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Growth Accelerations

RICARDO HAUSMANN

John F. Kennedy School of Government, Harvard University

LANT PRITCHETT

The World Bank

DANI RODRIK

John F. Kennedy School of Government, Harvard University

Unlike most cross country growth analyses, we focus on turning points in growth performance. We look for instances of rapid acceleration in economic growth that are sustained for at least 8 years and identify more than 80 such episodes since the 1950s. Growth accelerations tend to be correlated with increases in investment and trade, and with real exchange rate depreciations. Political-regime changes are statistically significant predictors of growth accelerations. External shocks tend to produce growth accelerations that eventually fizzle out, while economic reform is a statistically significant predictor of growth accelerations that are sustained. However, growth accelerations tend to be highly unpredictable: the vast majority of growth accelerations are unrelated to standard determinants and most instances of economic reform do not produce growth accelerations.

Keywords: economic reform, growth episodes

1. Introduction

Accelerating the process of economic growth in a sustained manner is just about the most important policy issue in economics. Economists have long used a variety of econometric approaches to shed light on why some countries grow faster than others. Early work focused on cross-section econometrics, with growth rates over two or three decades regressed on country characteristics and policies (Barro, 1991; Barro and Sala-i-Martin, 1992). More recent work has focused on levels-regressions with incomes (rather than growth) as the dependent variable (Hall and Jones, 1999; Acemoglu et al., 2001) and on panel econometrics which organizes the country-level data in averages over five years or other intervals (Islam, 1995; Caselli et al., 1996). The policy prescriptions coming out of this work have tended to be summarized under three broad principles: openness, sound money, and property rights (see, e.g., Summers, 2003). There are by now a number of good surveys and evaluations of this empirical literature, including especially Temple (1999), Durlauf (2003), and Easterly (2003).

A curious aspect of this literature is that it does not focus on what is perhaps the most telling source of variation in the underlying data. As Easterly et al. (1993) first pointed out and many others have confirmed since, growth performance tends to be highly unstable. Very few countries have experienced consistently high growth rates over periods of several decades. The more typical pattern is that countries experience phases of growth, stagnation, or decline of varying length (Pritchett, 2000). Standard growth theory, whether of the neoclassical or the endogenous variant, suggests that our best bet for uncovering the relation between growth and its fundamentals is to look for instances where trend growth experiences a clear shift.

This point can be seen from Figure 1, which shows the implications of a (permanent) improvement in "growth fundamentals" at time T in two classes of models. In the *neoclassical* growth model, growth accelerates at T, but eventually converges back to the growth rate prevailing prior to T (unless the fundamental in question is exogenous technological progress). In *endogenous* growth models, growth accelerates permanently at time T. But in both cases, if we are interested in identifying the relevant growth fundamentals, our best strategy would be to look for changes that happen in the economy at or before time T. In other words, we can get significant mileage by identifying the turning points in growth experience and asking for what determines these transitions. If instead we lumped together data on growth without paying attention to these turning points, we would be averaging out the most interesting variation in the data.

By organizing the data around the turning points in growth experience, we also come significantly closer to answering the questions that most preoccupy policy makers. Policy makers want to know: how likely is it that an economy undergoes a significant acceleration of its rate of growth for a sustained period of time? What policies or other correlates seem to be associated with such transitions? What can be said about the causes of such transitions? Are they in line with current views as to the relative importance of economic reforms and institutions? Policy makers

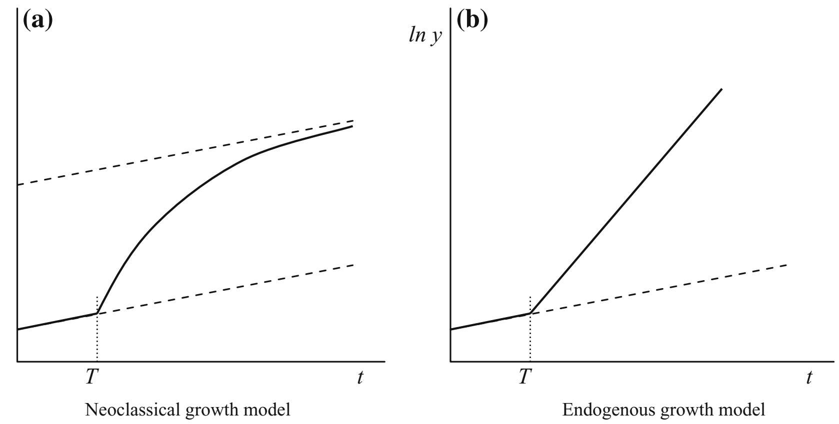

Figure 1. Effect of improvement in growth fundamentals at time T b.

may be rightly concerned about the possibility that even if standard cross-country regressions get the determinants right over a sufficiently long-time period, they are very poor predictors of turning points of growth.

They may also be concerned about the fact that growth regressions are based on very strong assumptions about a single linear model being appropriate for all countries in all states. There are a large number of models in which countries can be in different "states" and can switch from state to state responding to factors that determine their long-run equilibrium. For instance, in models with "poverty traps" the relationship between policy variables and growth outcomes is not linear as a movement across a threshold can cause a switch from a "trap" state to a growth state.

Rather than postulate a common model of output determination and dynamics we address these issues head on in this paper with empirical methods that begin by identifying growth episodes and then examine their determinants. We define a growth acceleration as an increase in per-capita growth of 2 percentage points or more (with most of the episodes we identify exceeding this threshold by a wide margin). To qualify as an acceleration, the increase in growth has to be sustained for at least eight years and the post-acceleration growth rate has to be at least 3.5 percent per year. In addition, to rule out cases of pure recovery, we require that post-acceleration output exceed the pre-episode peak level of income. Using this approach, we develop some new stylized facts about growth accelerations as well as analyze their predictability.

Our basic results are as follows. First, we find that growth accelerations are quite frequent. Using Penn World Tables (PWT) data we identify more than 80 episodes of rapid acceleration in economic growth that are sustained for at least 8 years. The unconditional probability that a country will experience a growth acceleration sometime during a decade is around 25 percent. Second, we find that growth accelerations tend to be correlated with increases in investment and trade, and with real exchange rate depreciations. Third, political-regime changes are statistically significant predictors of growth accelerations. Fourth, the nature of other determinants depends to some extent on whether the acceleration is sustained into the longer term or not. External shocks tend to produce growth accelerations that eventually fizzle out, while economic reform is a statistically significant predictor of growth accelerations that are sustained. Finally, and perhaps most importantly, we find that growth accelerations tend to be highly unpredictable: the vast majority of growth accelerations are unrelated to standard determinants such as political change and economic reform, and most instances of economic reform do not produce growth accelerations.

Two early precursors to the current work are Pritchett (2000) and Ben-David and Papell (1998), both of which employed statistical techniques to identify shifts in growth performance. Since we began our research on growth accelerations, a few other papers focusing on turning points and transitions have also appeared. Jones and Olken (2005a, b) have recently analyzed patterns of "start-and-stop growth" and have pointed to changes in political leaders as a driver of shifts in growth. Jerzmanowski (2005, forthcoming) has estimated a Markov-switching model that distinguishes four distinct growth regimes, and found that institutional quality helps determine transition probabilities among these growth "states."

The plan of our paper is as follows. In Section 2, we develop a filter to identify the instances in which countries experienced growth accelerations and discuss the resulting sample. We also present some robustness analyses, including the use of the World Development Indicators dataset in lieu of the PWT. Section 3 discusses the basic characteristics of growth accelerations and their correlates. Section 4 explores the predictors of growth transitions. Section 5 concludes.

2. Methods, Descriptive Statistics and Robustness

2.1. Methods and Descriptive Statistics

We define the growth rate $g_{t,t+n}$ at time t over horizon n to be the least squares growth rate of GDP per capita (y) from t to $t+n$ defined implicitly by the following:

$$\ln(y_{t+i}) = a + g_{t,t+n}{}^{*}t, \quad i = 0, \ldots, n.$$

The *change* in the growth rate at time t is simply the change in the growth over horizon n across that period:

$$\Delta g_{t,n} = g_{t,t+n} - g_{t-n,t}.$$

We identify growth accelerations by looking for rapid growth episodes that satisfy the following conditions.

