Political Regime Changes, Crises and Growth in Historical Perspective

by Yaroslava V. Babych

B.A. in Economics, May 2000, Franklin and Marshall College
B.A. in Philosophy, May 2000, Franklin and Marshall College
M.A. in Economics, May 2004, The George Washington University

A Dissertation submitted to

The Faculty of
Columbian College of Arts and Sciences
of The George Washington University
in partial fulfillment of the requirements
for the degree of Doctor of Philosophy

January 31, 2011

Dissertation directed by

Graciela L. Kaminsky
Professor of Economics and International Affairs

The Columbian College of Arts and Sciences of The George Washington University certifies that Yaroslava Vitaliyivna Babych has passed the Final Examination for the degree of Doctor of Philosophy as of August 27, 2010. This is the final and approved form of the dissertation.

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Yaroslava V. Babych

Dissertation Research Committee:

Graciela Laura Kaminsky, Professor of Economics and International Affairs, Dissertation Director

Marco Cipriani, Associate Professor of Economics and International Affairs, Committee Member

Ana Fostel, Assistant Professor of Economics, Committee Member

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Dedication

To my family

Acknowledgments

I wish to thank Graciela Kaminsky, my dissertation advisor, for her constant support, help and guidance during my work on the dissertation and through the years of graduate studies. I wish to thank my friends and colleagues – Aleksandra Markovic, Nilanjana Sarkar Van Order, Rei Odawara, Julia Bersch, Mauricio Olivera, Juan Jimenez – for their help, valuable insights, useful discussions, support and friendship.

Abstract of Dissertation

Political Regime Changes, Crises and Growth in
Historical Perspective

One of the central questions in the discipline of economics pertains to the determinants of economic growth. In recent years a large number of theoretical as well as empirical studies have analyzed the complex interactions between the country's institutions and economic growth. In particular, the countries' political governance structures are seen as the crucial components of sustained and stable growth, yet their precise contribution is hard to pinpoint. Despite the difficulties associated with establishing a clear causal relationship between political institutions and growth, uncovering the empirical regularities, the anatomy of the interactions between institutional frameworks and economic outcomes is seen as an essential step toward the deeper understanding of the link between them. Another less-researched area of growth literature focuses on the association between financial crises and the countries' short and the long-term growth outcomes.

My dissertation contributes to the literature on the anatomy of the relationship between institutions and growth by examining the role political regime changes play in predicting the on-start of growth "takeoffs" – significant turning points in a country's growth history. The dissertation further investigates the link between institutions and growth by examining the cross-country "political spillover" effects and their possible impact on growth. In addition, the dissertation takes a new look at the link between financial crises and the countries' long-term growth outcomes.

For the purposes of the study, I compile a unique set of historical data covering a broad range of economic and political variables. These variables include volume of trade, investment, government expenditure, the timing of financial crises and the systems of governance for a set of 61 countries covering the time period 1820-2003.

Chapter 1 examines whether political regime changes as well as the quality of political institutions help predict the on-start of the periods of sustained and rapid growth in a country's economic history – periods known as growth "takeoffs". I show that controlling for various economic factors, both democratic and autocratic regime changes are significant predictors of the takeoff initiation. This effect, however, is non-linear as I find evidence that countries with low income per capita levels benefit less from positive regime changes. I employ the Hansen's threshold effect methodology to estimate the level of GDP per capita at which the effect of political regime changes on the probability of a growth takeoff becomes significantly different. I also find similar non-linearity in the coefficients for trade openness and the quality of political institutions. In addition, I find evidence that the model developed in the chapter does significantly better in predicting the on-start of rapid growth episodes than the baseline constant probability forecast.

Chapter 2 of the dissertation investigates why political transitions to more representative forms of government are often associated with vastly different outcomes for different countries. I examine the possibility of cross-country "political spillovers", testing in particular whether countries surrounded by relatively more autocratic neighbors also experience a more difficult economic adjustment process following democratization. The dynamic fixed effects model, estimated using the pooled mean group estimator methodology of Pesaran, Shin and Smith (1999) allows me to account for both short and

long-run effects of political spillovers between neighboring countries. In particular, I find evidence that for countries which have experienced democratization, moving away from their neighborhoods on the political spectrum implies slower GDP per capita growth in the long run.

Chapter 3 examines the association between different types of financial crises and the country's long-term growth. I estimate the effect of currency, banking and twin crises episodes on the probability of initiating growth takeoffs as well as growth collapses. I find that currency crises are significant positive predictors of growth takeoffs, especially in the post World War II period. The currency crises episodes, however, were reducing the probability of growth takeoffs during the Gold Standard era. In addition, I find evidence in favor of the hypothesis that the prompt return to the original parity with gold following a currency crises – the so called "resumption rule" of the Gold Standard era may have contributed to the dampening of the economic activity in the long run.

The results in this chapter confirm the intuition that twin crises are likely to significantly dampen economic activity even in the long run. Twin crises are found to be positive predictors of growth collapses during 1980-2003, and negatively influencing the probability of growth takeoffs during the Gold Standard era.

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Glossary of Terms

Absolute political distance:

$$A_{it} = | \text{Polity}_{i,t} - (\Sigma_j \text{Polity}_{j,t} * (1/\omega_t^{i,j})) / \Sigma(1/\omega^{i,j}) |,$$

where $\omega^{i,j}$ are geographical great circle distance weights between countries i and j.

Change in the absolute political distance, $Z_{i,t} = \sum_{n=0}^{4} A_{i,t+n} - \sum_{n=1}^{5} A_{i,t-n}$

Crisis: A binary variable that take value 1 in the year that marks the onset of currency, banking or a sovereign debt crises. For the19th century the variable also takes value one if the country is a creditor, whose major borrower defaults in that year.

Democratization ($\text{Dem}_{i,t}$): A dummy variable that takes a value of 1 in the year of positive enduring regime change and the subsequent years. If the positive enduring regime change is interrupted by a negative regime change, the dummy takes the value of zero until a positive enduring regime change is achieved. If the country experiences another positive regime change, the $\text{Dem}_{i,t}$ dummy retains the value of one.

GDP per capita: Real GDP per capita expressed in 1990 international dollars.

Government Expenditure, TGE: Total central government expenditure (or public expenditure) at current prices divided by GDP at current prices.

Growth rate US/UK: Rate of growth in the UK (until 1913) or in the UK (1913-2003). This variable helps control for global macroeconomic conditions at time t.

Investment: Gross fixed capital formation (or private investment) at current prices divided by GDP at current prices

Infant mortality rate: Number of death of infants less than 1 year old per 1000 live births.

Inflation: Percent change in the Wholesale prices index (or the GDP deflator where available)

Negative enduring regime change: Defined as at least a 3 point decreases in the polity score of a country, which persisted for 5 years or longer.

Polity: An index variable (Polity IV dataset) defined as the level of country's democracy score (index from 0 to +10) minus the country's autocracy score (index from 0 to +10). The resulting polity scale ranges from -10 (strongly autocratic) to +10 (strongly autocratic).

Positive enduring regime change: Defined as at least a 3 point increase in the country's polity score which persisted for 5 years or longer.

Rate of return US/UK: Interest rate in the UK (until 1913) or in the US (1913-2003). This variable allows controlling for global macroeconomic conditions at time t.

Trade Openness, Volume of Trade, VOT: Volume of trade (defined as exports plus imports) at current prices divided by GDP at current prices

War years: The years of conflict dummy. The variable controls for the outliers in the growth regressions due output increases/declines in the war years. The variable takes the value of one for all the countries involved in war, even if the military action was not taking place on the countries soil. If the country stayed neutral, the war year dummy is equal to zero.

Introduction

What are the determinants of economic growth? Why do some countries grow rapidly, while others stagnate? Can a country's growth gains be sustained over the long-run? These are some of the foremost questions on the mind of scholars and policy-makers alike. In recent years much attention has been given to the analysis of the link between political institutions and the country's growth outcomes.

In particular, scholars have attempted to construct a comprehensive measure reflecting the level of individual countries' political development. This effort resulted in identifying what has been termed as the "three waves of democratization", the major rises and falls of the representative systems of governance around the world in the past 200 years.

Did the movements to democracy (autocracy) have an impact on the economic growth worldwide? Empirically, the answer is far from conclusive. Many studies find a positive but weak correlation between democratization and growth over the long run, while others identify a slightly negative or a statistically insignificant association.

Several factors may be relevant for the analysis of political institutions-growth nexus. First, the results may depend on the framework within which the growth histories of individual countries are analyzed.

Majority of the empirical studies analyze the impact of political institutions on a linear growth trend. This approach is fraught with many challenges. Among the most serious ones to be considered is the issue of endogeneity. Critics point out that in such regressions, political institutions variables are potentially endogenous, and the most likely

sources of endogeneity are the omitted variables bias as well as the possible simultaneity - the feedback effect of the country's growth outcomes on its political structure.[1]

Another criticism of this approach is that countries' historical growth series rarely follow a smooth upward-trending path. The observation becomes particularly relevant in the context of a country's long-term growth history. This in part is the reason why in recent years scholars' attention has been drawn to the analysis of growth takeoffs – the particular events in the countries' growth histories, when a country starts growing much faster than ever before and such growth is sustained over long periods of time. In addition, the focus on the determinants of growth takeoffs is important from the standpoint of economic development. A sustained growth takeoff can serve as the first impulse needed to help a developing country escape a poverty trap and put it on the path of stable growth.

The first chapter of the dissertation contributes to the study of takeoffs by analyzing the effect of political regime changes, be they democratic or autocratic, on the probability that the takeoff will be initiated in the future.

For the purposes of the study I create a unique historical dataset encompassing 61 countries over the period ranging from 1820-2003. The dataset is complied from a large variety of sources, and contains information on the countries' political institutions and regime changes, as well as other possible determinants of growth takeoffs – such as investment in physical capital, exports and imports, total government expenditure, infant mortality rate, the timing of financial crises.

[1] Chapter I discusses these issues in more detail.

The other important contribution is relating the literature on political institutions-growth nexus to the largely theoretical "threshold effects in growth" literature. I use the Hansen's threshold regression methodology to test for non-linearity and identify the levels at which key economic variables might be influencing changes in the coefficients. In particular, I test whether political regime changes affect the probability of takeoffs differently at different levels of income per capita.

The main results are in line with what has been previously found in the takeoff literature using narrower time frame: both autocratic and democratic regime changes are significant and positive predictors of growth takeoffs. The new result is the evidence of "threshold effect" in the coefficient on positive (democratic) enduring regime changes. I find that positive enduring regime changes are positive predictors of the probability of a growth takeoff, but only for countries above the threshold level of income per capita. For countries below that level, the coefficient on positive enduring regime change cannot be distinguished from zero.

The threshold effect is largely absent when I consider movements toward more autocratic regimes. This can be interpreted as the evidence that positive enduring regime changes in very poor countries may be associated with higher uncertainty, which would tend to dampen future investment and growth, whereas autocratic regime changes may be perceived as having less uncertain outcomes.

The coefficients on trade openness and the level of political development are found to be non-linear as well. The threshold methodology reveals, for example, that countries in the mid-range of trade openness benefit most from the incremental increase in the volume

of trade as a share of GDP. On the other hand, the countries in the lowest and the highest range benefit less, although the coefficient on trade openness remains positive.

In addition, I find that democratic regime changes, as predictors of growth takeoffs, are influenced by financial crises. A financial crises occurring the same time as the positive political regime change, dampens the effect of democratization on takeoffs and dissipates the link between the two variables. An interesting result is that financial crises themselves are positive predictors of growth takeoffs. This result is further investigated in the third chapter of the dissertation.

The second chapter of the dissertation explores a different aspect of political institutions-growth analysis. The weakness of the link between democratization and growth found in most of the empirical literature is perceived to be largely due to the heterogeneity in the countries experience with democratization.

Why do some countries grow faster following a positive political regime change, while others fail to experience significant pick-up in growth and may even fall behind? The recent research on the issue points in the direction of cross-country political spillover effects that might influence the "cost" of political transitions.

The recent studies propose to solve the issue of heterogeneity by grouping the countries in accordance with how likely they are to experience democratic reforms in the future. To a great extent this likelihood depends on the variable termed "foreign democratic capital" – the prevalence of democratic regimes among the country's neighbors. Intuitively, countries surrounded by autocratic neighbors are less likely to make a transition to a political system different from that of their close neighbors' – primarily due to political and/or economic pressures.

I interpret this result as indicative of a larger growth "cost" for the countries that do make a transition to democratization while being surrounded by more autocratic neighbors. One of the challenges is to estimate the costs of political transitions for countries in the more "democratic" versus more "autocratic" neighborhoods. The second challenge is to distinguish between the short and the long run effect of political transitions on growth.

Democratic transitions in themselves are seen as having a J-shaped effect on growth – short run growth costs followed by the subsequent increase in the average growth rates. One of the goals of the second chapter is to estimate whether the short and the long run growth effects are different for countries which following a democratic transition move "away" from their neighbors on the political spectrum, versus the countries which become politically "closer" to their neighborhood.

I use the Pooled Mean Group (PMG) estimator approach developed by Pesaran, Shin and Smith (1999) to distinguish between the short and the long-run effects of political regime changes on growth. This approach is potentially more efficient than a simple ARDL method, as it allows me to restrict the long-run coefficients to be the same in a panel of countries, while allowing for heterogeneity in the short-run coefficients.

The main finding confirms the initial hypothesis that countries surrounded by relatively more autocratic neighbors will have higher economic costs of democratic transitions. The countries, which after having democratized move away from their neighbors on the political spectrum, on average experience a statistically and economically significant decline in the growth rate of GDP per capita. While democratization affects economic growth positively in the long run, this influence may be counterbalanced by the increase in the country's "political distance" from its neighborhood.

Another interesting result is the existence of regional differences in the political spillover effects. For Latin American countries in particular, democratization seems to be benefiting growth even when the political distance between the countries is increasing. In the short run, however, and increase in the "political distance" between a country and its neighborhood does not seem to significantly affect growth.

The third chapter of the dissertation investigates the potential effect of financial crises on the long-term economic growth. The study has been in part motivated by the findings presented in the first chapter of the dissertation, where financial crises were discovered to be positive predictors of growth takeoffs.

The result was surprising, especially in light of the existence of a large body of empirical literature documenting significant economic costs associated with financial crises. From a historical perspective, the twin crises episodes are seen to be the most economically damaging, while currency crises are determined to be least costly.

While very few empirical studies emphasized positive aspects of financial crises, theoretically crises may be viewed as a by-product of financial liberalization. Thus to the extent that financially liberalized economies are less credit constrained and therefore experience higher long-run growth rates, the benefits of liberalization may outweigh the cost of occasional financial crises. In this way crises may be associated with higher long-term growth rates[2].

