZAF
Mauritania	MRT	Spain	ESP
Mauritius	MUS	Sri Lanka	LKA
Mexico	MEX	Sudan	SDN
Mongolia	MNG	Swaziland	SWZ
Morocco	MAR	Sweden	SWE
Mozambique	MOZ	Switzerland	CHE
Namibia	NAM	Syrian Arab Republic	SYR
Nepal	NPL	Taiwan	TWN
Netherlands	NLD	Tanzania	TZA
New Zealand	NZL	Thailand	THA
Nicaragua	NIC	Togo	TGO
Niger	NER	Trinidad and Tobago	TTO
Nigeria	NGA	Tunisia	TUN
Norway	NOR	Turkey	TUR
Oman	OMN	Uganda	UGA
Pakistan	PAK	United Kingdom	GBR
Panama	PAN	United States	USA
Papua New Guinea	PNG	Uruguay	URY
Paraguay	PRY	Venezuela, RB	VEN
Peru	PER	Vietnam	VNM
Philippines	PHL	Zambia	ZMB
		Zimbabwe	ZWE

Figure A1. The Correlation between Growth Magnitude – Unconditional Prediction (UCP) - and Growth Magnitude -No Change

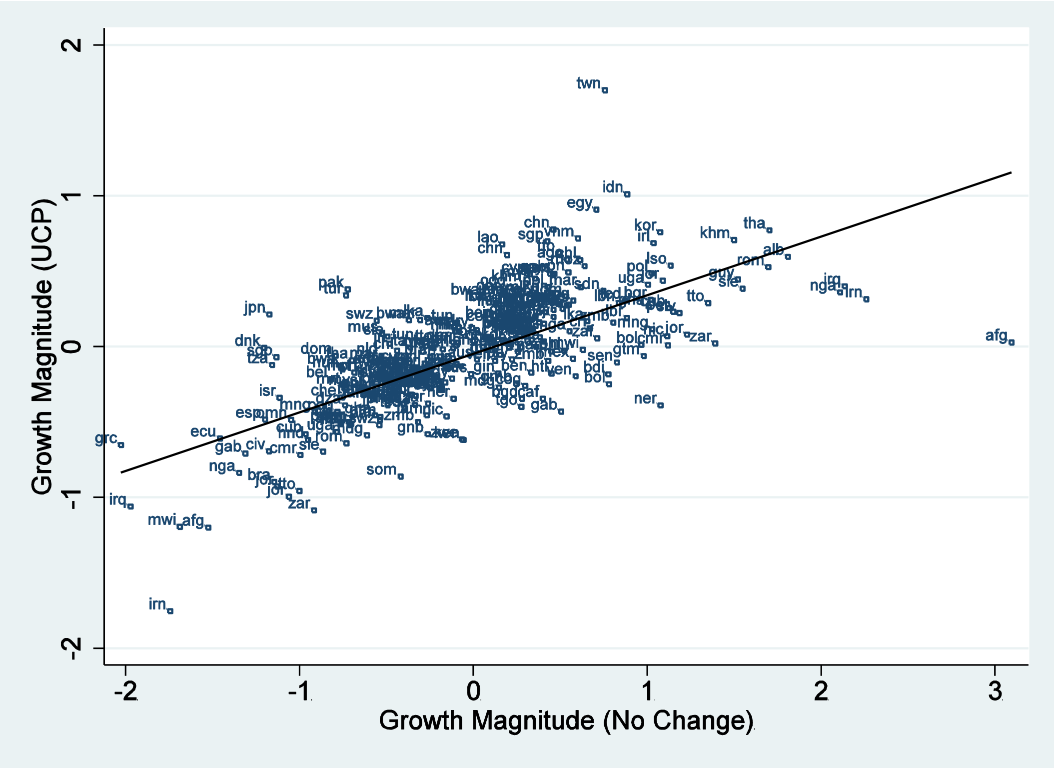

Figure A2. The Correlation between Growth Magnitude – Unconditional Prediction (UCP) - and Growth Magnitude –World Average