(1) $g_{t,t+n} \geq 3.5\,\text{ppa}$, growth is rapid,

(2) $\Delta g_{t,n} \geq 2.0\,\text{ppa}$, growth accelerates,

(3) $y_{t+n} \geq \max\{y_i\},\ i \leq t$, post-growth output exceeds pre-episode peak.

We set the relevant time horizon to be eight years (i.e., $n = 7$).

The timing of the *initiation* of the growth acceleration is chosen by finding the year that maximizes the F-statistic of a spline regression with a break at the relevant year. That is, since for some countries there are a number of consecutive years for which these criteria of a growth episode are met, the "best" starting date is chosen by looking for the best fit among all contiguous eligible dates. Countries can have more than one instance of growth acceleration as long as the dates are more than 5 years apart (so a country could accelerate from 0 to 3.5 percent in 1967 and then accelerate from 3.5 to 6.0 percent in 1972 as two distinct episodes).

We use the PWT 6.1 as our baseline data source since this gives us data that go back to 1950. We eliminate from our sample all countries with population less than 1 million (in the most recent year for which they have data), as well as all countries with fewer than 20 data points in PWT. Since $n = 7$, the earliest and latest years for which we can identify episodes are 1957 and 1992, respectively.

This filter yields a surprisingly large number of growth accelerations—83 episodes in all. Table 1 shows all of these episodes with the standard three-letter country abbreviation and the year of initiation. The table is grouped by region and decade and within each sorted by the magnitude of the growth acceleration. It is comforting to see that our method identifies most of the well-known episodes of growth acceleration that are commonly associated with discrete political changes or policy reforms (e.g., China 1978, Argentina 1990, Mauritius 1971, Korea 1962, Indonesia 1967, Brazil 1967, Chile 1986, and Uganda 1989). But the fact that there are so many instances of rapid growth indicates that growth accelerations are often

Table 1. Episodes of rapid growth, by region, decade and magnitude of acceleration.

Region	Decade	Country	Year	Growth Before	Growth After	Difference in Growth
Sub-Saharan Africa	1950s and 1960s	NGA	1967	−1.7	7.3	9.0
		BWA	1969	2.9	11.7	8.8
		GHA	1965	−0.1	8.3	8.4
		GNB	1969	−0.3	8.1	8.4
		ZWE	1964	0.6	7.2	6.5
		COG	1969	0.9	5.4	4.5
		NGA	1957	1.2	4.3	3.0
	1970s	MUS	1971	−1.8	6.7	8.5
		TCD	1973	−0.7	7.3	8.0
		CMR	1972	−0.6	5.3	5.9
		COG	1978	3.1	8.2	5.1
		UGA	1977	−0.6	4.0	4.6
		LSO	1971	0.7	5.3	4.6
		RWA	1975	0.7	4.0	3.3
		MLI	1972	0.8	3.8	3.0
		MWI	1970	1.5	3.9	2.5
	1980s and 1990s	GNB	1988	−0.7	5.2	5.9
		MUS	1983	1.0	.5	4.4
		UGA	1989	−0.8	3.6	4.4
		MWI	1992	−0.8	4.8	5.6
South Asia	1950s/60s	PAK	1962	−2.4	4.8	7.1
	1970s	PAK	1979	1.4	4.6	3.2
		LKA	1979	1.9	4.1	2.2
	1980s	IND	1982	1.5	3.9	2.4
East Asia	1950s and 1960s	THA	1957	−2.5	5.3	7.8
		KOR	1962	0.6	6.9	6.3
		IDN	1967	−0.8	5.5	6.2
		SGP	1969	4.2	8.2	4.0
		TWN	1961	3.3	7.1	3.8
	1970s	CHN	1978	1.7	6.7	5.1
		MYS	1970	3.0	5.1	2.1
	1980s and 1990s	MYS	1988	1.1	5.7	4.6
		THA	1986	3.5	8.1	0.6

Table 1. Continued.

Region	Decade	Country	Year	Growth Before	Growth After	Difference in Growth
		PNG	1987	0.3	4.0	3.7
		KOR	1984	4.4	8.0	3.7
		IDN	1987	3.4	5.5	2.1
		CHN	1990	4.2	8.0	3.8
Eastern Europe	1970s	ROM	1979	6.6	12.4	5.8
	1990s	POL	1992	−0.8	5.0	5.8
Latin America and Caribbean	1950s and 1960s	DOM	1969	−1.1	5.5	6.6
		BRA	1967	2.7	7.8	5.1
		PER	1959	0.8	5.2	4.4
		PAN	1959	1.5	5.4	3.9
		NIC	1960	0.9	4.8	3.8
		ARG	1963	0.9	3.6	2.7
		COL	1967	1.6	4.0	2.4
	1970s	ECU	1970	1.5	8.4	6.8
		PRY	1974	2.6	6.2	3.7
		TTO	1975	1.9	5.4	3.5
		PAN	1975	2.6	5.3	2.7
		URY	1974	1.5	4.0	2.6
	1980s and 1990s	CHL	1986	−1.2	5.5	6.7
		URY	1989	1.6	3.8	2.1
		HTI	1990	−2.3	12.7	15.0
		ARG	1990	−3.1	6.1	9.2
		DOM	1992	0.4	6.3	5.8
Middle East and North Africa	1950s and 1960s	MAR	1958	−1.1	7.7	8.8
		SYR	1969	0.3	5.8	5.5
		TUN	1968	2.1	6.6	4.5
		ISR	1967	2.8	7.2	4.4
		ISR	1957	2.2	5.3	3.1
	1970s	JOR	1973	−3.6	9.1	12.7
		EGY	1976	−1.6	4.7	6.3
		SYR	1974	2.6	4.8	2.2
		DZA	1975	2.1	4.2	2.1
	1980s and 1990s	SYR	1989	−2.9	4.4	7.3
OECD	1950s and 1960s	ESP	1959	4.4	8.0	3.5
		DNK	1957	1.8	5.3	3.5
		JPN	1958	5.8	9.0	3.2
		USA	1961	0.9	3.9	3.0
		CAN	1962	0.6	3.6	2.9
		IRL	1958	1.0	3.7	2.7
		BEL	1959	2.1	4.5	2.4
		NZL	1957	1.5	3.8	2.4
		AUS	1961	1.5	3.8	2.3
		FIN	1958	2.7	5.0	2.2
		FIN	1967	3.4	5.6	2.2
	1980s and 1990s	PRT	1985	1.1	5.4	4.3
		ESP	1984	0.1	3.8	3.7
		IRL	1985	1.6	5.0	3.4
		GBR	1982	1.1	3.5	2.5
		FIN	1992	1.0	3.7	2.8
		NOR	1991	1.4	3.7	2.2

produced by less noticeable changes. This is a point we will develop further when we turn to the analysis of determinants.

Aside from the sheer *number* of accelerations, the *magnitude* of the typical acceleration is also striking. Conditional on a growth acceleration of at least 2 ppa, the average acceleration was 4.7 ppa (median 4.0). This implies that in the typical episode output stood almost 40 percent higher at the end of the episode than it would have been without any acceleration. Moreover, there are many episodes of accelerations of 7 percentage points or more [e.g., Ghana 1965 (8.4), Pakistan 1962 (7.1), and Argentina 1990 (9.2)].

We estimate the (unconditional) probability of a growth acceleration by dividing the number of episodes by the number of country-years in which an episode could have occurred. The latter is calculated by summing up all the country-years in our sample and eliminating a 4-year window after the occurrence of each episode, since our filter takes this period as belonging to the same episode. Applying this rule we obtain 2998 possible occasions in which an episode could have occurred. Dividing our 83 episodes by this number we get that the average probability of a growth transition in our sample is about 2.8 percent per year. This means that a typical country would have about a 25 percent chance of experiencing a growth transition at some point in any given decade.