The third chapter of the dissertation contributes to the debate on the link between financial crises and long-term growth outcomes. I estimate the effect of currency, banking

[2] See Ranciere Tornell and Westermann (2008) "Systemic Crises and Growth" as well as the literature review in the third chapter of the dissertation.

and twin crises episodes on the probability of initiating growth takeoffs, as well as growth collapses.

The following set of questions comes to the fore: as harmful as crises may be in the short run, can they in the same time be "beneficial" for growth in the long-term? Do different types of financial crises affect long-term growth differently? Finally, did financial crises affect long-term growth differently in different eras of financial development?

One of the main findings of the study is that the effect of financial crises on growth takeoffs and growth collapses varies by the types of financial crisis in question, as well as by the historical time period. For example, currency crises are found to be significant positive predictors of growth takeoffs, especially in the post World War II period. The currency crises episodes, however, were reducing the probability of growth takeoffs during the Gold Standard era.

A possible explanation for this result could be the existence of the "resumption rule" during the Gold Standard era, whereby the countries implicitly committed to promptly restoring the original parity of their currency with gold. The precipitant return to the original parity may have resulted in the overvaluation of the real exchange rate in the years following the currency crisis, leading to lower exports growth as well as lower output growth. In the chapter I present evidence in support of this hypothesis.

In particular, I find that during the Gold Standard era exports and imports in the post-currency crises years did not deviate significantly from their respective historical growth rates. In the same time, during the Bretton Woods era, as well as the subsequent periods, the post-currency crisis export growth was significantly above its historical mean.

One of the results of the study is that the twin crises in the post- World War II period were significant predictors of growth collapses. During the Gold Standard era, however, the twin crises were merely negative predictors of takeoffs, but did not help predict growth collapses.

This finding is in line with the results presented in other empirical studies, which point to shorter duration and lower severity of the twin crises during the Gold Standard era. Once again, the result might be in part attributable to the differences in the monetary system rules in the two historical periods. Without the implicit parity commitment of the Gold Standard era, the capital flows would have been difficult to restore in the aftermath a crisis. This in turn would make the currency mismatch problems more onerous for the countries' banking systems.

The contribution of the study is in presenting a new perspective on the financial crises in different historical periods and their possible impact on the turning points in the countries' long-term growth history. The chapter offers valuable insights into both positive and negative aspects of financial crises, hitherto unexplored in the economic literature.

Chapter 1. Political Regime Changes and the Turning Points of Economic Growth

1.1. Introduction

Is there a link between a country's political institutions and economic growth? Are representative systems of governance more effectual at securing economic prosperity than the autocratic systems? The debate surrounding these issues is not new - the economic studies examining the connection between political regimes and the growth performance date back to 1960s[1]

In recent years, however, there has emerged a large and growing body of empirical literature investigating the complex links between political transitions and economic outcomes. These studies seek to examine the role that democratic institutions play in fostering growth, and to some extent, the role of economic growth (trade, financial openness) in promoting transition to representative political systems.

In part, this interest is due to the tectonic political shifts experienced by many countries in the late 1980s-early 1990s (e.g. the former members of the Warsaw Pact and the former USSR). So far these events raised more questions than they have provided answers about the complex relationship between political institutions and economic growth. Why is it, for example, that Poland, Hungary, Slovakia, and the Baltic states have gone through remarkable economic transformations following the stable political changes, while Romania, Moldova, Ukraine, Georgia remained democratic, yet failed to experience consistently high rates of growth? Why is it that a number of countries in the region (e.g.

[1] For example studies done by Samuel Huntington (1968); Schweinitz, Karl Jr. (1964). For a comprehensive review of studies on democracy-growth nexus see Przeworski and Limongi (1993) survey paper.

Belarus, Kyrgyzstan, Tajikistan, Kazakhstan) experienced varying degrees of political reversals from democracy back to the autocratic system of governance, with or without gains in growth?

In order to address these questions, we first need to establish an appropriate framework for analyzing the countries' growth histories. In this respect, the recent empirical studies on the growth and political institutions nexus may be grouped into two broad categories. Studies in the first category primarily look at how political regime changes affect and are affected by key economic factors: trade openness, financial openness and the average growth rate of income per capita[2].

The second group of studies focuses mainly on the turning points in the countries' economic history, seeking to uncover the nature of growth takeoffs as well as growth slowdowns[3].

The main difference between these strands of literature lies in their treatment of economic growth. Jerzmanowski (2006), for example, points out that the studies in the former category often analyze the impact of political institutions on the cross-country average growth rates, or on the linear time trend of growth. The latter group, however, views long-term growth as a changing sequence of different growth states, rather than simply a linear trend. The possible economic states include growth takeoffs, periods of stable and sustained growth, slowdowns, stagnations and crises. This framework seems to be particularly relevant for analyzing growth patterns in developing countries, emerging

[2] For example Milanovic (2005); Przeworski and Limongi (1993); Lopez-Cordova and Meissner (2005); Eichengreen; Papaioannou and Siourounis (2004) - these studies are reviewed later in the chapter.

[3] Hausmann, Pritchett and Rodrik (2005); Jones and Olken (2008); Jerzmanowski (2006),

markets, and even developed economies over particularly long periods of time, when the structural breaks in the growth trends are more prominent.

Growth takeoffs have received particular attention in the literature, with recent papers by Hausmann, Pritchett and Rodrik (2005), Aizenman and Spiegel (2007) investigating the link between takeoffs, economic reform, and political regime changes. The goal of these studies is to define takeoffs as the episodes of sustained, rapid and accelerating growth and to analyze the impact of various institutional and economic factors on the probability that the country escapes a poverty trap and enters a period of sustained growth.

This chapter contributes to the analysis of growth takeoffs by addressing the following questions:

How do we define rapid and accelerating growth episodes, particularly in the context of the historical data, spanning more than a century of growth history? To what extent do political regime changes, be they democratic or autocratic, as well as other key variables such as trade openness, government expenditure, education and investment help predict the onset of growth episodes? Finally, do political regime changes affect the probability of growth takeoffs differently at different levels of key variables - such as the level of a country's per capita income or total government expenditure?

In this chapter the principle method for identifying growth takeoffs is based on the methodology originally developed by Hausmann, Pritchett and Rodrik (2005). The methodology is modified in order to make it applicable for the analysis of the historical data. The chapter also expands the time series dimension of the country sample normally used in the literature, to include growth episodes in the 19th and the beginning of the 20th

century. In order to assess how various economic and political factors may have influenced the probability of a growth takeoff initiation, the chapter uses a unique set of historical data compiled from a wide range of sources. The additional explanatory variables include measures of government size and trade openness, investment in physical capital, proxies for educational attainment of the labor force, quality of country's political institutions, dummy variables for financial crises, etc.

The other important contribution of this chapter is relating the literature on political institutions-growth nexus to the mainly theoretical "threshold effects in growth" literature introduced by Azariadis and Drazen (1990). I use methodology developed by Hansen (1999) to test for non-linearity and identify the thresholds at which key economic variables influence coefficients in the regression.

The main results of the chapter are in line with earlier studies, in particular the findings of Hausmann et al. (2005). I find that both negative (autocratic) and positive (democratic) enduring political regime changes have a significant and positive effect on the probability that a country experiences a growth takeoff, once the impact of financial crises is taken into account.

In addition, I find the following evidence in support of the "threshold effects": the coefficient on democratic regime changes is positive and significant only for countries that have reached a certain level of GDP per capita. Below that level, the effect of democratic regime changes on the probability of growth takeoffs cannot be distinguished from zero.

I also find that the effects of openness to trade and the quality of political institutions on the probability of growth takeoffs are non-linear. In particular, an increase in the 5-year average of a country's democratization index (a proxy for quality of political

institutions) has a positive and significant effect of the probability of growth takeoffs - but only for countries with already high levels of the democratization index. The effect of trade openness on growth probability is highest for countries that lie between the 78th and 87th percentile of the sample. Below and above those levels, the volume of trade effect on growth is smaller, but still significant and positive.

Another result presented in this chapter is that infant mortality rate (proxy for educational attainment of the labor force), government expenditure, volume of trade, and initial level of GDP per capita all significantly influence the probability of a country entering a phase of rapid growth. The signs of these effects are consistent with the theory. In particular, higher government expenditure and infant mortality rate reduce the probability of a growth takeoff[4], while volume of trade[5], and the initial average level of GDP per capita[6] significantly increase the probability that a country will experience a rapid growth episode.

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[4] Robert J. Barro (1991) points to a negative empirical relationship between growth and the size of government. See also Tavares and Wacziarg (2006) for the review of empirical and theoretical studies on this link. Most of the studies agree that government's impact on growth involves a trade-off between the negative effect of distortionary taxation and the benefits associated with redistribution.

Educational attainment traditionally serves as a proxy for human capital accumulation. A positive link between educational attainment and growth has been documented by numerous empirical studies. However, educational attainment as measured by years of schooling is far from an ideal proxy for human capital. Some researchers (e.g. Papaioannou and Siourounis (2005)) use health variables, such as life expectancy, in its stead. In this chapter, however, I use infant mortality rate rather than life expectancy, since this measure is available for a wide spectrum of countries and has relatively long historical time-series.

[5] A positive relationship between volume of trade and growth has been documented in numerous studies, including Dollar and Kraay (2002), Papaioannou and Siourounis (2005). Robert Lucas in his 1993 Econometrica paper "Making a Miracle" discusses the theoretical foundation of trade-growth link.

[6] I use both 1-year lag of GDP per capita and a 4-year average of GDP/capita (lagged 2 periods) to control for the level of income effect. While 1-year lag of per capita income has significant negative effect on growth takeoff probabilities, the 4-year average has a significant positive effect. This result highlights the importance of initial conditions for the country's growth performance. The supporting empirical evidence can be found for example in Danny Quah (1993). The author estimates the transitional probabilities for countries moving between income quintiles. His results suggest that richer countries face very high likelihood of remaining rich, while very poor countries similarly high likelihood of remaining poor.

The rest of the chapter is organized as follows: Section 1.2 analyzes recent empirical literature on the institutions - growth nexus and discusses a set of challenges and limitations pertaining to data availability, endogeneity, and sample selection bias problems. Section 1.3 examines the methodology for identifying growth takeoff episodes in the historical context as well as the technique for identifying the threshold effects in panel data. Section 1.4 presents the base empirical model for predicting growth acceleration episodes as well as a set of extensions to the base model. In this section I also discuss the results of the threshold estimation for political regime change variable, and evaluate the accuracy of forecasts generated by the model. Section 1.5 concludes.

1.2. Recent Empirical Literature: Research Challenges and Limitations

1.2.1 Definition of democratization

The first obvious challenge for researchers studying the link between democracy and growth is the definition of democratization. The need to trace more precisely just how representative the country's political institutions are, calls for a measure which can distinguish minutely between various political regime characteristics.

In the political science literature, democratization is generally defined as the movement toward the establishment of representative political systems, such as a parliamentary system of governance; movement toward limiting the powers of a chief executive and toward a greater openness and competitiveness of political participation.

Today, one of the most detailed indexes of political liberalization is the index developed by Polity IV project (Marshall and Jaggers (2002)). The Polity index is a composite of scores assigned to the different features of a country's political system - such

as competitiveness of political participation, constraint on the power of the chief executive, openness of political participation, etc. The scores are combined to rank countries on the scale from -10 to +10, with -10 corresponding to the full autocracy and +10 to full democracy as defined in the project.

The advantage of Polity IV index is the broad time coverage[7], as well as the methodology for analyzing the features of the political system which carry over between different time periods and historical eras. The Polity index can be used to illustrate what is known as "three waves of democratization" in the past two hundred years (Huntington(1993)). Figure 1.1 gives an illustration of the "three waves'".

The first wave of democratization took place in the period of 1800-1922 and saw the rise of representative system of governance in the United Kingdom, Sweden, Norway and France, to name a few. The second wave 1945-1960s corresponded to the period following World War II and before the rise of autocratic regimes in Africa and some countries of Latin America. The third wave of democratization, mid-1970s to 2000, started with the fall of the autocratic regimes in Portugal and Spain, and was followed by the disintegration of the Soviet Union and subsequent democratization of the former Warsaw Pact countries and some of the former republics of the USSR.

1.2.2 Endogeneity

Whether the three waves of democratization have been associated with higher rates of income per capita growth, is one of the central questions raised in the literature on the

[7] Polity IV index starts from 1800, or the year of the creation of the state, whereas another frequently used index, the Freedom House Freedom in the World index, starts from 1973

institutions-growth nexus[8]. Typically, the growth-democracy link is explored via dynamic growth regressions with the indicators of political structure as independent variables[9]. One of the central problems associated with this type of analysis is the problem of endogeneity. The most likely sources discussed in the literature are related to omitted variables and simultaneity biases. In addition, Przeworski and Limongi (1993) discuss the possibility of sample selection bias.

The authors of various studies in this strand of literature have paid considerable attention to addressing the endogeneity issues.

In particular, the link between democratization and growth is likely to be spurious if there are omitted variables in the regression which are correlated with both democratization and growth. For example omitting trade openness from the growth regression is likely to bias the coefficients on democratization upward if trade openness is positively correlated with both democratization and growth. Hence, the estimated coefficient on democratization could be positive even if the actual coefficient is zero.

For this reason the recent studies typically include a rich set of likely growth determinants in the regression model. For example, Papaioannou and Siourounis (2004) include government consumption, trade and investment share in GDP, schooling and life expectancy, as well as log GDP level and lags of growth rate as explanatory variables in the panel growth regression. Inclusion of these variables aims at reducing the omitted variable bias.

[8] The notable recent contributions include papers by Milanovic (2005), Przeworski and Limongi (1993) and Tavares and Wacziarg (2001), Papaioannou and Siourounis (2004). In addition, a number of authors explore the two way link between globalization (trade and financial openness) and democratic regime changes (e.g.. Lopez-Cordova and Meissner (2005), Eichengreen and Leblang (2006)).

Equally important problem is the potential feedback effect of growth on democratization. For example, income growth may itself promote democratization (Acemoglu, Johnson and Robinson (2005) argue that the rise of Atlantic trade in some of the Western European countries helped strengthen the fortunes and political influence of the merchant class thereby limiting the power of monarchy, especially in the countries with direct access to Atlantic trade routs). In this case, in order to deal with potential endogeneity one has to find a set of suitable instrumental variables for democratization. A good instrument would be correlated with democratization over time, but not with the error term in the regression.

The works by Tavares and Wacziarg (2001), Eichengreen (2006), who study the link between growth/financial openness and democratization suggest a potential set of instruments for democracy.

Tavares and Wacziarg (2001), for example estimate how democratization affects potential growth determinants, such as education, inequality, public expenditure and capital accumulation, and then estimates how these variables in turn affect economic growth. Democratization is instrumented with a set of historical, cultural and demographic variables which include ethnolinguistic fractionalization, religion, independence, colonial past, as well as population size, share of population below 15 and above 65, etc. Similarly, Eichengreen (2006), while assessing the effect of democratization on financial/trade openness, instruments democracy with the number of past transitions from democracy to

[9] Milanovic (2005), Tavares and Wacziarg (2001), Papaioannou and Siourounis (2004).

dictatorships, age of constitutional system in the country, and the number of countries in the world which are also democratic.