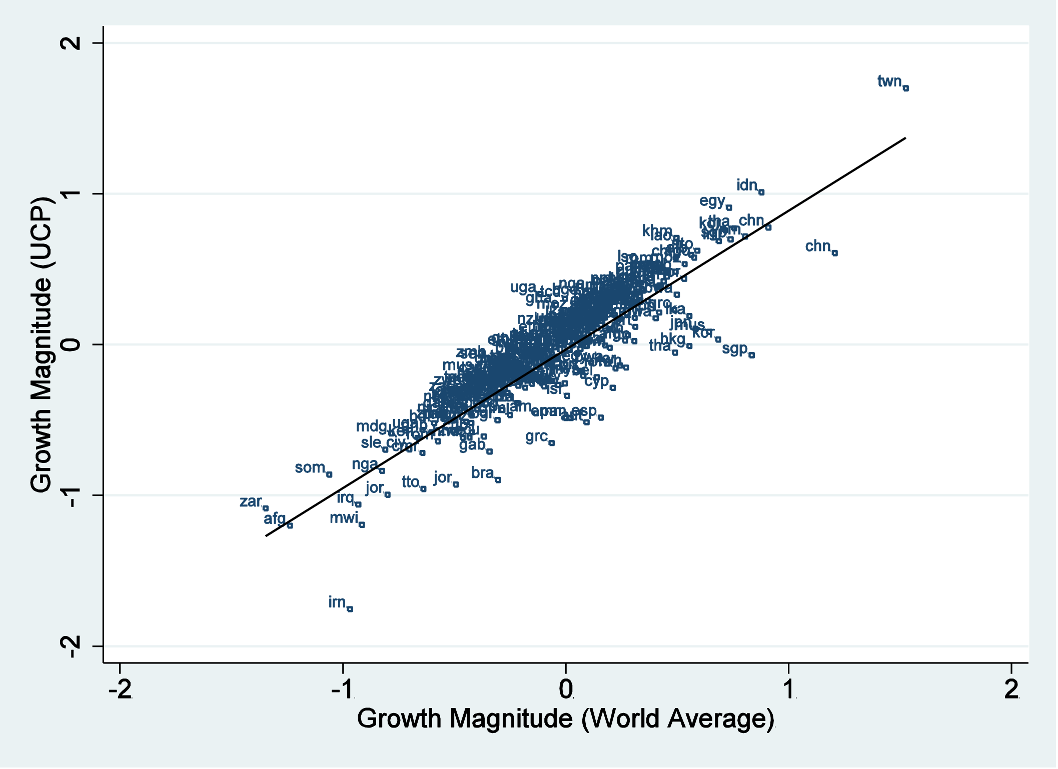

Figure A3. The Correlation between Growth Magnitude – Unconditional Prediction (UCP) - and Growth Duration

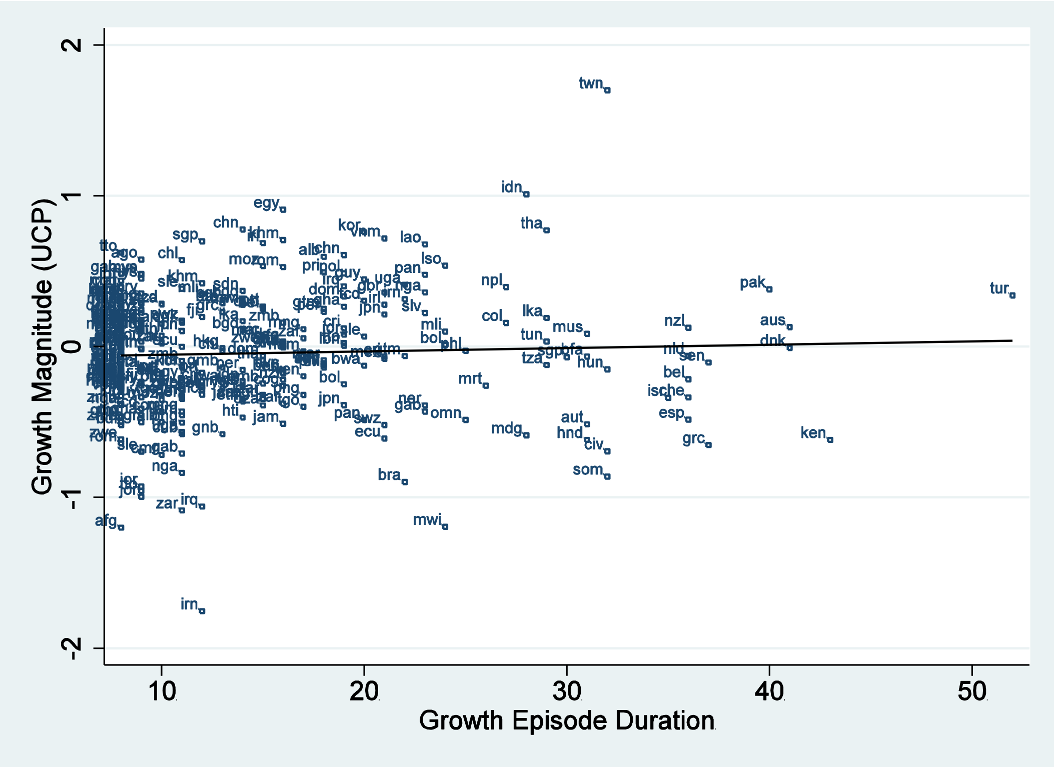

Figure A4. The Correlation between Growth Magnitude – Unconditional Prediction (UCP) - and Level of Per Capita Income


Growth Magnitude (UCP)
2
1
0
-1
-2
4
6
8
10
Initial Level of Per Capita Income (ln)

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identifying routes to social justice

The Effective States and Inclusive Development Research Centre

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