Another way of expressing the high rate of occurrence of growth accelerations is to note the proportion of countries that experience at least one such episode. Our data set allows us to search for growth accelerations for a total of 106 countries during the 36-year period between 1957 and 1992. (Note however that for many countries we are restricted to a shorter span of time.) Of these, 60 (or 54.5 percent) have experienced at least one growth acceleration and 23 (or 20.9 percent) have experienced two (or more) accelerations.

Table 2 presents the number and probability of growth accelerations by region and decade. Looking at the growth experience by decades requires two caveats. The decade of the 1950s and 1990s have substantially fewer observations than the thirty intervening years. In the case of the 1990s, the absence is due to the fact that our filter requires the calculation of post-transition rates of growth, which means our last feasible year is 1992. In the case of the 1950s, the reason is the lack of pre-transition growth rates as well as the fact that many developing countries are absent from the dataset. With these caveats about the 1950s and 1990s, growth transitions exhibit a declining trend that may have been partially reversed in the 1990s.

If we look at the experience by regions, the largest number of growth accelerations is actually in Africa (20), a continent that one hardly associates with economic growth. However, this region still has the lowest probability of a growth transition among all the regions: only 1.9 percent. Asia has 18 occurrences and an average probability of a growth transition of 4.9 percent for the full sample period, which is the highest among the regions. We identified 17 growth transitions in Latin America but this adds to a below-average probability of 2.5 percent. We identified 12 growth transitions in Europe, five of which were in the 1950s when the region was recovering from WWII. Europe's overall probability of a growth

Table 2. Frequency of growth episodes (%).

	Region								
Decade	Asia	Africa	Middle	Europe	Latin America	Other	Total	Epis-odes	Observ-ations
1950s	11.11%	5.26%	22.22%	12.82%	3.77%	10.00%	8.78%	13	148
1960s	6.12%	3.49%	5.26%	0.76%	2.78%	6.90%	3.44%	23	668
1970s	3.36%	2.46%	6.06%	0.00%	2.81%	1.89%	2.49%	23	922
1980s	5.30%	0.56%	1.12%	2.78%	0.97%	0.00%	1.62%	16	990
1990s	3.13%	1.10%	0.00%	4.26%	5.45%	4.76%	2.96%	8	270
Total	4.90%	1.87%	4.08%	2.34%	2.53%	2.89%	2.77%	83	2998
Episodes	18	20	10	12	17	6	83		
Observations	429	965	245	513	673	173	2998		

Number of growth episodes divided by number of datapoints in that decade and region.

transition was 2.3 percent but with a rising trend in the 1980s and 1990s after very low numbers in the 1960s and 1970s. There are 10 growth transitions in the Middle East and North Africa which add up to the second highest probability in the world (4.1 percent). However, nine of these transitions took place before 1980 and are presumably associated with oil booms.

Since we are interested in both the initiation of episodes of rapid growth and in whether or not the rapid growth is sustained, we also calculate the growth rates starting eight years after the initiation of the episode. Obviously the longer the time period we consider after the initiation of a growth episode, the greater the number of recent accelerations that we lose. Table 3 presents the growth episodes by their growth rate in the seven years preceding their growth acceleration and in the ten years following their episode of growth acceleration (i.e., in years $[t+7, t+17]$).

This exercise distinguishes those episodes that were and were not sustained into the longer term. We choose 2 percent growth as our threshold as this is (roughly) the OECD average over the long term and hence is the rate which a country would need to grow to converge with the industrial countries. Of the 69 growth episodes for which this calculation can be undertaken, 16 had negative growth after the end of the episode, 16 had slow growth (between 0 and 2) and 37 had rapid growth. Figure 2 shows six examples in which growth was sustained at a rapid pace after the first 8 years of fast growth.

Figure 3 shows six examples of countries that experienced growth acceleration followed by negative growth (Nigeria, Trinidad and Tobago, and Algeria) or slow growth (Colombia and Brazil). Pakistan is an interesting case, as it had two episodes, one in 1962, which was initiated from falling output in the previous 7 years and was followed by slow growth in the 1970s (1.8 ppa), and then another episode of rapid growth in 1979, which was followed by growth of 2.3 ppa in the 1990s.

Table 3 also distinguishes between those episodes that began from negative, slow, or above average growth. While 15 of these 69 episodes were preceded by falling output, 22 out of 69 were initiated from slow and 32 out of 60 from above average growth.

Table 3. Episodes of rapid growth classified by growth rates before and after the episode.

	Growth rate in the eight years before the initiation of the episode of rapid growth $(t, t-7)$		
	Negative Before (< 0) (15/69)	Slow Before (>= 0 & < 2) (32/69)	Above Average Before (>= 2) (22/69)
Negative after < 0 (16/69)	GHA65 GNB69 JOR73 NGA67 TCD73	ECU70 MLI72 MWI70 RWA75 TTO75	COG78 DZA75 IDN87 PAN75 ROM79 SYR74
slow after =<0 & >2 (16/69)	DOM69 PAK62 UGA77	ARG63 ZWE64 AUS61 COL67 GBR82 LSO71 NIC60 NZL57 URY74	BRA67 ISR67 PRY74 THA86
Above average after >=2 (37/69)	CHL86 CMR72 EGY76 IDN67 MAR58 MUS71 THA57	CAN62 ESP84 PER59 IND82 PRT85 IRL58 SYR69 IRL85 USA61 KOR62 LKA79 MUS83 CHN78 NGA57 COG69 PAK79 DNK57 PAN59	BEL59 TUN68 BWA69 TWN61 ESP59 FIN58 FIN67 ISR57 JPN58 KOR84 MYS70 SGP69

Growth rate in the ten years from 8 years after the initiation of the growth episode $(t+7–t+17)$ (with at least 7 years of data—no episodes after 1986).

Countries on the upper left hand corner had negative growth before and after the growth episode. As can be seen, this group is dominated by African countries. Countries in the lower row had high growth after the eight-year period. This group is dominated by East Asian and European countries. This differentiation suggests that it would be interesting to inquire about the determinants of whether a given growth acceleration is sustained or not after the initial 8-year period. We will look more deeply into this in Section 4.

2.2. *Robustness of the Definition of a Growth Episode*

Before launching into further analysis of the correlates of growth episodes we will discuss three issues with the robustness of our method of identifying growth accelerations: (a) the parameters that define a growth episode; (b) the data used; (c) statistical issues.

Parameters of the "filter." We can illustrate the function of the filter by showing graphically the initiation of a growth episode and then three examples of countries

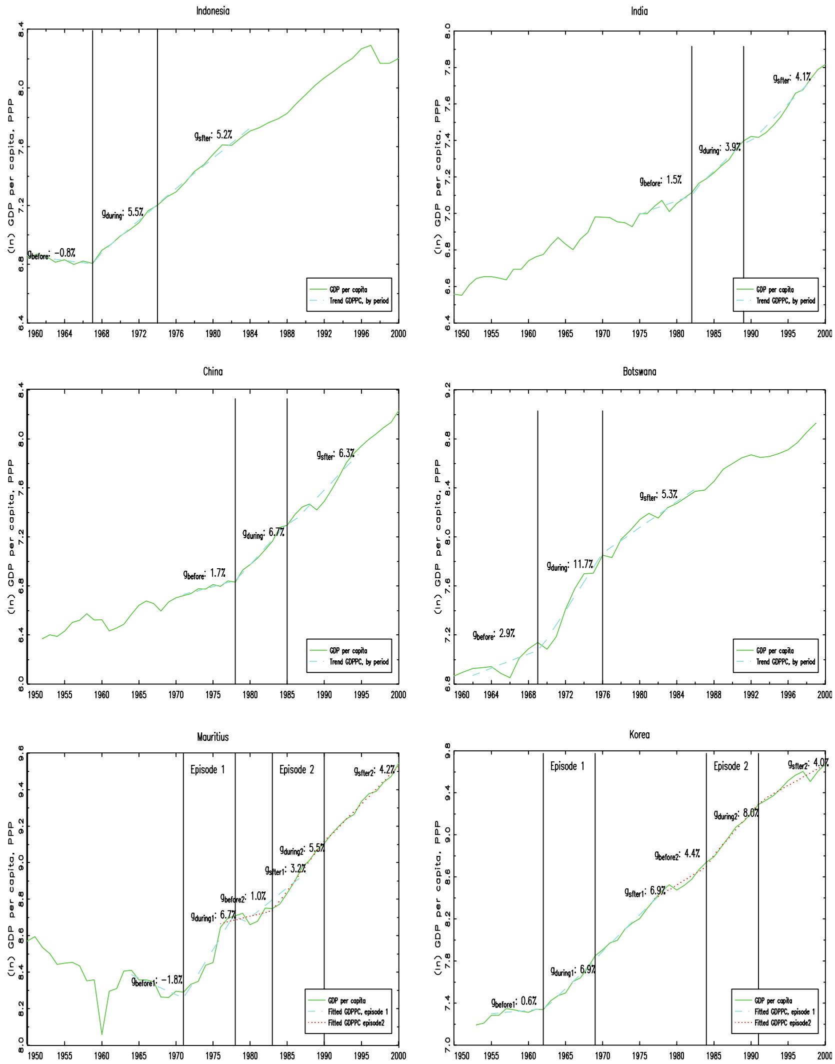

Figure 2. Examples of growth episodes that were sustained.