Unfortunately, these instruments may not be suitable for the use in an historical context. The longer the time period under consideration, the more limited is the use of historical and cultural variables, since they themselves may be shaped by different growth patterns - the number of past political transitions and the age of constitutional system are examples of such variables. In addition, these variables may affect growth independently from their effect on democratization, or through a variable omitted from the regression.
For this reason, the time-series cross-section analysis of growth-democracy nexus usually relies on fixed or random effects regressions without the use of instruments, and attempts to control for the endogeneity by using lagged values of the dependent variables as well as non-overlapping period averages of the variables (see Milanovic (2006)).

Despite the limitations imposed by endogeneity, the above mentioned studies provide a valuable insight into the channels through which democracy may affect growth, as well as the role of trade and financial openness in promoting democratic change.

For example Lopez-Cordova and Meissner which look at 115 countries and time period from 1870-2000, indicate that countries with greater propensity to trade also had more representative political institutions.

Eichengreen (2006), on one hand, assesses both sides of the possible causal relationship between democracy and globalization. The results suggest that there is significant and positive relationship running both ways from democracy to globalization and from globalization to democracy.

Whereas Tavares and Wacziarg (2001) results indicate that growth is positively affected by education and physical capital accumulation. Democracy, in turn, was found to increase human capital accumulation and decrease physical investment. The overall effect of democracy on growth, taking into account the various channel variables, was found to be moderately negative. Hence, the authors argue, the generally weak effect of democratization on growth found in the earlier studies.

With respect to the above mentioned studies, however, several additional caveats are in order. First, they largely do not address the sample selection bias problem - one of the main criticisms put forward by Przeworski and Limongi (1993). The authors of the survey note for example, that short-term results are likely to be biased toward showing a positive influence of reversals to autocracies on the countries' growth performance. This is because, they argue, democracies have a better chance of enduring through economic downturns, as they provide an avenue for changing the government without changing the regime. Autocracies, on the other hand, are unlikely to endure through very bad times, and are therefore more closely associated with positive growth outcomes.

The long-run estimations seem to confirm the idea that democracy is good for growth, yet, this result may only stand because there were very few reversals to autocracy in the past 30 years (the usual time span of the studies), and not enough data is available to draw conclusions on what the growth outcomes would have been, had the countries remained autocratic or reverted back to autocracy. Secondly, the analysis of trend growth may sometimes be problematic in developing countries, where “growth miracles'” are often coupled with “growth disasters”, and the number of structural breaks in the growth series is typically higher than in the developed economies.

1.2.3 Analyzing the turning points: an approach to studying long-run growth

One way to address the structural break criticism is to focus attention on the turning points of a country's growth performance rather than on the growth trends. This is the approach taken in the papers by Hausmann, Pritchett and Rodrik (2005), Jones and Olken (2008), Jerzmanowski (2006).

Hausmann, Pritchett and Rodrik in particular focus on identifying the periods of growth takeoffs - the rapid and accelerating growth episodes in a country's economic history and further investigate whether political regime changes help predict the onstart of the episodes. Jones and Olken, on the other hand, analyze both the upturns and the downturns in a country's growth patterns to determine whether these changes are associated with changes in the quality of institutions. Michal Jerzmanowski (2006) extends the idea further by modeling growth as a Markov switching process between different growth regimes, such as takeoffs, periods of sustained growth, stagnations and crises. He looks at whether the quality of institutions affects the probability of a transition between the growth states.

The focus on takeoffs rather than linear growth trend raises important questions. One of them is whether countries which have higher probability of takeoffs have on average achieved higher standard of living. The connection between takeoffs and the country's standard of living is not obvious, as higher probability of growth takeoffs may be indicative of economic instability. This would be the case of countries where frequent growth spurs are followed by growth collapses.

The evidence presented in this chapter, however, suggests that growth takeoffs play an important role in the country's overall economic development. For example the

countries with GDP per capita in the top 40 percent of the income distribution have on average higher unconditional probability of experiencing a growth takeoff than countries in the lowest 40 percent[10].

The findings of the studies mentioned above are mutually consistent. The Hausmann, Pritchett and Rodrik (2005) study (later in the text - HPR) reports, for example, that positive as well as negative regime changes are statistically significant predictors of growth acceleration episodes[11].

However, when the regression is run on the sample of only developing countries, the predictive power of positive political regime change becomes insignificant across different specifications. Negative regime change coefficients are still significant and positive. This finding seems to point in the direction of a possible "threshold effect" - i.e. at some particular (low) level of income per capita positive regime changes may lose their predictive power for growth takeoffs.

In the same time, Jerzmanowski (2006) finds that institutional quality significantly influences the probability of a country switching between growth regimes. For example, a country with weak institutions may briefly enter a period of high growth, but is more likely to revert back to stagnation. Jones and Olken (2008) report a positive, yet non-significant association between the measures of institutional quality and growth.

[10] Figure 1.5 illustrates this point. It must be noted, however, that more takeoffs do not necessarily imply higher standards of living. In fact, the highest unconditional probability of a growth takeoff occurs in the countries which are in the 3rd income quintile. Among the countries in this group - Chile, Argentina, Venezuela, Portugal, Spain, Ireland

[11] Yet, having gone through a political regime change or through economic reforms does not guarantee that the country will experience a period of accelerating growth. Most of political regime changes are not followed by growth takeoffs.

Looking at a country's growth history from the perspective of changes in growth regimes and analyzing growth takeoff episodes rather than growth trends, allows the authors to deal with the problem of frequent structural breaks in the growth series. In addition, this approach helps circumvent the sample selection bias problem outlined in Przeworski and Limongi (1993) paper. Largely because the question of the studies is not whether democratic regimes are better or worse for growth performance, but rather whether growth takeoff episodes can be in part explained by institutional changes. Changing the focus in this way works, because growth takeoffs are relatively rare events in the country's growth history. Therefore, while dynamic growth regressions may find that democratic regime changes are associated with modest average increases in the growth rate, it does not necessarily follow that democratizations are associated with the periods of prolonged and accelerating growth.

One of the drawbacks of this group of studies, however, is that they for the most part (with the exception of the HPR (2005) paper) rely on the indexes of corruption and the rule of law to measure institutional quality. Therefore, the analyzed sample period is usually restricted to begin in the 1970s, when the data become available for a wide sample of countries.

Another question the above mentioned studies overlook, is whether the effect of political transitions on growth is non-linear. In particular, whether for countries with otherwise similar characteristics the effects of political regime changes might be different depending on the country's level of GDP per capita, education, trade openness, etc.

The idea was originally introduced by Azariadis and Drazen (1990) and has since been developed mainly in the theoretical literature. In particular, Azariadis and Drazen

suggested that growth rates among countries differ for different levels of “threshold variables” such as human capital accumulation. If the return on human capital investment depends on the overall level of human capital accumulation, then for low levels of the overall accumulation, it may not pay to invest in costly but productive training.

In this chapter I extend the idea of the "threshold effects" to analyze the impact of political regime changes on the probability of growth takeoffs.

Endogeneity, however, still remains an important issue in the above mentioned studies. For example, omitted variables bias is a serious concern. Especially since in most cases variables such as government expenditure, human capital, volume of trade and investment's share in GDP which are standard in the growth literature, are generally omitted from the analysis. Despite the fact that there is no well developed theory of growth takeoffs, omitting these potentially important variables may bias the result. In this chapter of the dissertation, I aim at minimizing the bias by considering a variety of standard growth determinants in addition to democratization.

The possibility of feedback effect running from growth to democratization should also be considered. In particular, growth patterns (or expectations of future growth) may give rise to a political regime change in earlier periods. This however, becomes less likely given the nature of growth takeoffs. As HPR (2005) study points out, takeoffs develop and are sustained over a number of years, and therefore are generally hard to anticipate. Given the difficulty with finding suitable instruments for democratization in the historical context, I adopt the approach which aims at minimizing the feedback effect by including the lagged values of dependent variables in the regression.

The limitation of this approach is that endogeneity problems potentially remain, and do not allow to establish a precise causal link between political institutions and economic growth. Nevertheless, short of claiming the causal effect of democratization on growth takeoffs, it is important to look into the anatomy of the historical link between political institutions and the events in the country's growth history, to investigate the correlation patterns which would inform further research on the subject.

1.3. Methodology

1.3.1 Identifying growth acceleration episodes

The first step in analyzing the effect of institutional changes on the probability of growth takeoffs, is to develop a proper methodology for identifying the episodes of rapid and accelerating growth. Jones and Olken (2008) in particular, use Bai-Perron (1998, 2003) method to test for structural breaks in the GDP growth series. The problem with this method is the danger of identifying too many breaks that are simply "recoveries" from a bad shock. HPR (2005) propose a methodology that filters out such recoveries. In the same time they seek to ensure that the identified periods are long enough (at least 8 years), and that the pace of growth is such as to allow the country to catch up with its rich industrialized counterparts.

In the HPR methodology, the growth rate, $g_{t,t+n}$ is defined as the growth rate at time t over horizon n. For example an 8-year average growth rate would be denoted as $g_{t,t+7.}$

The average growth rate is derived from the least squares regression of a log GDP per capita over n-year period on a constant and a time trend:

$$\ln(y_{t+i}) = \alpha + g_{t,t+n} \times t \quad \text{where i = 0,…..n}$$

The change in the growth rate at time t is defined as

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

For n=7, for example, $\Delta\, g_{t,\,n}$ can be interpreted as telling how much the forward looking eight year average growth rate decreased or increases, as compared to the growth rate in the eight years prior to time t.

A growth episode in HPR paper is considered to be a rapid growth episode when the following three conditions are met:

1) $g_{t,t+n} \geq 3.5\%$ - growth is rapid
2) $\Delta\, g_{t,\,n} \geq 2\%$ - growth is accelerating
3) $y_{t+n} \geq \max\{y_i\}$, $i \leq t$ - ruling out the "growth recovery" episodes.

The last condition requires that GDP per capita at the end of the growth episode is greater than the maximum value of GDP per capita in all the previous time periods.

The year of the rapid growth episode initiation is determined as follows: in the case when several consecutive years meet the criteria for the onset of a rapid growth episode, linear spline regressions are fitted through the series with a break in one of the years of interest. The *initiation year* is determined by the regression with the highest F-statistic.

While this method is simple and effective, its main weakness is the arbitrariness. Why should the "rapid growth episode" be starting at a particular value of 3.5%? Why should be "catching up" growth rate be 2%? HPR argue this is because 2% is the average rate of growth for OECD countries starting from 1970s. Although this explanation seems reasonable, it may be a problem for researchers working with historical data. The average

growth rates of GDP per capita were around 1-1.5% in the 19th century. In view of these considerations, I propose the following modified set of conditions to deal with this methodological issue.

Historical method for identifying growth takeoff episodes:

1. If $g_{t,t+n} \geq$ 1 standard deviation above the mean of $g_{0,t}$ (i.e. the growth rate from t =0 up to time t) - growth is rapid.

2. If $g_{t,\,n} \geq$ average growth rate of countries in the top 50th income percentile (updated every 20 years from the start of the sample) - growth is accelerating.

This condition has the advantage of accounting for historical differences in average growth rates.

3. $y_{t+n} \geq \max\{y_i\}$ where $i \leq t$. This condition is the same as in HPR analysis.

A set of examples of rapid growth episodes identified under the Historical method, are given in Figure 1.2 panel a-d. The vertical lines represent the approximated starting years of rapid growth episodes for four different countries.

1.3.2 Predicting growth acceleration episodes: Base Model

To identify predictors of growth acceleration episodes, I estimate a distributed-lag random effects probit model of the following form:

$$Y_{i,t} = \alpha + \beta_1' X_{i,t-1} + \beta_2' D_{i,t-1} + \beta_3' \sum_{k=1}^{n} Z_{i,t-k} + \beta_4' \left(\sum_{n}^{d} Z_{i,t-n+1} \right) / d + \beta_5' \bar{Z}_{\bar{t},t-1} + (u_i + e_{i,t}) \quad (1.1)$$

Here $Y_{i,t}$ is a 0-1 binary variable which takes the value of 1 at the time of the onset of the growth acceleration episode, as well as in the years t-1 and t+1 around the episode.

The wider time window helps safeguard against the possibility of identifying the start of a growth takeoff imprecisely, due to flaws in the data or inconsistencies in the identification.

$D_{i,t}$ - a dummy indicators of financial crises.

$X_{i,t}$ - a set of political change variables. These are binary indicators that take a value of 1 in the year of a negative or positive regime change as well as in the years t-1 and t+1 around the episode.

$Z_{i,t}$ - a set of economic variables, such as volume of trade, total government expenditure, investment (all expressed as a share of GDP); along with the proxy for education and log of GDP per capita income.

$\overline{Z}_{\bar{t},t-1}$ - cross-section averages of the explanatory variables for a given year.

In order to partially control for endogeneity, all explanatory variables enter the regression with lags.

Another important feature of the model is the inclusion of the distributed lags of independent variables. The lags as well as the lagged time averages of explanatory variables (3-4 years), help capture the effects on growth that are manifested over time, in a period of several years.

The model also controls for period effects by using year specific averages of the explanatory variables across the entire sample. Otherwise, introducing year dummies would have been too expensive in terms of the loss of degrees of freedom in the model.

1.3.3 Identifying threshold effects

A simple econometric methodology proposed by Hansen (1999) allows us to see whether the effects of trade openness, quality of political institutions, and political regime

changes on growth are non-linear. In particular, whether political regime changes affect the probability of takeoffs differently depending on a country's level of GDP per capita, and whether the effect of trade openness varies substantially at different levels of the trade volume.

A threshold regression model described by Hansen takes the following form:

$$Y_{i,t} = \mu_i + \beta_1' X_{i,t-1} \times I(q_{i,t-1} \le \gamma) + \beta_2' X_{i,t-1} \times I(q_{i,t-1} > \gamma) + e_{i,t} \quad (1.2)$$

Here $Y_{i,t}$ is the dependent variable; $X_{i,t}$ a vector of regressors, and $q_{i,t}$ - the threshold variable. The indicator function, $I(\cdot)$, effectively divides the observations into two regimes, distinguished by the different regression slopes β_1 and β_2; γ is the threshold value of $q_{i,t}$ - this value needs to be estimated.

In a random effects probit regression, γ can be estimated through a grid-search procedure, picking the value that maximizes the log-likelihood function. To avoid putting too few observations into the threshold, a minimal set of observations must lie in both regimes (1-5% of the total number of observations). With threshold value γ thus determined, one can test $H_0 : \beta_1 = \beta_2$, using the likelihood ratio test. The p-values have to be constructed using bootstrap method, since the likelihood ratio test statistic has a non-standard distribution[12].