that meet one or more but not all of the conditions. A classic growth acceleration is Indonesia in 1967. In the years before 1967 growth was −0.8 ppa while in the 8 years after 1967 growth was 5.5 ppa, for a growth acceleration of 6.3 percentage points.

The key element in the filter is the combination of both a high *level* of growth and a significant *acceleration* of growth. There are many cases in which growth improves substantially but does not reach the threshold of "rapid." Using an 8-year period and the thresholds of 3.5 ppa growth and a 2.0 ppa increase are defensible, but admittedly arbitrary. Obviously shortening the horizon of 8 years

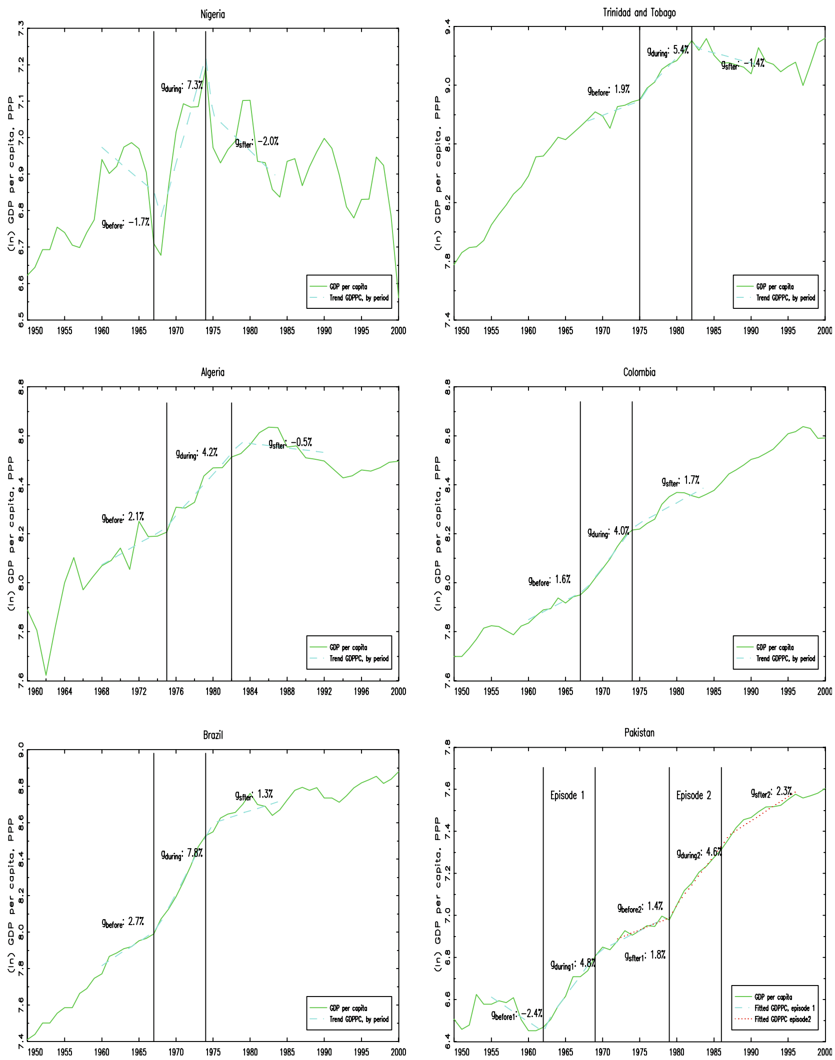

Figure 3. Examples of growth episodes that were not sustained.

identifies far more episodes than 83. For example, using 5-year growth rates identifies 125 episodes versus only 37 using 10-year horizons.

Tightening or relaxing the thresholds of the filter produces the expected results. If the threshold for change is 2 ppa but the growth threshold is raised to 4.0 ppa then only 68 episodes are identified versus 90 if the threshold is 3.0. With the threshold for absolute growth at 3.5 ppa, raising the acceleration threshold to 2.5 yields only 67 episodes while lowering it to 1.5 identifies 93 episodes. We shall present a set of robustness checks with these varying cutoffs when we discuss the predictability of growth accelerations in Section 4.

Table 4. The 13 episodes identified in PWT data but not in WDI data… and the episodes in WDI data but not in PWT data.

	PWT 6.2 Data					WDI data		
		Growth Before	Growth After	Difference in Growth		Growth Before	Growth After	Difference in Growth
MWI	1992	−0.8	4.8	5.6		−0.6	2.0	2.6
GNB	1988	−0.7	5.2	5.9		−0.7	1.5	2.2
GBR	1982	1.1	3.5	2.5		1.2	3.49	2.3
FIN	1967	3.4	5.6	2.2		3.5	5.5	1.98
NOR	1991	1.4	3.7	2.2		1.5	3.5	1.95
MYS	1970	3.0	5.1	2.1		3.4	5.2	1.8
URY	1989	1.6	3.8	2.1		1.8	3.2	1.4
LKA	1979	1.9	4.1	2.2		3.3	3.3	0.0
PAN	1975	2.6	5.3	2.7		2.7	2.3	−0.4
MWI	1970	1.5	3.9	2.5		3.6	2.9	−0.7
SYR	1974	2.6	4.8	2.2		5.0	4.2	−0.8
TCD	1973	−0.7	7.3	8.0		−1.6	−3.5	−1.9
HTI	1990	−2.3	12.7	15.0		−1.4	−5.0	−3.6
Episodes identified in WDI data but not in PWT data								
PAN		−1.2	2.6	3.8	1988	1.7	3.9	5.7
CHL		1.3	3.3	2.0	1974	0.3	3.8	3.5
KEN		2.6	4.3	1.7	1967	2.5	5.2	2.8
CRI		1.9	3.3	1.4	1967	1.8	4.0	2.1
SGP		3.4	4.6	1.2	1987	3.7	6.1	2.4
LSO		−1.5	−0.5	1.0	1985	−0.8	3.7	4.4
GAB		7.7	4.2	−3.5	1969	5.4	13.7	8.4

Data. Unless otherwise noted we use the PWT version 6.1 data. In order to be sure that our estimates of growth episodes were robust to using a different series for GDP per capita we also implemented exactly the same procedures using data from the World Bank's World Development Indicators (see Table 4). Since the WDI data begin in 1960, 30 of the 83 episodes lack adequate data for comparison. Of the 53 possible episodes for which there are WDI data 20 (38%) are identified as episodes with exactly the same dates, 15 (28%) are identified as episodes with dates of initiation differing by two years or less and another 5 (9%) are identified as episodes—but with dates of initiation differing by more than 2 years.[1] So on 75 percent of the 53 episodes there is agreement on the basics. We take this to be encouraging.

Thirteen of the 53 PWT-identified episodes produce different results when WDI data are used. Seven of the PWT episodes show an acceleration of growth but either do not meet the threshold for rapid growth of 3.5 percent (MWI 92, GNB, and GBR) or the change in growth is less than two points (MYS, URY, FIN 67,

1 The episodes are (with PWT then WDI dating): Zimbabwe 64 (67), Paraguay 74 (70), Algeria 75 (71), Egypt 76 (73), and China 78 (81).

and NOR). This leaves six episodes on which the data sources just disagree, including four instances in which the PWT data suggest an acceleration and the WDI data show a fall in growth.

Statistical issues. There are two major ways in which we differ from similar literature. Papell and Ben David (1998) examine changes in growth by a similar search over possible breaks in trend and then examine all and only "statistically significant" changes in growth rates.[2] This is not appropriate for our interests because this will identify growth changes of very different magnitude because of the differing statistical power caused by the underlying variability of the output series. It is possible that if a "statistical significance" cut-off were used two countries with exactly the same magnitude acceleration to exactly the same rate of growth but with different underlying annual volatility could be classified differently. Since we identify growth changes of substantial magnitude our 83 episodes are also (almost) all statistically significant.[3] There could be many "statistically significant" accelerations of growth that we do not classify as episodes, because the increase in growth is economically not meaningful.

The second issue is whether we use a log-linear trends or first differences to estimate growth rates. Perron (1989) and others (Jones and Olken, 2005b) have modeled the evolution of output as a I(1) process so that first differences are stationary and hence testing for "breaks" is testing differences in means of first differences. We suspect that for our purposes nothing particularly significant hangs on this distinction in the modeling of the evolution of output.

3. Growth Accelerations: Basic Results

At what income levels are growth transitions more likely? Basic convergence stories hold that growth accelerations are more likely for poorer countries. We split the data into income quartiles (Table 5) and find that for the period as a whole there is a monotonically declining probability of a growth transition with rising levels of income as would be implied by a global growth process that shows convergence. However, this is not true of all decades. Probabilities slope steeply downwards in the 1970s and were surprisingly flat in the 1990s. In the 1960s the lower half of the distribution performed better than the upper half.[4] In the 1980s the bottom half did worse than the upper half. These patterns are not unlike the aggregate growth experience by decade, in that the 1960s were a good time for poor countries while the 1980s have been terrible.

As a precursor to a detailed examination using regression analysis, it is interesting to ask what simple correlates seem to be associated with the start of a growth

2 Bai and Perron (1998) extend this to multiple structural breaks and discuss problems with small sample properties of such tests.

3 At the 10 percent level the exceptions of Syria 74, Malawi 70, and Uruguay 89. There are four countries between the 5 and 10 percent significance level (Finland 92, Singapore 69, Uganda 77, and Algeria 75).

4 However, the top quartile did better than the second quartile.

Table 5. Acceleration probabilities: income quartiles against decade and region.

	Income Quartile (4 is the highest)					
Decade	1	2	3	4	Total	Episodes
50	8.33%	5.41%	10.81%	10.53%	8.78%	13
60	5.52%	2.94%	1.83%	3.51%	3.44%	23
70	3.96%	3.45%	2.63%	0.00%	2.49%	23
80	1.23%	1.60%	2.02%	1.60%	1.62%	16
90	3.03%	2.94%	2.99%	2.90%	2.96%	8
Total	3.54%	2.77%	2.69%	2.10%	2.77%	83
Episodes	26	21	20	16	83	

transition. This can be done by looking at the average value of a certain variable around the date of the growth transition, which we take to be the years $t-1$, t, and $t+1$ where t is the date of the acceleration and compare it to the value of that same variable during the seven previous years. We ask the question whether changes in that variable are significantly different from zero. Another aspect we can study is the correlates of growth *during* a growth transition, in which case we compare the period covered between year t and year $t+7$ to the average for the 4 years prior to the acceleration [$t-1$ through $t-4$].

The results for both calculations are presented in Table 6. We study investment, exports, imports, the real exchange rate and inflation. We find that growth accelerations coincide with an increase in the export and import ratios which average 10.7 and 8.7 percent, respectively, with increases in the investment ratio of 16 percent and by a large real depreciation of 21.7 percent. All these results are highly statistically significant. We do not find, however, that the terms of trade changes at the time of a growth acceleration are significantly different from zero, although the estimated change is positive. We also find a positive but not statistically significant increase in inflation at the time of the transition. This result could mean that

Table 6. Correlates of growth accelerations.

	TOT	Imports/GDP	Exports/GDP	Inflation	Investment/GDP	RER
Around the start versus previous 7 years (%)	2.5	8.7	10.7	434.0	16.0	−21.7
t-stat	0.51	2.15	2.37	1.24	2.51	−3.54
p value	0.61	0.04	0.02	0.22	0.01	0.01
Number	41	41	41	52	76	11
In the 8-year period versus previous seven (%)	2.8	14.2	14.6	−90.7	14.9	−5.2
t-stat	0.66	3.36	4.35	−0.51	4.25	−0.71
p value	0.51	0.00	0.00	0.61	0.00	0.49
Number	45	50	50	58	83	15

some growth accelerations take place in the context of the resolution of a macroeconomic crisis.

If we look instead at these same variables during the 8-year growth acceleration, instead of just around the start of the process we find similar results except for the real exchange rate. Export, import and investment ratios rise by an average of 14.6, 14.2, and 14.9 percent, respectively. However, real exchange rate changes are no longer statistically different from zero and the estimated coefficient is now a fourth of the estimated change at the time of the acceleration.

Obviously, these results do not imply causality. However, it is interesting to note that growth accelerations seem to require more investment, more exports and a more competitive real exchange rate. Hence, they do not seem to happen by pure accelerations in total factor productivity or in the increased import capacity emanating from a greater availability of external funding.

4. Predictors of Growth Transitions

We have shown in the preceding that growth accelerations are a fairly common occurrence. Our data allows us to identify growth episodes over a maximum time span of 36 years (1957–1992) and yields 83 such episodes. Hence in any given year, there are between two and three *new* growth transitions that are initiated around the world. In this section, we analyze the predictability of these transitions. In particular, we ask: how well do the standard explanatory variables do in predicting the timing of growth accelerations. We focus on three types of predictors, relating to (a) the external context, (b) domestic economic policies, and (c) political circumstances. We first analyze all growth transitions taken together, and then distinguish between those that are sustained in the longer term and those that aren't.

As we shall see, these three categories of explanatory variables have some leverage in predicting growth transitions. Furthermore, sustained and unsustained growth accelerations tend to be associated with somewhat different triggers. Perhaps the most important conclusion of this section, however, pertains to the *unpredictability* of growth accelerations. Despite a somewhat liberal interpretation of what predictability means in this context, we find that there is only a loose link between favorable external, economic, or political conditions (as measured by conventional explanatory determinants) and growth accelerations. In particular, standard economic reform packages have marginal effects on the probability that a growth transition will be initiated.

4.1. Explanatory Variables

We categorize our explanatory variables under three headings.

(i) *External shocks*. It is plausible that many growth accelerations are triggered by favorable external conditions. To capture this, we rely on a variable that is based on the terms of trade. This is a dummy variable, *TOT_Thresh90*, which takes the value 1 whenever the change in the terms of trade from year t to

$t-4$ is in the upper 10 percent of the entire sample. This variable is meant to capture exceptionally favorable external circumstances. We could also have used a variable related to capital inflows, but such flows are endogenous and (presumably) forward-looking, rendering causal inference problematic.

(ii) *Political changes*. Growth accelerations can also be triggered by changes in the underlying political balance as revealed by transformations in the political regime. We use several variables to measure political regime change. *Regchange* takes a value of 1 in the 5-year period beginning with a regime change as recorded in the Polity IV dataset (Marshall and Jaggers, 2002). (Regime change is defined as either a three-unit change in the polity score or as regime interruption.) *Poschange* is one during this 5-year period if the regime change increased the Polity score (variable CHANGE in the Polity IV dataset), denoting a movement towards greater democracy. *Negchange* is defined analogously for a decrease in the polity score, and denotes a move towards greater authoritarianism.[5]

While the Polity variables are the main ones we use, we will also show results with additional political variables. *Lead_Death* is a dummy for the 5-year period starting with a political leader's death. *Tenure* is an interaction term between *Lead_Death* and the length of the tenure of the dying ruler. These variables come from Jones and Olken (2005a). *War_End* is a dummy for the 5-year period beginning with the cessation of an armed conflict from the Correlates of War International War Database (Singer and Small, 2003).[6] *Civil_War* is a dummy for the 5-year period beginning with the ending of an armed civil war.[7]

(iii) *Economic reform*. Perhaps the most important potential determinant from our perspective is a change in economic policy that is conducive to higher economic growth. To quantify such a change in economic policy, we rely primarily on an index that was originally developed by Sachs and Warner (1995) and which has been subsequently revised and updated by Wacziarg and Welch (2003). The Sachs–Warner index was meant to capture changes in an economy's openness to trade, but as argued in Rodriguez and Rodrik (2001), the coding incorporated a number of structural features (e.g., presence of marketing boards and socialist economic regimes) and the macroeconomic environment (e.g., presence of a large black-market premium for foreign currency), in addition to tariff and non-tariff barriers to trade. The Wacziarg and Welch (2003) update continues with the same basic approach.