For the purpose of the current analysis, the threshold regression model takes the following form:

[12] Since under the null hypothesis, the threshold is not identified, the classical test statistic has non-standard distribution and requires bootstrap estimation - Hansen (1999). The bootstrap sample for probit model is constructed using methods outlined in MacKinnon (2006).

$$Y_{i,t} = \alpha + \beta_1' X_{i,t-1} \times I(q_{i,t-1} \le \gamma) + \beta_2' X_{i,t-1} \times I(q_{i,t-1} > \gamma) + \beta_3' D_{i,t-1} + \\ + \beta_4' \sum_{k=1}^{n} Z_{i,t-k} + \beta_5' (\sum_{n}^{d} Z_{i,t-n+1}) / d + \beta_6' \overline{Z}_{\bar{t},t-1} + (u_i + e_{i,t}) \quad (1.3)$$

where $X_{i,t}$ is the lagged value of the political regime change indicator and $q_{i,t}$ is the threshold variable of interest (i.e. log GDP per capita; total government expenditure; volume of trade, etc).

According to the hypothesis, if the threshold variable is for example, log GDP per capita level, the coefficient β_1 should not be significantly different from zero, while the coefficient β_2 should be significant and positive. This would indicate that a positive political regime changes is not likely to benefit the country's growth if the initial level of per capita income is too low. In other words, below a certain threshold level of income, positive regime changes do not help predict growth takeoffs.

A special case of the threshold regression model (equation 1.4) is when the variable in question serves as its own threshold variable. This would allow us to test if the observations in the sample can be split at some value of the variable in question and test for the significance of the difference in coefficients.

$$Y_{i,t} = \alpha + \beta_1' X_{i,t-1} + \beta_2' Z_{i,t-1} \times I(Z_{i,t-1} \le \gamma) + \beta_3' Z_{i,t-1} \times I(Z_{i,t-1} > \gamma) + \beta_4' D_{i,t-1} + \\ + \beta_5' \sum_{k=1}^{n} Z_{i,t-k} + \beta_6' (\sum_{n}^{d} Z_{i,t-n+1}) / d + \beta_7' \overline{Z}_{\bar{t},t-1} + (u_i + e_{i,t}) \quad (1.4)$$

This chapter uses the observations on the volume of trade and the 5-year average of country's Polity score to test for the presence and the optimal number of such breaks; and to determine at which values of the variables these breaks occur.

1.4. Results

1.4.1 Identifying growth acceleration episodes

I applied both the HPR method and the Historical method for identifying growth takeoffs to the dataset of 54 countries covering time period from 1820-2003. The full list of growth acceleration episode dates identified by both methods is given in Table 1.2. The table also provides the 8-year average growth before and after the time of the episode initiation.

In addition, Tables 1.3.1 and 1.3.2 summarize the differences between the two methods. Table 1.3.1 indicates that the Historical method identifies a significant proportion of the episodes, which are also captured by the HPR methodology. For example, eleven out of thirteen growth takeoff episodes (about 85%) identified under the HPR methodology before 1914 are also captured by the Historical method. However, only 28% of the episodes identified under the Historical methodology in the same time period are captured by the HPR method. This suggests that the former method overlaps with the HPR methodology and yet captures a number of new episodes, which would otherwise be ignored (for example, UK 1842, the year that marked a period economic expansion in the United Kingdom, after key pro-trade legislative acts were passed by the Parliament; Netherlands 1845 and 1860 periods of growth, which saw significant expansion of Dutch capital oversees).

The difference between the two methods is especially pronounced in the period between 1870 (the year when a number of Latin American countries as well as Canada, US, Japan and New Zealand enter the sample - see Table 1.1) and the year of 1945.

Table 1.3.2 shows the cumulative distribution of episodes over time. As expected, the Historical method dominates the HPR method mostly between 1870-1945, when the identification criteria outlined by the HPR method would have been too restrictive.

1.4.2 Base Model

1.4.2.1 Variables

The base model is a random-effects probit model given by equation (1.1). Following HPR (2005), I define the dependent variable as a 0-1 dummy, which takes the value of 1 in the year t of the initiation of the rapid growth episode as well as in the years t-1 and t+1 around the episode. The time window safeguards against the possibility of capturing the initiation date imprecisely, due to the flaws in the data or methodological inconsistencies.

The explanatory variables in the regression can be grouped into the following categories:

1. Political change and quality of political institutions variables, which include the country's 5 year average Polity score and two variables capturing the start of positive and negative regime change episodes.

The average Polity score serves as a measure of advancement of representative political system in the country and a proxy for institutional quality. As noted in the methodology section, the advantage of using a 5-year average of the Polity score is that this measure is less sensitive to the transitory changes in political institutions.

The binary indicators take the value of 1 in the year of a positive/negative enduring regime change[13] as well as year t-1 and t+1 around the episode.

[13] definition is provided in the Glossary of Terms

2. Economic variables include: a measure of trade openness (a country's volume of trade expressed as a share of GDP), a measure of the size of government (total government expenditure as a share of GDP), investment as a share of GDP, and log GDP per capita expressed in 1990 international dollars. In addition, I include a financial crisis dummy, which takes the value of 1 in the year when a country is involved in a financial or a banking crisis, as well as in years t-1 and t+1 around that year.

The model also includes 3 and 4 year averages of all the continuous economic variables mentioned above. In addition, a 4 year average of the infant mortality rate is included in the regression. This variable serves as a proxy for country's human capital accumulation. The measure was chosen over more the traditional ones (such as years of schooling or literacy rate) primarily because it is available for longer periods of time for historical data, and because empirical studies point to a strong link between health indicators (such as infant mortality rate) and literacy rates[14].

3. Time averages of political and economic variables. In order to partially control for period specific effects I introduce the cross-section year specific averages of all continuous political and economic variables in the model. Since the time period for most countries in the sample is relatively long, including year dummy variables in the regression is expensive in terms of the degrees of freedom lost.

1.4.2.2 Base model results and economic interpretation

The coefficients, standard errors and corresponding marginal effects for the base model regression are reported in Table 1.4 (columns 1-3). All the marginal effects are

[14] For example, Zakir and Wunnava (1999)

evaluated at sample means for continuous variables, and for discreet changes of dummy variables from zero to one.

In the model specified above, the political regime change variables have the coefficient signs and magnitudes consistent with the findings of HPR (2005).

The results in Table 1.4 (1-3) indicate that both positive and negative regime changes positively influence the probability that a country experiences a growth takeoff. In the base model specification, however, positive enduring regime changes do not appear to influence the probability of rapid growth episode initiation significantly. (Negative enduring regime change coefficients, on the other hand, are significant and positive). This lack of significance can be explained by the presence of threshold effects. For part of the sample, positive enduring regime changes may have a negative effect on the probability of growth takeoff; while in the other part of the sample this effect may be positive. Indeed, the threshold regression estimations presented later in this section lend support to this hypothesis.

In the base model specification, a positive enduring regime change increases the probability of growth takeoff by approximately 2.38 percentage points. The negative enduring regime change increases the probability by about 6.65 percent. The effect of the negative regime change on the probability of growth is 2.8 times larger. This is consistent with the HPR findings, where the negative regime change effect is about 3.7 larger than the positive effect.

While the results seem to suggest that movement toward autocratic rule has a larger positive impact on growth, an alternative interpretation may be offered. Enduring positive regime changes possibly rely less on economic growth to sustain themselves than do

autocratic regimes. In this respect, it is interesting to look at another measure of institutional quality discussed above - the 5-year average Polity score. The impact is evaluated at the sample mean, which is at 4.11 points - about the level of Finland in the 1930s, Russia in 1998, Malaysia in 1980s or Greece in 1960s.

The marginal effects calculations suggest that all else equal, an increase of the 5-year average polity score at t-1 from sample mean to the maximum 10 point score, increases the probability of growth takeoff by about 1.7%. For a more modest 4-point increase in average polity score (from 4.11 to 8.11 - about the level of France and the United Kingdom in early 1900s, Argentina in 1989, Bulgaria in late 1990s) the probability of growth takeoff increases by 1.12 percentage points.

As for the economic variables, a 10% increase in the Trade Openness (from 0.494 sample mean - about the level of Volume of Trade (VOT) as a share of GDP for the United Kingdom in 1897 - to 0.544 - about the level of the UK in 1909) at t-1 would increase the probability of growth takeoff at time t by approximately 0.74%. Similarly, a one standard deviation increase from the mean VOT (from 0.494 to 0.892 - about the level of Hungary in 1996) would lead to on average 8.7% increase in the probability of growth takeoff.

The marginal effects coefficients also suggest that one standard deviation increase in the 4-year average of log GDP per capita (corresponding to an increase from $5,131.27 per capita to $11,045.52 per capita income - roughly the difference between Portugal and Germany in 1970) at t-2 would result in a 61% increase of the probability that a growth episode will be initiated in the year t. Alternatively, for countries otherwise similar, the country with income per capita 1 standard deviation above the mean has much higher chances of experiencing a growth episode than the country whose income per capita is at

the sample mean. In the same time, a more modest $400 increase above the mean income per capita would lead to an approximately 2.5 percentage point increase in the probability of a growth takeoff.

Other variables in the regression have signs consistent with theory:

An increase in 3-year average of total Government Expenditure as a share of GDP (from 0.187 to 0.304) would lead to decline in the growth takeoff probability by 1.56%. An increase in the 4-year average of infant mortality rate at t-1 (from 64.8 deaths per 1000 live births to 123.5 - roughly the difference between Denmark and Spain in 1939) would result in about 1.9% decrease in the probability of growth takeoff in the next period.

The coefficients in front of year-specific means of explanatory variables can be interpreted as follows: a one standard deviation increase in “average democracy” in the world (from 3.1 points to 5.5 points on the polity scale) leads to a 1.43 percentage point increase in the probability that a growth takeoff will be experienced by any given country. The base regression coefficients also suggest that the impact of average “world democracy” is twice the impact of “own democracy” on the probability of growth takeoff episode initiation.

The impact of higher infant mortality rate in the world at time t-1 is significant and negative. The impacts of higher trade openness in the world, as well as the country's own investment/GDP ratio, and GDP per capita at time t-1 are also significant and negative (this can be attributed to cyclical fluctuations - as the growth episodes are usually initiated when economies are starting to recover from a recession).

An interesting result is the significant and positive effect of financial crisis on the probability of a growth takeoff. This result seems to be consistent with some recent

findings. For example, Ranciere, Tornell and Westermann (2004) argue that economies, which have experienced occasional crises, have grown on average faster than countries with smooth credit conditions. They develop a model in which credit market imperfections generate borrowing constraints and low growth, and show that a country on a more risky path will grow faster but will also experience occasional self-fulfilling crises.

1.4.3 Extensions of the Base Model: Results and Interpretation

1.4.3.1 Interaction Terms

I consider several extensions to the base model described above. One of them is to introduce interactions terms that would capture the effects of positive and negative enduring regime changes during the times of economics crisis. Table 1.4, column 4 presents the marginal effects of 1 standard deviation change from the sample mean. The asterisks indicate the significance level of the corresponding regression coefficients. The coefficient for the interaction term of Crisis and Positive enduring regime change is significant and negative, suggesting that democratic regime changes during the time of economic crises actually decrease the likelihood of growth takeoff episode starting in the next period. In the same time, introducing the interaction term has made the coefficient for positive enduring regime change positive and significant, increasing the marginal effect of change to 5.85 percentage points. Other coefficients in the model are not significantly changed.

The results suggest that crises significantly dampen the impact of democratic change on the likelihood of growth takeoffs. Why would the financial crisis play such a role during positive regime changes as opposed to negative regime changes, as suggested by the data? One of the likely explanations is that every political regime change brings

about uncertainty. Democratic regime changes, especially in the time of economic turmoil, may be perceived as brining about less stability than do autocratic regime changes.

In this respect it would be interesting to see whether during crisis times countries with more representative political institutions have greater chances of experiencing a rapid growth episode. I introduce another interaction term to the regression - crisis with 5-year polity average. The interaction term is significant and positive suggesting that in the time of economic crisis, higher polity score helps increase the probability of growth takeoffs. The results are summarized in Table 1.4, column 5 - a 3.6-point increase in the country's average polity score helps increase the probability of growth takeoff by about 1.5% in the post-crisis time.

1.4.3.2 Controlling for economic conditions in the rest of the world

The base model attempts to control for global economic conditions (such as exceptionally high or low value of global investment or trade at time t-1) by way of introducing year-specific world averages of the main economic variables. Another way of taking into account external economic conditions is by introducing variables that capture economic performance in the largest economies in the world. For example, recent research suggests that the country's capital flows as well as growth rates may be affected by interest rates in the US. In particular, higher interest rates in the US may lead to capital outflows from other countries[15].

[15] For example Calvo and Reinhart in their paper *Capital Flows to Latin America: Is There Evidence of Contagion Effects?* (1996) suggest that higher interest rates in the US are significantly associated with capital outflows from Latin America. Another paper by Giovanni and Shambaugh *The Impact of Foreign Interest Rates on the Economy: The Role of the Exchange Rate Regime* (2006) suggests that high large-country interest rates are associated with lower GDP growth in the other countries.

By the same argument, one might expect that a period of high growth in a large country would lead to capital inflow from the rest of the world and will be associated with a period of capital outflow from other countries.

Table 1.4, column 6 shows the marginal effects of the regression, which includes the variables for the rate of return and a lag of the 3-year average growth rate in the UK (before 1913) or the US (after 1913). United Kingdom and United States are dropped from the sample. The results suggest that the 3-year average growth rate in the large economy has a significant negative effect on the probability of a country experiencing a growth takeoff; yet, controlling for these external conditions does not alter the results of the base model significantly.

1.4.3.3 Threshold effects

The results presented so far give the idea of how political regime changes as well as level of development of political institutions influence the probability of growth takeoffs. Yet, one needs to test for the non-linearity in the regression coefficients; in particular since the impact of political regime change may differ for countries with different levels of democracy, GDP per capita, degrees of trade openness. The impact of trade openness and quality of political institutions on growth may also be different for different levels of these variables. To test these hypotheses I estimate the threshold regressions as shown in equation (1.3) and (1.4) of Section 1.3.

Table 1.5 provides the marginal effects of the threshold regression estimation. Table 1.6 panel a-d gives the estimated p-value for various thresholds. As can be seen from Table 1.6, one cannot reject the presence of at least two thresholds in the Volume of Trade

(VOT) variable. The sample is optimally split at 87th and 78th percentile of VOT. (This corresponds to VOT level of 0.79 and 0.63 as a share of GDP).