5 Note that any change in the Polity score that is larger in absolute value than 20 (indicating Authority Interruption or Authority Collapse, etc.) is coded as a zero.

6 This variable is given as *yearlef* and *yearlef2* in the original Correlates of War International War Database.

7 This variable is given as *yearend1* and *yearend2* in the original Correlates of War Civil War Database.

> This makes the Sachs–Warner–Wacziarg–Welch (SWWW) index a good candidate for a measure that captures broad economic reforms. Hence we code *Econ_Lib* as a dummy that takes the value of 1 during the first five years of a transition towards "openness" a la SWWW.

In addition, we shall use a measure of financial liberalization, *Finance*, which is a dummy for the first 5 years of a financial liberalization episode. The timing of financial liberalization is taken from Bekaert et al. (2001).

4.2. Basic Results

As a precursor to the more detailed statistical analysis, we begin with a simple bivariate examination of the relationship between growth accelerations and their potential determinants. It turns out that the more elaborate exercise below does not change much the picture that emerges from this simple analysis.

We present the evidence by asking two questions: (a) what proportion of growth accelerations are preceded or accompanied by changes in our list of determinants: and conversely (b) what proportion of changes in the determinants are accompanied or followed by growth accelerations. To give the determinants time to make their effects felt, we allow for up to a maximum of 5 years' lag between a change in the determinant and the growth acceleration. The timing of the growth acceleration is taken to be the 3-year period centered on the dates listed in Table 1. A 3-year window reduces the probability that we will narrowly miss the timing of an acceleration through quirks in the data or in our method. Whenever this 3-year window overlaps with the 5-year window for the determinants, we count it as a case where growth acceleration coincides with one of its determinants. The results are shown in Table 7.

Of particular interest is the predictive power of the economic reform variable (*Econ_Lib*). Table 7 shows that only 14.5 percent accelerations are associated with economic liberalization—or, equivalently, that 85.5 percent of growth accelerations are *not* preceded or accompanied by liberalizations. Moreover, fewer than one in five episodes (18.8 percent) of economic liberalization are followed by growth takeoffs.

We find that around half of growth accelerations are preceded by political-regime changes ($Regchange = 1$). This may seem high, but on the other hand only a tiny proportion of political-regime changes (13.9 precent) are followed by growth accelerations. So it appears that political regime changes result in a lot of false-positives. Finally, the relationship between growth accelerations and positive terms-of-trade shocks is quite weak. Somewhat more than a quarter of growth accelerations are preceded by such shocks, but only 5 percent of positive terms-of-trade shocks are followed by growth accelerations.

These results reflect the poor match between occurrences of growth takeoffs and favorable external, economic or political circumstances. A lot of takeoffs take place when those conditions appear not to be particularly favorable, at least as measured

Table 7. Predictability of growth accelerations.

(a) All growth episodes	
Proportion of growth accelerations that are preceded or accompanied by:	
Economic liberalization	14.5%
Political regime change	49.4%
External shock	27.5%
Proportion of occurrences of column variable that is accompanied or followed by growth accelerations:	
Economic liberalization	18.8%
Political regime change	13.9%
External shock	5.2%
(b) All growth episodes (lower threshold for increase in growth: 1.5 ppa)	
Proportion of growth accelerations that are preceded or accelerations:	
Economic liberalization	16.1%
Political regime change	44.1%
External shock	24.6%
Proportion of occurrences of column variable that is accompanied or followed by growth accelerations:	
Economic liberalization	23.4%
Political regime change	14.3%
External shock	5.2%
(c) Sustained growth episodes only	
Proportion of growth accelerations that are preceded or accompanied by:	
Economic liberalization	18.8%
Political regime change	53.1%
External shock	33.3%
Proportion of occurrences of column variable that is accompanied or followed by growth accelerations:	
Economic liberalization	22.2%
Political regime change	8.5%
External shock	2.1%

Notes: We allow fo r a 5-year lag between a change in the underlying determinant and a growth acceleration. The timing of the growth acceleration is the 3-year window centered on the initiation dates shown in Table 2.

by standard indicators. And growth takeoffs typically fail to materialize when the conditions are indeed favorable.

Would the analysis lead to different results if we were to set the bar for growth accelerations differently? Could it be that our requirement for identifying a growth acceleration is too demanding and that we are missing many cases of more moderate growth spurts that are set off by economic reform or external shocks? In panel (b) of Table 7 we ask how the results are affected if we lower the threshold for growth acceleration from an increase in growth of 2–1.5 ppa. The numbers do not change very much. Economic reform does somewhat better, but only slightly so, while the results on the other two determinants are mixed. Playing with different lags for the determinants does not seem to make much of a difference either (as we shall briefly discuss when we present the probit analysis).

Perhaps the standard determinants do poorly because many of our growth accelerations end up being reversed, as we have seen. Would they do they do better if we were to focus solely on cases of *sustained* growth accelerations? The short answer is no. Panel (c) of Table 7 shows the relevant numbers. Only 18.8 percent of sustained growth episodes are preceded or accompanied by economic liberalization, while only 22.2 percent of economic liberalizations are followed by sustained growth take-offs.

The bottom line is clear: growth accelerations seem to be driven largely by idiosyncratic causes. To paraphrase Tolstoy, not even happy families are alike.

4.3. Probit Analysis

We now turn to a more detailed statistical analysis to see how the basic results reported above stand up. As before, our dependent variable is a dummy that takes the value of 1 around the time of a growth acceleration (and 0 otherwise). More specifically, we assign a value of 1 to the 3 years centered on the first year of the growth episode (i.e., the dummy equals 1 for $i = t-1, t$, and $t+1$). Our comparison group consists of the countries that have not had a growth episode in that same year. So our sample consists of all countries for which the relevant data are available, including countries that have not experienced growth episodes. We make the following adjustments to the sample. First, for each country, we drop the first and last seven years of data, since growth episodes could not have been calculated for those years.[8] Second, we drop all data pertaining to years $t+2, \ldots, t+7$ of an episode, since we are interested in predicting the timing of accelerations. We run probits where the dependent variable is regressed on several determinants. We will also present estimates with alternative estimation strategies. All our runs contain a full set of year effects to control for external circumstances that are common to all countries.

Table 8 presents the main probit results. Our baseline specification, shown in column (1), includes the terms-of-trade shock, political regime change, and economic liberalization. The first two of these enter with statistically significant coefficients. According to the estimates, a large positive terms-of-trade shock (as defined above) increases the probability of experiencing a growth acceleration by 4.4 percentage points. A political regime change increases this probability by 5.3 percentage points. In this baseline specification, economic reform does not have a statistically significant impact on growth acceleration, although its estimated coefficient is (as expected) positive.

In the next three columns we probe the political determinants more deeply. Column (2) decomposes the political regime change into a positive (towards democracy) and negative (towards autocracy) component. The striking result is that while both of these are separately significant, the impact of a movement towards autocracy

8 We could also have dropped data for years in which a growth episode is not initiated ($t-1, t, t+1$) somewhere in the world. However, this would have no practical effect on our sample since the years $t-1, t, t+1$ of growth episodes span the entire sample from 1957 to 1992.

Table 8. Predicting growth accelerations.