The effects on the probability of growth takeoffs (presented in column 3 of Table 1.5) are significantly different for different levels of trade openness. For a small increase in the volume of trade away from the mean, the impact on the probability of growth takeoff is largest when VOT as a share of GDP is between 0.63 and 0.79. (Nearly 1.66 times larger than when the VOT is above 79% of GDP level; and 1.45 larger than the effect of VOT below 63% of GDP). For example, the rising VOT is likely to have a stronger impact on the probability of growth takeoff in countries such as Belgium in early 1960s (VOT 0.67) than in countries such as Norway (VOT 0.82) or Canada (VOT 0.29) in the same period.

Another hypothesis I am interested in testing is whether countries that already have higher average polity score (hence, stronger political institutions from the start) benefit more from an increase in the quality of political institutions than do countries characterized by lower average polity score.

The results in Table 1.6-a support the presence of one threshold in the 5-year Polity average at 68th percentile or 9-point average Polity score level.

The coefficients in Table 1.5, column 2 suggest that above the 9-point level an increase in the 5-year average of polity score from 9.2 to the maximum of 10 points would increase the likelihood of growth takeoff by 0.78%. This would correspond to an increase from the polity score level of Portugal and Spain in 1983-84 to that of the UK or the US.

Finally, I test the hypothesis that political regime changes affect countries' growth prospects differently, depending on the level of per capita GDP. I estimate a threshold

model described by equation (1.3) Section 1.3, where the sample split variable, $Z_{i,t}$ is positive/negative regime change dummy, and the threshold variable, $q_{i,t}$ is log GDP per capita.

According to the result shown in Table 1.6-c, we cannot reject the hypothesis of one threshold at the 69th percentile of log GDP per capita (corresponding to $5,698.17 per capita income expressed in 1990 international dollars) for positive political regime change.

The results from a threshold regression (Table 1.5, column 1) indicate that a positive regime change (defined here as a 3 point increase in Polity score in less than 3 years) positively and significantly affects the chances of a growth takeoff, but only for countries above $5,698 per capita income (such as for example Chile in 1990s, Spain in 1983, Uruguay in 1989). Below this level of income, the estimated effect is negative but not statistically significant.

This result confirms the original hypothesis that a richer country might benefit democratic regime changes, while pro-democratic revolutions in poor countries may not have a beneficial impact on growth.

In the same time, level of per capita income does not seem to matter for the coefficient on negative regime changes.

1.4.3.4 Evaluating a growth takeoff probability forecasts

How well does the model developed in the chapter predict probability of growth takeoffs?

Figure 1.3 a-d plots the model's predicted probability that rapid growth=1 for select countries. The vertical bars are the actual realizations of rapid growth episodes. First, note

that predicted probabilities of growth takeoff realization are very low, rarely rising above 50%. This is not unusual for models predicting rare events[16].

The relative accuracy or "skill" of the model's forecast in this case is best evaluated by comparing it with "unconditional forecast" - i.e. the simple ratio of the number of rapid growth initiation years to the total number of observation years in the sample. The "unconditional forecast" probability that the country will experience a growth takeoff in any given year is therefore 234/2760 = 0.08478.

Does the model's forecast do better in predicting growth takeoffs relative to the unconditional forecast -and if so, how much better? Below I discuss several relevant forecast evaluation scores, closely following the methodology described in Lahiri and Wang (2006).

A common measure of forecast accuracy in economics is the mean squared error or the forecast, $MSE(p,x) = \frac{1}{NT}\sum_{I=1}^{N}\ \sum_{t=1}^{T}(p_{i,t} - x_{i,t})^2$, where $p_{i,t}$ is the model's predicted probability, and $x_{i,t}$ is the 0-1 realization indicator of the rapid growth event for country i at time t. MSE ranges from 0 to 1, with 0 corresponding to a perfect forecast. Yet, the relative forecast performance is better measured with the 0-1 Skill Score

$$SS = 1 - \frac{MSE(p,x)}{MSE(\mu,x)},$$

Where μ is the "unconditional forecast", a constant probability of the event. The Skill Score compares the MSE of the model with the MSE generated by the "unconditional forecast" probability - the higher *SS*, the higher is the "value added" of the model's forecast.

[16] See detailed discussion in Lahiri and Wang (2006)

SS can be interpreted as the percent improvement of the model's forecast relative the "unconditional forecast".

It is evident from Table 1.7 that the Skill Score of the model is very modest, only 5.45% improvement in forecast relative to the unconditional forecast. This is not an unexpected result[17]. To understand the reason we need to look at how well the model predicts takeoff initiation times versus "tranquil" times. The skill scores in Table 1.7 suggest that the model improves the forecast of takeoff times by nearly 10%, but worsens the forecast of non-growth times by almost 37%. The constant probability "unconditional forecast" is obviously assigning a very high probability to non-growth episodes and does better in predicting zeros than the model's forecast.

These results, however, do not mean that the model's forecast cannot be useful. One way of presenting predicted probability forecasts is by converting probabilities to odds ratios. The Odds ratio is essentially the ratio of Forecast odds (the odds in favor of the event, as determined by the model) to Unconditional rate odds (the odds in favor of the event as determined by the unconditional forecast). For example, the Unconditional rate odds, UO in this case = 0.08478/(1-0.08478) = 0.0926335. If the Forecast odds, FO in a particular year = 0.18/(1-0.18) = 0.2195. The Odds ratio = FO/UO = 2.369. This means that the odds in favor of the event as predicted by the forecast are nearly 2.4 times greater than the odds generated by the simple constant rate prediction. (See Figure 1.4 panel a-d for an illustration).

[17] HPR study points out that despite significant correlations with political regime change variables, growth takeoffs are very difficult to predict.

If the odds ratio is high, it is a signal that the rare event in question is very likely. A forecasting rule may be designed in such case. For example, if the odds ratio rises above a certain threshold (say, FO/UO =2) we predict that the growth takeoff will be initiated. Below this threshold, we predict a “tranquil” year. The performance of various forecasting rules can be compared using “skill scores”, which evaluate the number of hits and misses, correct predictions and false alarms generated by the rule. Let's define:

X - number of “hits” - predictions of a growth takeoff at time t, when the actual realization = 1

Y - number of “misses” - prediction of no-growth at time t, when the actual realization = 1

Z - number of “false alarms”- predictions of growth takeoff at time t, when actual realization =0

W - number of “correct zero predictions” - prediction of tranquil year in time t, when the actual realization = 0

The forecast skill measures, the Kuiper Skill score (KSS), the Heidke Skill score (HSS), and the Odds Ratio Skill score (ORSS) are then defined as follows:

KSS = (X*W - Y*Z)/[X+Y)×(Z+W)]- this measure ranges from a -1 to +1, with +1 corresponding to ``perfect skill" of the forecast

HSS = 2*(X*W -Y*Z)/[(X+Y)×(Y+W)+(X+Z)×(Z+W)] - this is a -1 to +1 measure with a similar interpretation. HSS, however, values correct prediction of ones more than the correct predictions of zeros, as compared to the KSS. Both KSS and HSS are commonly used in evaluating rare events, for example in meteorological forecasts.

ORSS = (θ-1)/(θ+1), where θ = (X*W)/(Y*Z) - also a -1 to +1 skill ratio with +1 corresponding to “perfect skill” of the forecast.

The Odds Ratio Skill can be tested to determine whether the skill of the model's forecast significantly outperforms the unconditional forecast of the event.

Lahiri and Wang (2006) suggest the following test: log (Odds ratio) = (log(X) + log(W)) - (log(Z) + log(Y)) is approximately normally distributed with standard error $\frac{1}{\sqrt{n}}$, where n = 1/X + 1/Z + 1/Y + 1/W. If the log odds ratio is more than 1.96 standard errors away from zero, this would indicate that the skill score is statistically significant on a 5% level. Hence, it is unlikely that the difference between the model's forecast and the unconditional forecast is due to chance.

Table 1.8 presents the result of all three skill scores associated with different thresholds and several definitions of “hits” and “misses”

The skill scores indicate that forecast rules based on the probabilities given by the model generate significantly better predictions than the constant probability forecast alone.

1.5. Conclusion

In this chapter I ask whether political regime changes and the overall quality of political institutions are associated the turning points in a country's economic history. I estimate a random effects probit model based on the sample of 54 countries from 1834-2003. The findings indicate that political regime changes as well the quality of political institutions help predict growth takeoffs. In particular, both democratic and autocratic enduring regime changes, as well as the initial level of democratization significantly

increase the probability that a country will enter a period of sustained and rapid growth. In addition, I find that trade openness, and the initial income per capita level increase the probability of a growth takeoff initiation. In the same time, an increase in government expenditure as a share of GDP and infant mortality rate (a proxy for educational attainment of the labor force), reduce this probability.

Further, I present evidence in favor of the "threshold effects" in growth. In particular, I find that countries with income per capita below a certain threshold level, do not benefit from democratic regime changes to the same extent as their richer counterparts. The effects of trade openness and the quality of political institutions are also non-linear. In particular, international trade benefits growth the most in the countries which fall in the mid-range of trade openness. In the same time, the increase in the level of democratization helps mostly the countries with already well developed democratic institutions. In addition, I use several alternative forecast skill indicators to assess how well the model developed in the chapter can predict growth takeoffs. I conclude that the model does significantly better in predicting the occurrence of rare events, such as the turning points in a country's economic history, than the baseline constant probability forecast.

This work opens the avenues for future research into the nature of growth-political institutions nexus. In particular, what are the possible sources of threshold effects in growth? Do threshold effects play a role in determining the duration of growth takeoff episodes? Does the country's "political neighborhood" have an effect on the probability of a growth takeoff initiation? These and other questions remain open to future investigation.

Chapter 1 Appendix:

Data Sources:

1. All GDP per capita data comes from Angus Maddison *Historical Statistics for the World Economy 1-2003 AD* available at: http://www.ggdc.net/maddison/

2. B.R. Mitchell *International Historical Statistics Europe 1750-1993* and B.R. Mitchell *International Historical Statistics Africa, Asia & Oceania 1750-1993* - sources for European and Asian countries data on:

GDP at current prices data until 1948-50

Gross capital formation until 1948-50

Total Central Government Expenditure until 1948-50

Exports, Imports until 1948 -50

Wholesale prices index until 1948-50

3. B.R. Mitchell *International Historical Statistics the Americas 1750-1993* - source for the US (until 1948) and Brazil (until 1900) data on:

GDP at current prices; gross capital formation; total central government expenditure; exports; imports; wholesale price index.\\

Infant mortality rate - US, Latin American countries until 1993

4. Oxford Latin American Economic History Database - source for Latin American countries data 1900-2000 on:

GDP at current prices; gross domestic fixed investment; central government expenditure; exports; imports; implicit GDP deflator. Data available at: http://oxlad.qeh.ox.ac.uk/index.php

5. International Financial Statistics (IFS) - all countries after 1948-1950 data on:

GDP at current prices; gross fixed capital formation, government expenditure, exports, imports, GDP deflator.

6. World Development Indicators (WDI) - all countries data on infant mortality rates after 1993 (and for earlier dates if missing from Mitchell)

7. OECD (2004), HEALTH DATA 2004, 1st edition: http://www.oecd.org/health/healthdata - Supplementary data source for OECD countries infant mortality rates from 1960 (if missing from Mitchell).

8. Other supplementary data sources for select countries:

Netherlands: National Accounts of the Netherlands 1800-1913 available at: http://nationalaccounts.niwi.knaw.nl/start.htm - source for 1820-1913 data on: GDP at current prices, investment, imports, exports, public expenditure, GDP deflator

Norway: Norges Bank Historical Data: source for 1830-2001 data on: GDP at current prices, gross investment, \\imports, exports, government consumption, GDP deflator.

Spain: Prados de la Escosura, L. (2003). \textit{El progreso economico de Espana, 1850-2000}. Madrid: Fundacion BBVA - source for 1850-1959 data on GDP at current prices, Investment, Imports, Exports, Government Expenditure, GDP deflator.

Portugal: Nunes, Mata and Valerio "Portuguese Economic Growth 1833-1985"', *Journal or European Economic History* XVIII/2 (1989) - source for 1833-1950 data on exports, imports, GDP at current prices, GDP deflator, public expenditure.

9. Sources of data on currency, banking and debt crises:

Kindelberger, Charles *Manias, Panics and Crashes: A History of Financial Crises* (1996) John Wiley & Sons, Inc.

Suter, Christian *Debt Cycles in the World-Economy* (1992) Westview Press

Eichengreen, Barry and Michael Bordo "Crises Now and Then: What Lessons from the Last Era of Financial Globalization?" NBER Working Paper No.8716, (Jan. 2002)

Graciela L. Kaminsky, Carmen M. Reinhart "The Twin Crises: The Causes of Banking and Balance-Of-Payments Problems" *American Economic Review*, Vol. 89, No. 3 (Jun., 1999), pp. 473-500

10. Marshall, Monty G. and Keith Jaggers. *Polity IV Dataset (Computer File; Version p4v2001)*. College Park, MD: Center for International Development and Conflict Management, University of Maryland, 2002 - source of political regime change data and democracy (polity) indicators. All countries 1820-2001 available at: http://www.cidcm.umd.edu/inscr/polity

11. Data on country's involvement in war – from Correlates of War database accessible at http://www.correlatesofwar.org/

Data Coverage:

There are overall 61 countries in the dataset. Since some European countries leave the sample as others enter, there are at most 57 countries in the sample in any given year. In addition, because of data availability the working sample for the base model is reduced to 54 countries.

Western/Northern Europe: United Kingdom, Ireland, Netherlands, Belgium, France, Switzerland, Spain, Portugal, Prussia, Germany, Austria, Italy, Finland, Sweden, Norway, Denmark.

Eastern Europe/Central Asia: Poland, Hungary, Czechoslovakia, Czech Republic, Slovakia, Albania, Macedonia, Croatia, Yugoslavia, Serbia-Montenegro, Bosnia, Slovenia,

Greece, Bulgaria, Moldova, Romania, USSR, Russia, Estonia, Latvia, Lithuania, Ukraine, Belarus, Armenia, Georgia, Azerbaijan, Turkey.

Asia/Oceania: Japan, Thailand, Malaysia, Singapore, Philippines, Indonesia, Australia, New Zealand.

The Americas: United States, Canada, Mexico, Colombia, Venezuela, Peru, Brazil, Chile, Argentina, Uruguay.

Table 1.1: Expansion of the sample: years in which GDP per capita data become available

Year	Number of countries in the sample	Countries
1820	4	Netherlands, France, Sweden, Denmark
1830	5	United Kingdom
1846	6	Belgium
1850	9	Switzerland, Spain, Prussia
1860	11	Italy, Finland
1865	13	Norway, Portugal
1868		Germany
1870	20	Austria, New Zealand, Canada, United States, Brazil, Uruguay, Japan
1900	26	Argentina, Chile, Colombia, Mexico, Peru, Venezuela
1901	27	Australia
1920	29	Czechoslovakia, Yugoslavia
1921	31	Ireland, Greece
1923	32	Turkey
1924	34	Bulgaria, Hungary
1926	35	Romania
1928	36	USSR
1935	37	Philippines
1929	38	Poland
1945	39	Indonesia
1950	41	Albania, Thailand
1957	42	Malaysia
1959	43	Singapore
1990	55	Serbia-Montenegro, Slovenia, Macedonia, Croatia, Bosnia, Czech Republic, Slovakia, Armenia, Azerbaijan, Belarus, Moldova, Ukraine, Estonia, Latvia, Lithuania, Russia, Georgia

Figure 1.1 Three Waves of Democratization

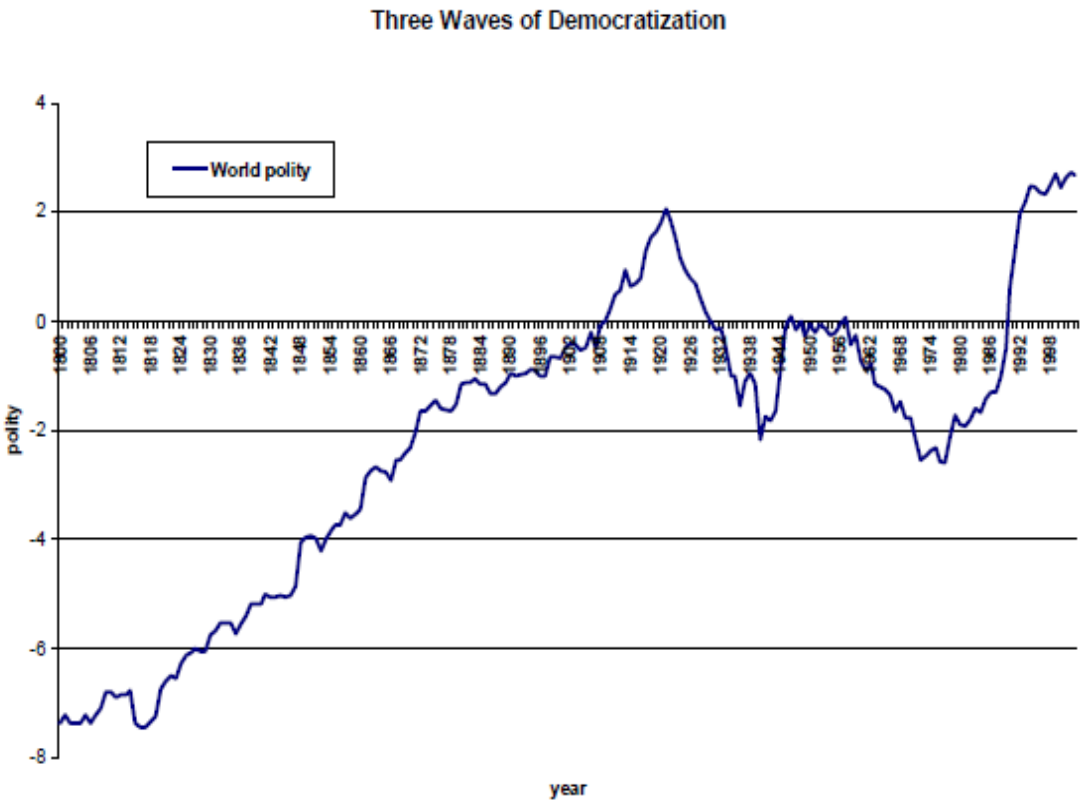
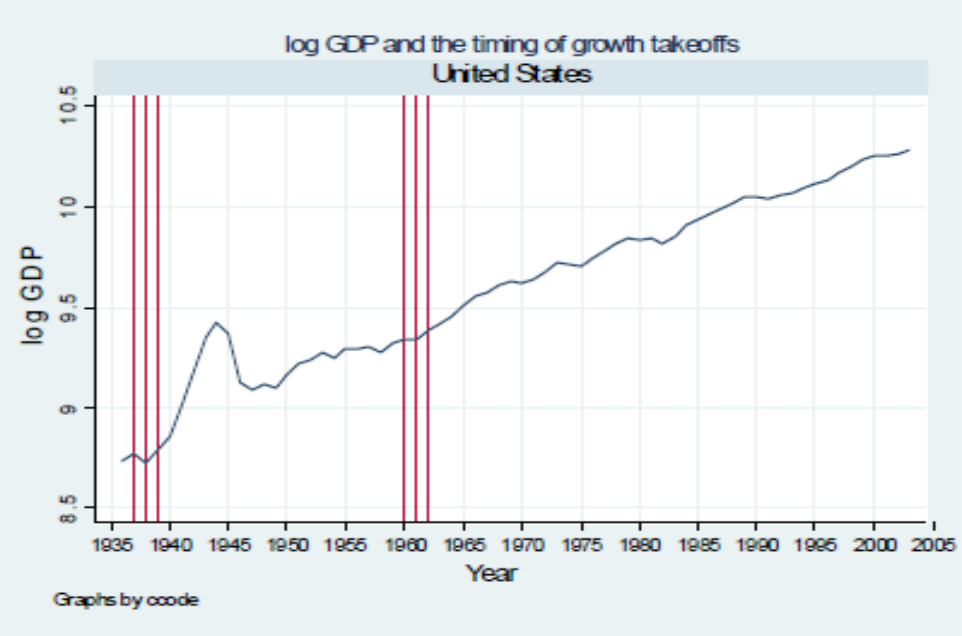
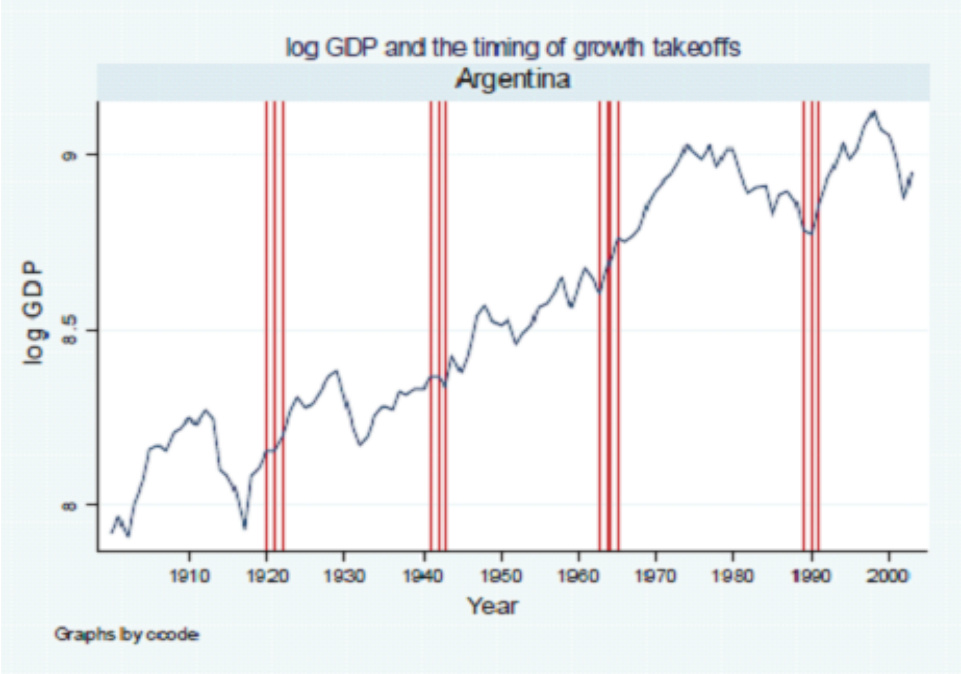


Figure 1.2: Takeoff episodes

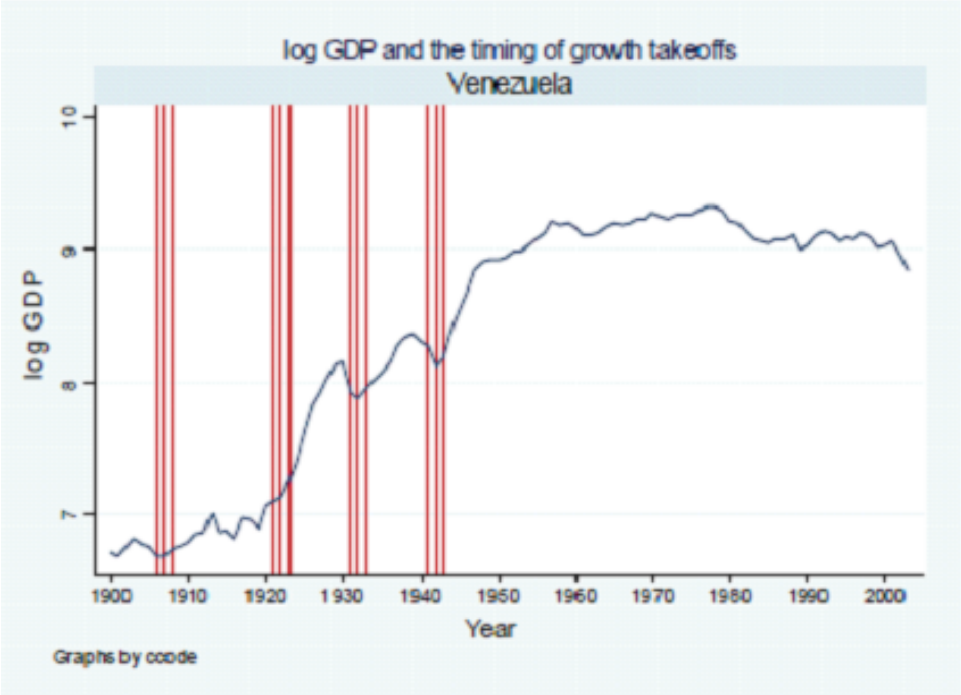
Panel (a)



Panel (b)



Panel (c)



Panel (d)

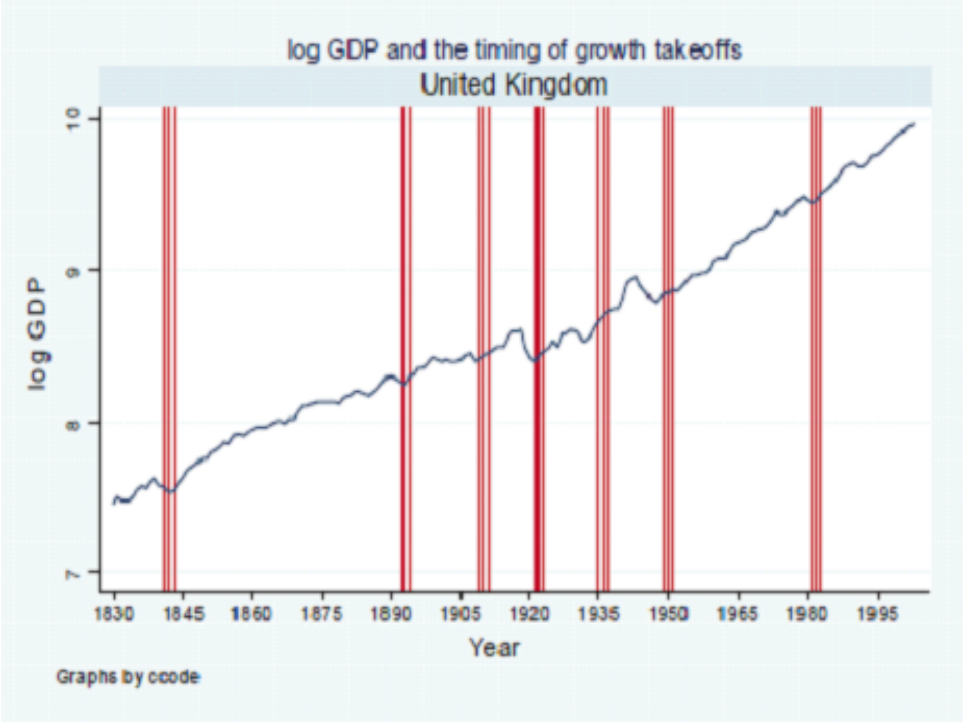
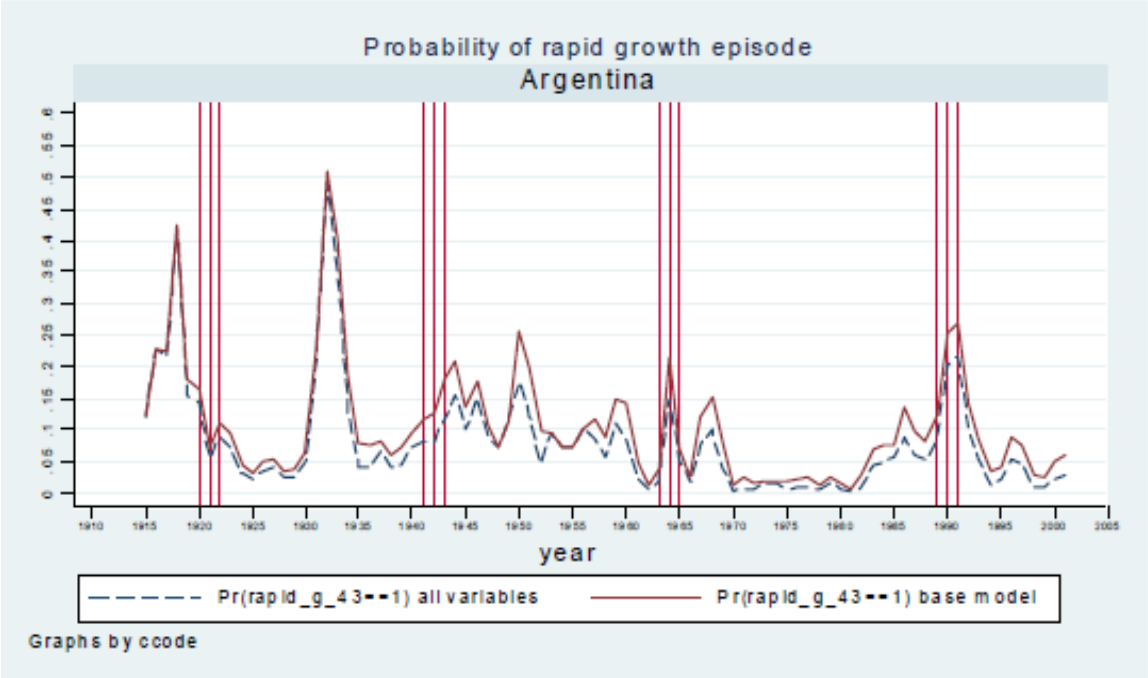


Figure 1.3: Probability of takeoffs

Panel (a)