Dependent Variable is a Dummy for the Timing of Growth Accelerations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
TOT Thresh90	0.044	0.045	0.044	0.042	0.039	0.038	0.038	0.038	0.043		
	(2.60)**	(2.62)**	(2.57)*	(2.51)*	(2.59)**	(2.52)*	(2.51)*	(2.55)*	(2.56)*		
Econ Lib	0.021	0.022	0.020	0.020	−0.012	−0.013	−0.013	−0.013	0.022	0.023	0.023
	(1.040)	(1.100)	(1.030)	(1.040)	(0.710)	(0.790)	(0.790)	(0.780)	(1.140)	(1.240)	(1.250)
RegChange	0.053									0.044	
	(4.74)**									(4.16)**	
PosChange		0.029	0.030	0.027	0.026	0.024	0.024	0.025	0.028		0.009
		(1.97)*	(2.10)*	(1.93)+	(2.08)*	(1.90)+	(1.90)+	(1.96)*	(1.97)*		(0.660)
NegChange		0.108	0.108	0.108	0.088	0.084	0.085	0.089	0.111		0.105
		(5.80)**	(5.83)**	(5.85)**	(5.33)**	(5.22)**	(5.24)**	(5.47)**	(6.05)**		(5.99)**
Leader Death			−0.027	−0.057	−0.007	−0.008	−0.008	−0.008	−0.057		
			(1.240)	(1.99)*	(0.150)	(0.170)	(0.170)	(0.160)	(1.99)*		
Tenure				0.006	−0.036	−0.038	−0.038	−0.038	0.006		
				(2.12)*	(2.92)**	(2.83)**	(2.83)**	(2.81)**	(2.09)*		
Finance					0.071	0.105	0.105	0.108			
					(2.79)**	(2.71)**	(2.71)**	(2.77)**			
Finance Dev						−0.026	−0.026	−0.027			
						(1.000)	(1.000)	(1.090)			
War End							−0.002	0.011	0.026		
							(0.130)	(0.640)	(1.340)		
Civil War								−0.025	−0.030		
								(1.380)	(1.490)		
Observations	2140	2140	2140	2140	1902	1902	1902	1902	2140	2852	2852
Growth episodes included	51/83	51/83	51/83	51/83	45/83	45/83	45/83	45/83	51/83	83/83	83/83
Pseudo R^2	0.05	0.06	0.06	0.07	0.08	0.08	0.08	0.08	0.07	0.05	0.06

Notes: Estimated by probit. Coefficients shown are marginal probabilites evaluated at the sample means.
Numbers in paranthesis are robust t-statistics. All regressions include year dummy variables (see text for sources).
+ Indicates significance at the 10 percent level. * indicates significance at the 5 percent level.
** Indicates significance at the 1 percent level.

is more than three times larger (10.8 versus 2.9 points). Column (3) shows that a political leader's death has a negative (but insignificant) impact on the likelihood of a growth acceleration. When the leader's death is interacted with the length of the leader's tenure (column 4), we get stronger results: a leader's death is particularly damaging if that leader has not been in office for very long. According to the estimates in column (4), a leader's death has a positive impact on growth acceleration when his tenure starts to exceed about 10 years.

Column (5) shows that financial liberalization has a strong positive impact on the probability of experiencing a growth acceleration, increasing this probability by 7 percentage points. For some countries, mostly developed ones, the financial liberalization variable is censored at 1980. In column (6), we enter a dummy variable (*Finance_Dev*) that allows countries with censored values to have a different effect for *Finance*, and we still get a very strong impact from financial liberalization. Note that the estimated coefficient on economic reform turns negative when *Finance* is included in the regression (but it remains insignificant). Columns (7)–(9) show that armed conflict (external or internal) does not have a significant effect on the likelihood of a growth acceleration.

Finally, columns (10) and (11) drop the terms of trade variable to regain additional observations (allowing the sample size to rise from 2140 to 2852). The main results are similar. In particular, economic reform remains insignificant and a political regime change in the direction of autocracy still shows up as a strong predictor of growth acceleration.

Our baseline results are quite robust to the method of estimation. Table 9 displays the results for a series of alternative methods. First, we show the results for probits where standard errors are clustered by individual countries and corrected for heteroskedasticity (column 1). Next we run a Tobit regressions, making use of the actual difference in growth post-acceleration and treating non-episodes as censored at 0 (column 2). Third, we show the results from a modified logit framework suggested by King and Zeng (2001) that is designed to better handle rare-ocurrence bias (column 3). Next, we run a random-effects probit (column 4). Finally, we show the results with the linear probability model (column 5). The results in all cases are not only qualitatively, but also quantitatively similar. The similarity between the probits and the linear probability model are especially striking. This is reassuring, and suggests that the probit results we reported above are broadly representative.

Our results are also robust to varying the lag length on the economic reform and political regime change variables. *Econ_Lib* and the political variables are dummies that take a value of 1 in the first 5 years of a significant change, and therefore allow us to capture a causal link with growth accelerations in that 5-year window. When we extend this window up to 10 years, the results remain unaffected.[9]

The probits in Table 8 utilize the entire sample of countries, including developed countries. As another kind of robustness check, we present in Table 10 the

9 These results are not reported, but are available upon request.

Table 9. Robustness to alternative estimation methods.

	(1) Cluster	(2) Tobit	(3) Relogit	Relogit M	(4) RE	(5) LPM
TOT_thresh90	0.045	2.543	0.635	0.049	0.480	0.045
	(1.92)+	(2.24)*	(2.69)**		(2.92)**	(2.17)*
Econ Lib	0.022	1.494	0.372	0.026	0.053	0.030
	(0.70)	(1.10)	(1.29)		(0.26)	(1.15)
Poschange	0.029	2.176	0.439	0.032	0.291	0.025
	(1.35)	(2.22)*	(1.83)+		(1.95)+	(1.65)+
Negchange	0.108	5.821	1.255	0.124	1.053	0.108
	(3.62)**	(5.48)**	(6.01)**		(6.06)**	(4.47)**
Obs	2140	2140	2140		2140	2140

Notes: Cluster is a dprobit regression with standard errors clustered for each country group and corrected for heteroskedasticity. Tobit is a tobit regression where non episodes are coded with a 0. There is no correction for heteroskedasticity. Relogit is a logit model corrected for rare occurance bias as suggested by King and Zeng (2001). Relogit M are the coefficients of the relogit model given as attributable risk. This is the expected change in the probability of an episode going from a 0 in the dependent variable to a 1. RE is a probit regression with country random effects. LPM is the linear probability model. See also notes from previous table.

Table 10. Predicting growth accelerations (developing countries only).

Dependent Variable is a Dummy for the Timing of Growth Accelerations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
TOT Thresh90	0.044	0.045	0.044	0.015	0.047	0.045	0.046	0.045		
	(2.34)*	(2.40)*	(2.35)*	(2.05)*	(2.34)*	(2.16)*	(2.20)*	(2.44)*		
Econ Lib	0.038	0.037	0.034	0.013	−0.003	−0.008	−0.009	0.039	0.046	0.048
	(1.590)	(1.580)	(1.490)	(1.470)	(0.130)	(0.320)	(0.330)	(1.68)+	(2.02)*	(2.12)*
RegChange	0.043								0.040	
	(3.40)**								(3.48)**	
PosChange		0.016	0.018	0.003	0.014	0.014	0.015	0.018		0.003
		(0.980)	(1.090)	(0.480)	(0.760)	(0.750)	(0.810)	(1.040)		(0.170)
NegChange		0.096	0.096	0.041	0.078	0.083	0.087	0.099		0.099
		(4.85)**	(4.88)**	(4.92)**	(3.89)**	(3.93)**	(4.11)**	(5.03)**		(5.51)**
Leader Death			−0.037	−0.120						
			(1.410)	(.)						
Tenure				0.037						
				(30.51)**						
Finance					0.181	0.193	0.197			
					(2.71)**	(2.81)**	(2.87)**			
War End						−0.006	0.012	0.029		
						(0.300)	(0.460)	(1.240)		
Civil War							−0.035	−0.033		
							(1.210)	(1.380)		
Observations	1620	1620	1620	1620	1382	1321	1321	1620	2208	2208
Pseudo R^2	0.06	0.07	0.07	0.1	0.08	0.08	0.09	0.07	0.05	0.06

Notes: Same as Table 8.

analogous results for a sample that includes only developing countries. In most respects, the findings are quite similar. We note three small changes. First, "positive" political regime change (i.e., democratization) is no longer statistically associated with growth accelerations. It is only movements towards autocracy that enters with a statistically significant and positive coefficient. Second, the estimated impact of financial liberalization is much larger and almost double that found in the previous table. Third, economic reform now enters with a statistically significant coefficient in runs that exclude the terms of trade variable (columns 9 and 10).