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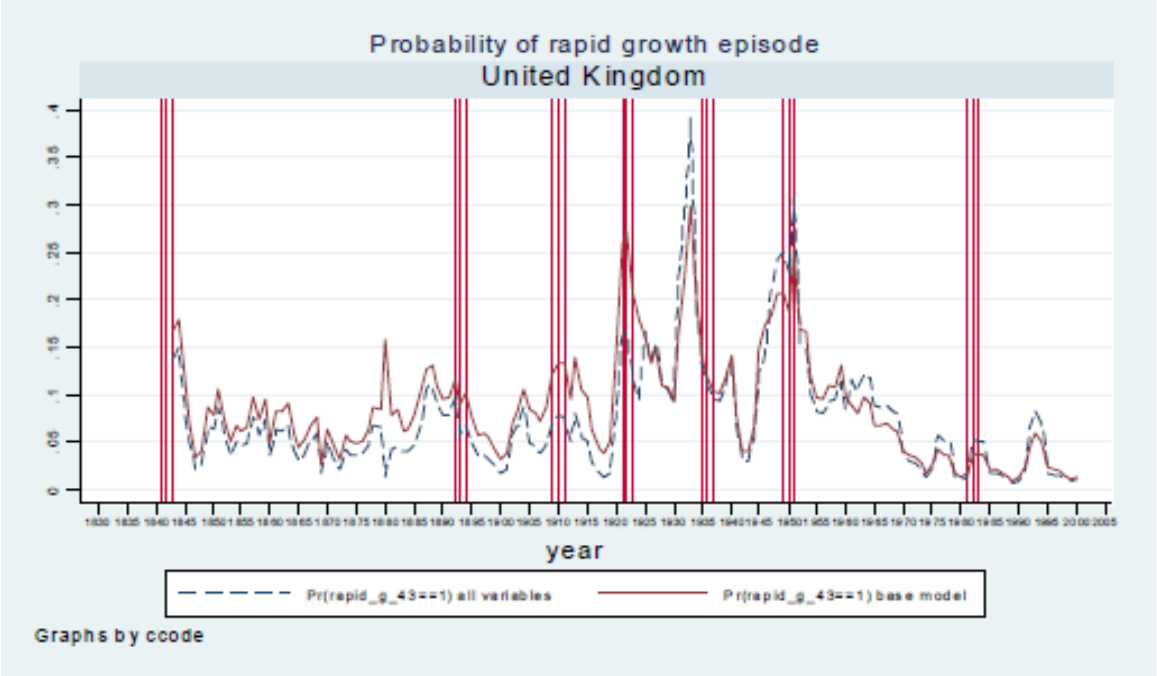

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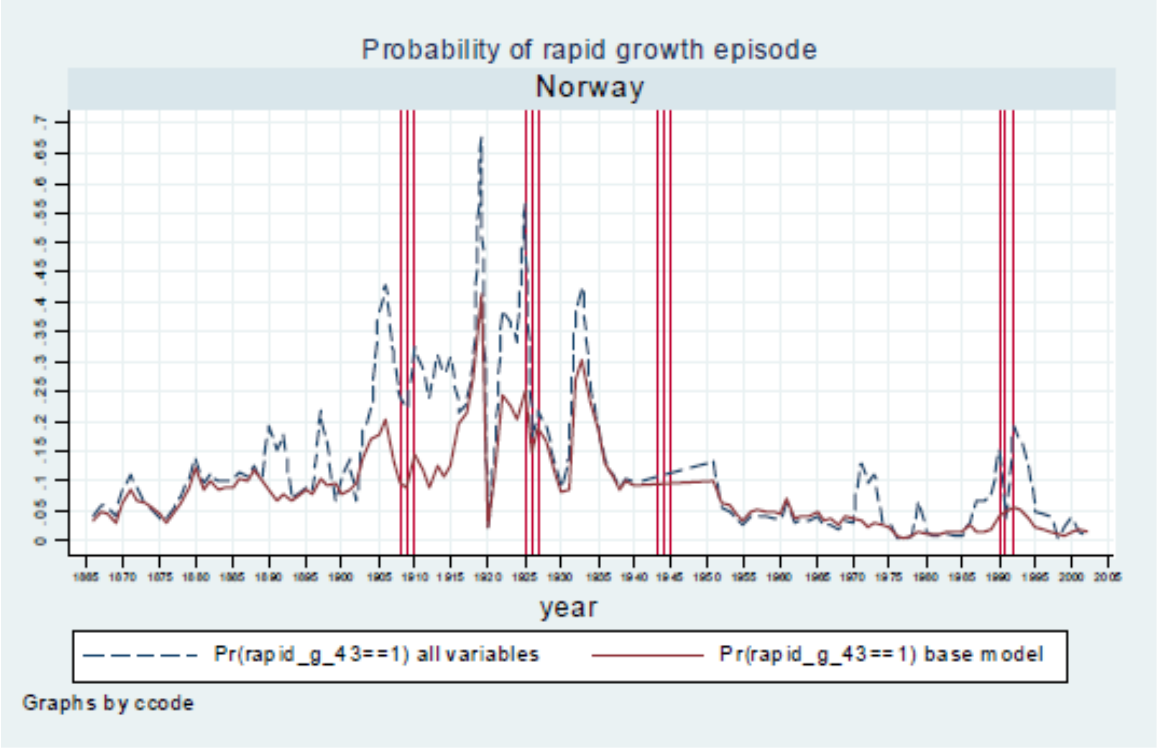


Panel (d)

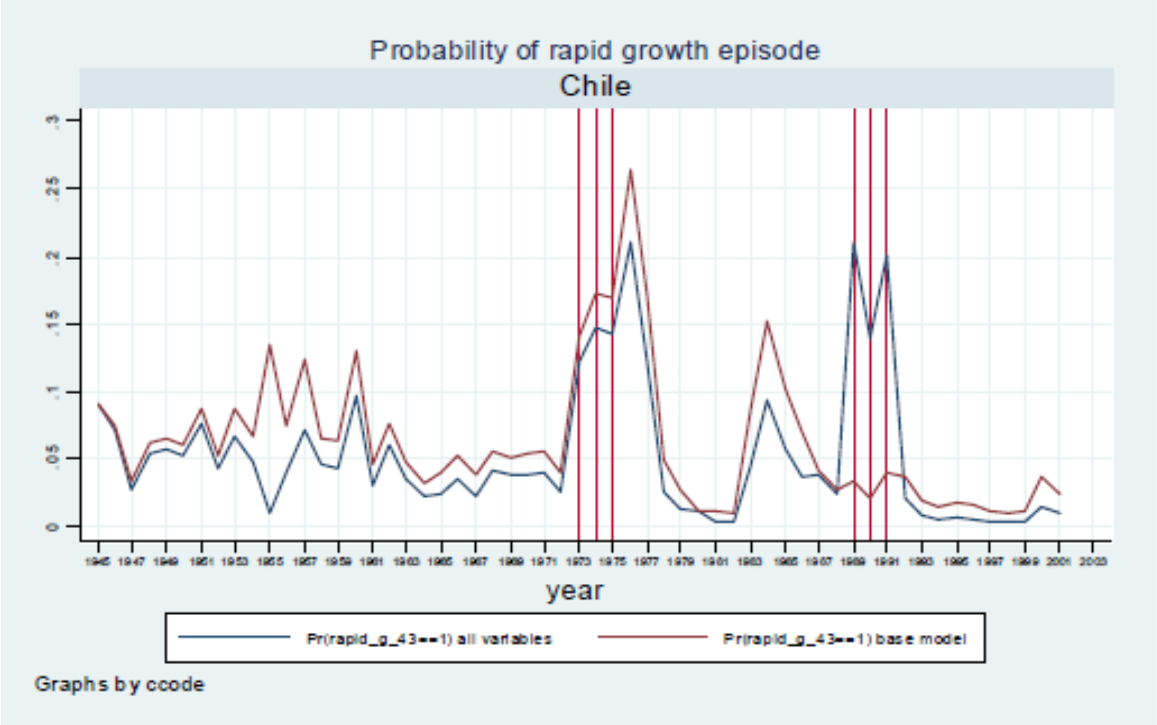
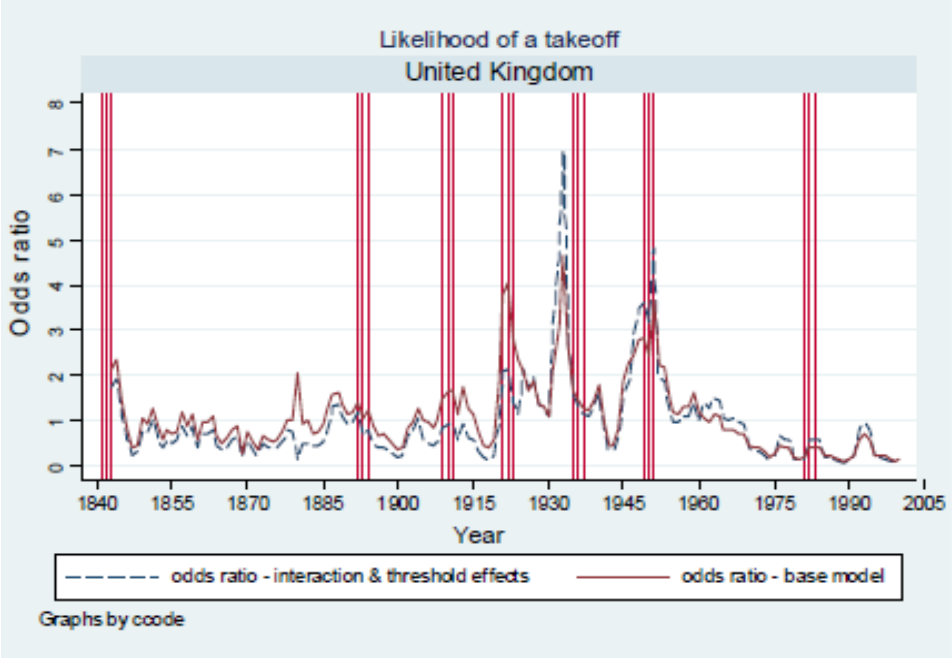
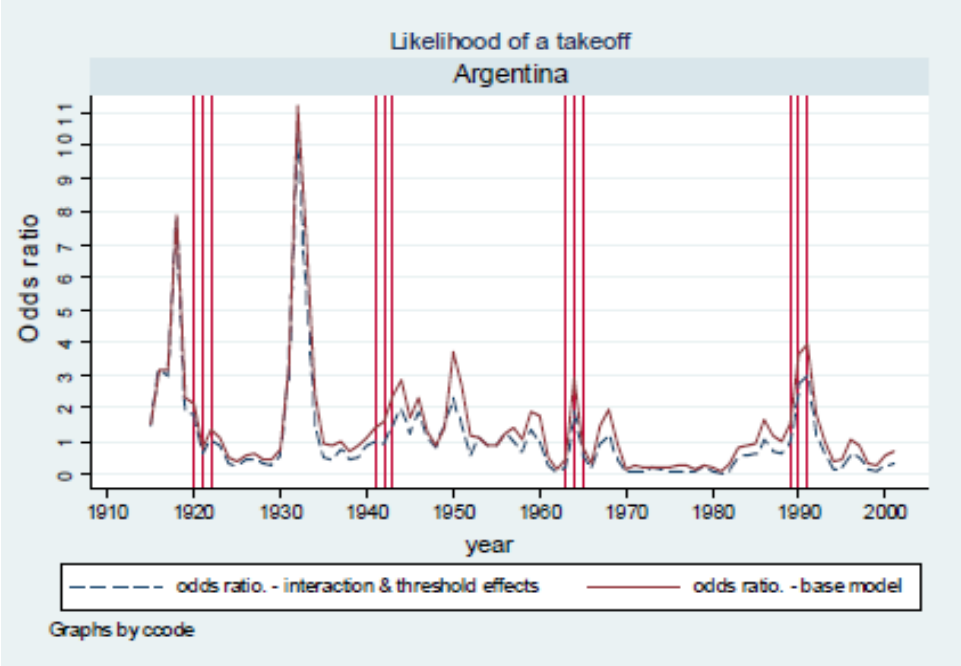


Figure 1.4: Odds Ratio: Likelihood of a takeoff

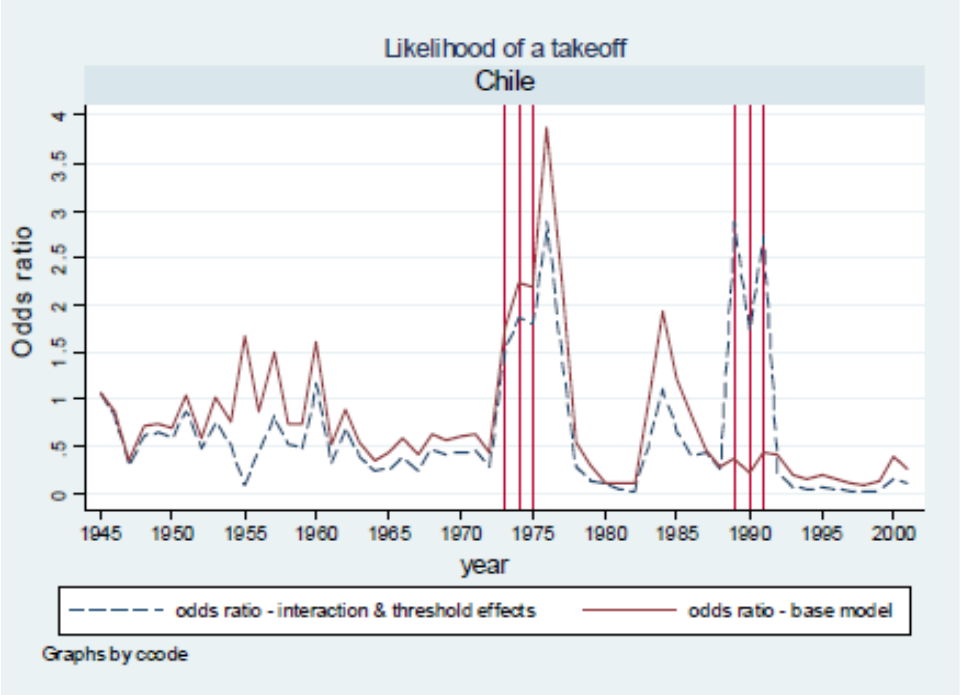
Panel (a)



Panel (b)



Panel (c)



Panel (d)