Our final set of robustness checks relate to the parameters of the filter and the dataset we use. We discussed in Section 2 alternative thresholds and the changes that occur when we use WDI data instead of the PWT. We get a somewhat different set of growth accelerations depending on choices we make on each of these. To see how much difference this makes in practice, Table 11 shows the results of our baseline specification as we vary the set of growth accelerations. The main message is the robustness of the political determinant. "Negative" political change is uniformly significant, with coefficients that vary from 0.05 to 0.12. "Positive" political change is almost always significant, but enters with much smaller coefficients. The terms-of-trade variable generally enters with the correct (i.e., positive) sign and is significant, with the exception of two instances when it enters with a negative (but insignificant) coefficient. Economic reform remains insignificant (with the exception of one instance).

Once again we want to emphasize the limited success that our right-hand side variables collectively achieve in predicting major growth turnarounds. Even though many of the explanatory variables are statistically significant, they explain very little of the growth pattern that the data reveal. The average in-sample predicted probability of growth acceleration generated by our baseline probit *conditional* on an acceleration having taken place is only 10.1 percent (compared to an unconditional prediction of 6.6 percent). In other words, the average predicted probability is only slightly higher for countries that undergo an acceleration compared to those that do not. A more dramatic way of stating this is that our empirical framework yields a nine-to-one odds against a growth takeoff for those takeoffs that actually materialized.

4.4. Sustained Versus Unsustained Growth Accelerations

The results we have just discussed reveal some interesting, but also puzzling associations. It is not clear a prori why transitions to autocracy should have more favorable effects on growth accelerations than transitions to democracy. Nor is it clear why financial liberalization should have such a potent impact on the likelihood of growth accelerations when the impact of our broader measure of economic reform is weak at best. It turns out that it is much easier to understand and interpret these results once we distinguish between growth accelerations that are sustained into the longer term and those that are not.

Remember that our growth accelerations are defined for a time horizon of eight years. That is, we require post-transition growth rates to be higher than pre-transition

Table 11. Robustness to alternative filters.

	Base Run (Same as Table 4.2)	5−year Horizon	10−year Horizon	Difference = 1.5 ppa	Difference = 2.5 ppa 3.0 ppa	Post-acc. Growth = 4.0 ppa	Post-acc. Growth =	WDI Data Set
TOT_thresh90	0.0446	−0.016	0.029	0.040	0.0223	0.046	0.0387	−0.0241
	(2.62)**	(0.950)	(2.63)**	(2.17)*	(1.55)	(2.69)**	(2.58)**	(1.49)
Econ Lib	0.0217	0.048	−0.004	0.024	0.0109	0.029	0.0248	−0.0208
	(1.10)	(2.10)*	(0.31)	(1.13)	(0.67)	(1.42)	(1.42)	(0.98)
Poschange	0.0286	0.000	0.077	0.018	0.0354	0.032	0.0275	0.0393
	(1.97)*	(0.010)	(6.11)**	(1.16)	(2.72)**	(2.16)*	(2.05)*	(2.61)**
Negchange	0.108	0.081	0.05	0.12	0.1104	0.12	0.1067	0.0984
	(5.80)**	(4.19)**	(4.03)**	(5.86)**	(6.39)**	(6.29)**	(6.22)**	(5.19)**
Obs	2140	2381	1835	2101	2123	2126	2121	1856
Pseudo R^2	0.06	0.05	0.12	0.06	0.07	0.07	0.07	0.07

Notes: Same as Table 8.

rates by at least 2 percentage points and also to remain above 3.5 percent during this 8-year period. We now make a distinction among accelerations according to whether they were sustained beyond that eight year horizon. We call those episodes where the growth rate remained above 2 percent in years $[t+7, t+17]$ *sustained episodes*, and those where the growth rate fell below the 2 percent threshold *unsustained episodes*. Since this classification requires 17 data points beyond the onset of a growth acceleration, not all episodes can be classified as such.[10] Therefore in the regressions below we have to work with a somewhat smaller sample.

The first two columns of Table 12 show that the earlier results are more or less replicated in this truncated sample. However, economic reform is now marginally significant, while financial liberalization is marginally insignificant. We next distinguish between sustained and unsustained accelerations and use them in turn as the dependent variable. The results are interesting. The next four columns show that there are significant differences in the determinants of the two types of growth accelerations. Most striking among these differences are the following: (1) Positive terms of trade shocks are conducive only to unsustained episodes; they have no predictive power over sustained episodes. (2) Economic reform has a statistically and quantitatively significant impact on the likelihood of sustained accelerations. (3) Financial liberalization's positive impact is confined to unsustained accelerations. (4) Positive political change (democratization) has a significant impact on sustained episodes but not unsustained episodes.

Table 12. Sustained and unsustained growth accelerations.

	Dependent Variable					
	All (1)	All (2)	Sustained (3)	Sustained (4)	Sustained (5)	Unsustained (6)
TOT_thresh90	0.079	0.082	0.017	0.012		0.020
	(3.44)**	(3.85)**	(1.37)	(1.20)		(3.74)**
Poschange	0.039	0.047	0.045	0.051	0.019	0.001
	(1.81)+	(2.37)*	(3.34)**	(3.74)**	(1.52)	(0.25)
NegChange	0.123	0.120	0.045	0.039	0.042	0.021
	(5.49)**	(5.65)**	(2.96)**	(2.82)**	(2.91)**	(4.80)**
Econ Lib	0.078	0.079		0.171	0.087	
	(1.87)+	(1.94)+		(4.14)**	(3.59)**	
Finance	0.073					0.997
	(1.49)					(9.18)**
Obs	1222	1337	1197	1197	1817	1151
Pseudo R^2	0.11	0.10	0.07	0.11	0.13	0.16

Notes: Same as Table 8.

These results strongly suggest that sustained and unsustained growth accelerations tend to be triggered by different conditions. Financial liberalization and positive

10 In order to be considered as a sustained episode, the episode needs to be to have at least 10 years of data after the last year of the episode.

external shocks are associated with growth accelerations that eventually fizzle out. Fundamental economic reform and positive political regime change increase the likelihood of sustained accelerations.

However, we need to repeat the same caveat as before: the predictability of these different kinds of growth episodes still remains extremely low. The determinants of growth episodes—whether of the sustained or unsustained kind—are very poorly captured by our explanatory variables.

5. Conclusions

We have focused in this paper on instances of significant acceleration in economic growth. We close the paper by reiterating what we think are the two main surprises that come out of our analysis. First, growth accelerations are a fairly frequent occurrence. Of the 110 countries included in the sample, 60 have had at least one acceleration in the 35-year period between 1957 and 1992—a ratio of 55 percent. Whatever else this may say about growth, it certainly suggests that achieving rapid growth over the medium term is not something that is tremendously difficult and it is well within most countries' reach (see also Rodrik, 2003 forthcoming). This is a useful antidote to the pessimism that often pervades policy discussions on growth.

Second, and not unrelated to the previous finding, most growth accelerations are not preceded or accompanied by major changes in economic policies, institutional arrangements, political circumstances, or external conditions.[11] As we have shown, standard growth determinants have some statistical leverage over the timing of accelerations. But on the whole those determinants do a very poor job of predicting the turning points. It would appear that growth accelerations are caused predominantly by idiosyncratic, and often small-scale, changes. The search for the common elements in these idiosyncratic determinants—to the extent that there are any—is an obvious area for future research.

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11 For a specific instance of this finding, see Rodrik and Subramanian (2004) on India.

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