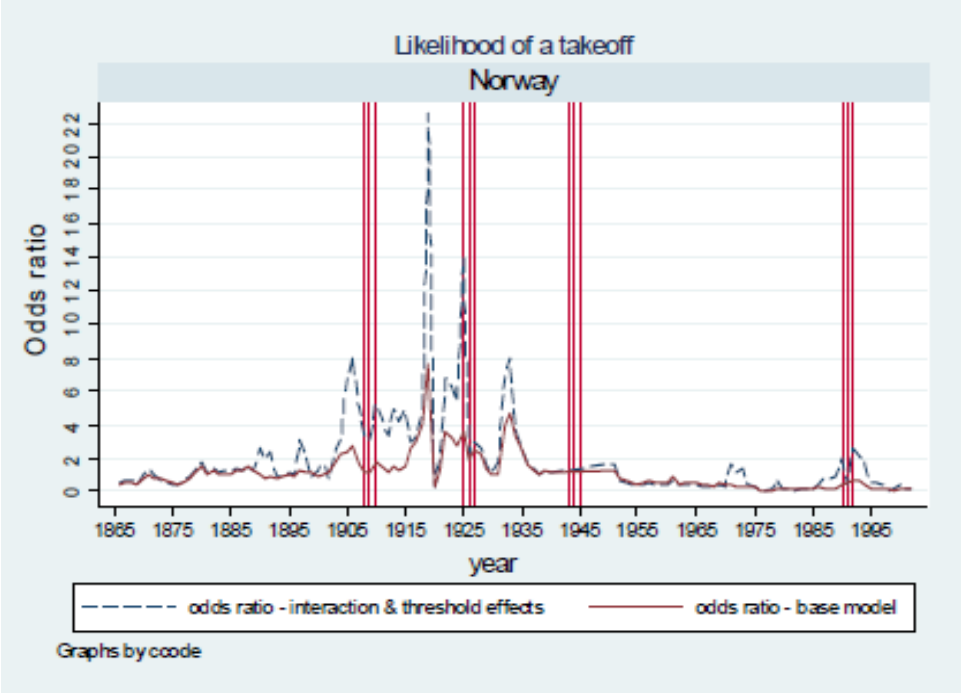
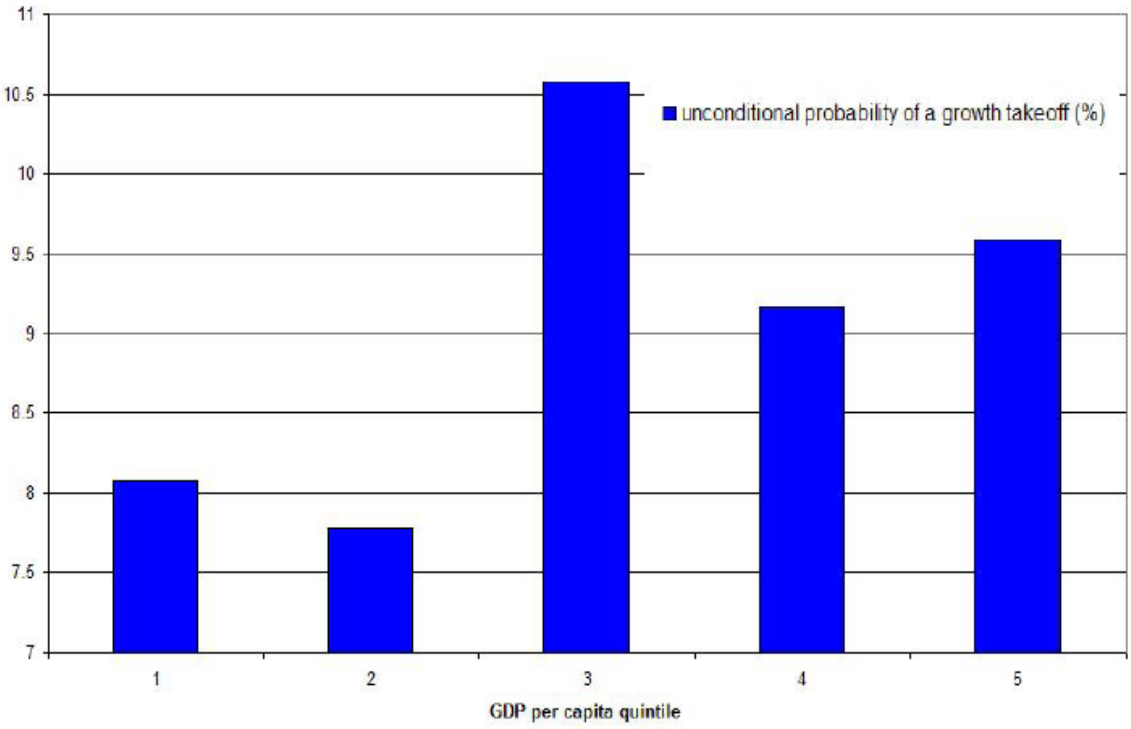


Figure 1.5: Unconditional probability of a growth takeoff



Unconditional probability of a growth takeoff calculated as the number of takeoff initiation years divided by the number of total country-year observations - averaged over the countries in each income quintile. Income quintiles are based on the average GDP per capita levels of income in the last 10 years of the sample(1993-2003). The sample is restricted to countries with at least 20 years of country-year observations.

Table 1.2 Rapid growth episodes: Historical definition

Country	year	growth before[1]	growth after[2]	Country	year	growth before	growth after
The Americas							
US	1877	0.0070	0.0402	Uruguay	1881	-0.0130	0.0385
	1896	0.0040	0.0380		1905**	0.0200	0.0488
	1922	0.0115	0.0249		1923	0.0243	0.0423
	1938	0.0329	0.1178		1943	-0.0054	0.0469
	1961	0.0111	0.0396		1973*	0.0060	0.0388
					1988**	0.0039	0.0258
Canada	1877	-0.0007	0.0446				
	1896	0.0016	0.0567	**Europe West**			
	1921	-0.0263	0.0576	UK	1842**	-0.0006	0.0348
	1937	-0.0006	0.0894		1893	0.0080	0.0241
	1949	-0.0034	0.0252		1910	0.0038	0.0256
	1962	0.0124	0.0365		1922	-0.0296	0.0238
	1996	0.0038	0.0279		1936	0.0150	0.0413
					1950	-0.0146	0.0228
Mexico	1936*[3]	0.0016	0.0229		1982	0.0124	0.0359
Colombia	1923	0.0006	0.0315	Ireland	1946	-0.0007	0.0308
	1933**[4]	0.0159	0.0325		1958	0.0135	0.0401
	1943	0.0055	0.0259		1994	0.0431	0.0840
	1967	0.0156	0.0390				
				Netherlands	1845**	-0.0029	0.0136
Venezuela	1907*	-0.0031	0.0369		1860	-0.0013	0.0187
	1922**	0.0393	0.1633		1879	0.0056	0.0259
	1932	0.0349	0.0775		1896	-0.0077	0.0114
	1942**	0.0135	0.1384		1921	0.0163	0.0382
					1944	-0.0841	0.1357
Peru	1922*	0.0222	0.0473		1984	0.0034	0.0236
	1931**	0.0088	0.0483				
	1948	0.0186	0.0378	Belgium	1918	-0.0421	0.0674
	1959	0.0133	0.0448		1943	-0.0364	0.0488
					1959	0.0220	0.0423
Brazil	1905	0.0025	0.0162				

Table 1.2 Rapid growth episodes: Historical definition (continued)

Country	year	growth before[1]	growth after[2]	Country	year	growth before	growth after
	1916	0.0027	0.0406	France	1853*	0.0076	0.0262
	1931	0.0061	0.0379		1887	0.0046	0.0225
	1945	0.0153	0.0312		1906	0.0018	0.0239
	1955	0.0250	0.0442		1918	-0.0348	0.0801
	1967*	0.0088	0.0715		1932	-0.0006	0.0222
					1944	-0.0927	0.1291
Chile	1922	-0.0145	0.0337				
	1974*	0.0002	0.0403	Switzerland	1883	-0.0004	0.0325
	1990**	0.0437	0.0663		1892	0.0133	0.0275
Argentina	1921	0.0125	0.026		1918	-0.0197	0.0486
	1942	0.0131	0.0323		1943	0.0003	0.0650
	1964	0.0077	0.0328				
	1990	-0.0177	0.0400	Spain	1870	-0.0116	0.0365
					1896	-0.0013	0.0251
Europe West					1920	0.0057	0.0230
Portugal	1880	-0.0033	0.0236		1950	-0.0016	0.0454
	1894	-0.0039	0.0271		1960	0.0288	0.0812
	1918**	-0.0093	0.0381		1984**	0.0105	0.0405
	1942	0.0072	0.0273		1996	0.0150	0.0388
	1959	0.0352	0.0597				
	1984	0.0198	0.0524	Finland	1868	0.0030	0.0231
					1892	0.0097	0.0386
Germany	1923**	0.0038	0.0524		1918**	-0.0471	0.0712
	1932	-0.0032	0.0700		1931*	0.0260	0.0541
	1951	-0.0097	0.0711		1948**	0.0205	0.0381
					1958	0.0301	0.0478
Austria	1922**	0.0033	0.0406		1967	0.0352	0.0561
	1934	-0.0408	0.0657		1993	-0.0026	0.0416
	1950	-0.0034	0.0664				
				Sweden	1842	-0.0047	0.0143
Italy	1881	-0.0011	0.0157		1853	-0.0004	0.0264
	1902**	0.0259	0.0432		1867	0.0017	0.0450
	1911	0.0387	0.0540		1891	0.0120	0.0246

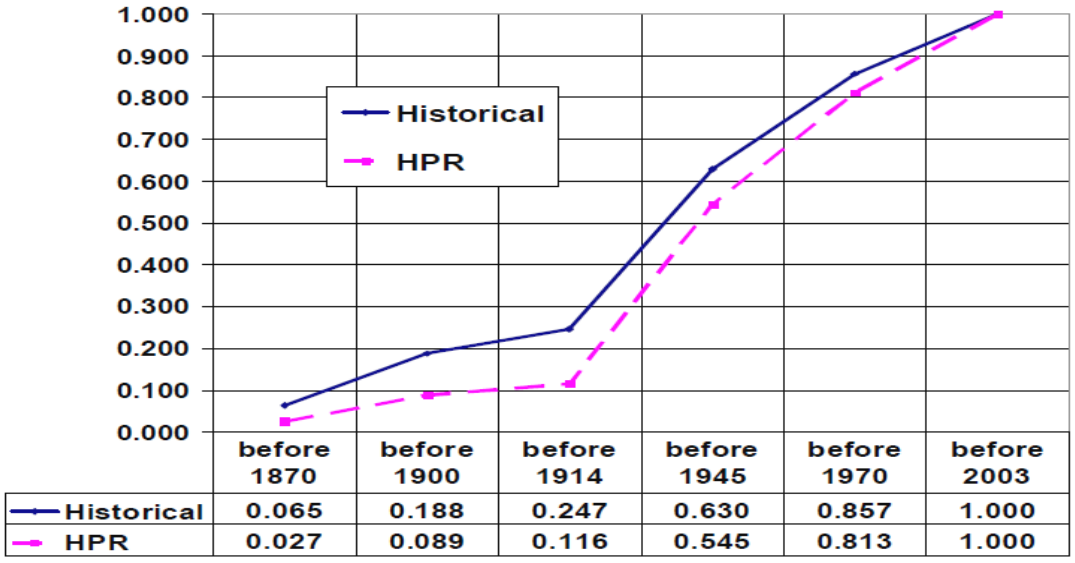
Table 1.2 Rapid growth episodes: Historical definition (continued)

Country	year	growth before[1]	growth after[2]	Country	year	growth before	growth after
	1933*	-0.0007	0.0303		1923**	0.0118	0.0395
	1945	-0.0695	0.0965		1932	0.0219	0.0479
					1958	0.0249	0.0446
Denmark	1842	0.0048	0.0214		1996	0.0015	0.0284
	1921	-0.0035	0.0255				
	1941	-0.0151	0.0447	Norway	1909	0.0175	0.0317
	1958	0.0219	0.0421		1926	0.0155	0.0293
					1944	-0.0234	0.0661
Europe East					1991	0.0163	0.0375
Poland	1992	-0.0286	0.0558				
				Asia & Oceania			
Hungary	1948	-0.0517	0.0446	Japan	1888	0.0176	0.0304
	1956	0.0329	0.0495		1914	0.0058	0.0433
	1996**	-0.0203	0.0455		1934	0.0122	0.0545
					1951	0.0118	0.0629
Czechoslovakia	1934	-0.0238	0.0587		1960	0.0678	0.0839
	1953	0.0287	0.0543				
				Thailand	1961*	0.0274	0.0502
Yugoslavia	1932*	-0.0021	0.0335		1986	0.0355	0.0885
	1943	0.0388	0.0591				
	1957	0.0360	0.0563	Malaysia	1972*	0.0353	0.0564
					1987	0.0187	0.0689
Greece	1931*	0.0090	0.0319				
	1963	0.0475	0.0680	Singapore	1966*	0.0350	0.1118
Bulgaria	1945	-0.0422	0.0924	Indonesia	1967	-0.0147	0.0766
	1956	0.0357	0.0707		1988	0.0212	0.0606
Romania	1960	0.0369	0.0597	Australia	1918	-0.0145	0.0277
					1931	-0.0298	0.0451
USSR	1942	0.0303	0.1128				
				New Zealand	1899	0.0128	0.0316
Albania	1996*	-0.0105	0.0577		1932	-0.0197	0.0668

Table 1.3.1 Summary of growth acceleration episodes
HPR method and Historical method compared

	HPR Method		*Historical method*	
	Overlapping episodes (% of the total to date)	Total number of episodes	Overlapping episodes (% of the total to date)	Total number of episodes
Before 1914	**0.8461**	**13**	**0.2895**	**38**
Before 1945	**0.7541**	**61**	**0.4742**	**97**
Before 1970	**0.7473**	**91**	**0.5152**	**132**
Before 2003	**0.75**	**112**	**0.5455**	**154**

Table 1.3.2 Cumulative distribution over time of growth acceleration episodes identified under the HPR and the Historical methods [5]



	before 1870	before 1900	before 1914	before 1945	before 1970	before 2003
Historical	0.065	0.188	0.247	0.630	0.857	1.000
HPR	0.027	0.089	0.116	0.545	0.813	1.000

[1] Average 8-year growth rate before the initiation of a takeoff

[2] Average 8-year growth rate after the initiation of a the takeoff

[3] *growth episode occurred within 5 years after a negative enduring regime change

[4] **growth episode occurred within 5 years after a positive enduring regime change

[5] Ratio of the number of episodes to date divided by the total number of episodes identified by the given method

Table 1.3.3 Summary of rapid growth episodes by region and time period, % of the total number of episodes.

	Asia	Europe West	Europe East	Latin America	Western Offshoots[6]	Total %	Total episodes
before 1870	0	6.49	0	0	0	6.49	10
1871-1900	0.65	7.79	0	0.65	3.25	12.34	19
1901-1950	1.3	24.68	4.55	13.64	5.19	49.35	76
1951-2002	5.84	11.69	5.84	6.49	1.95	31.82	49
Total %	7.79	50.65	10.39	20.78	10.39	100	
Total #	12	78	16	32	16		154

Table 1.3.4 Average growth for countries in the top 50th income percentile[7]

Average Growth	Year (t)
.0071529	1840
.0153623	1860
0128864	1880
.0122852	1899
.0122781	1920
.0133317	1940
.0148869	1960
.0202957	1980
.0201626	1996

[6] United States, Canada, Australia and New Zealand

[7] The measure of average growth listed in the table should be interpreted as follows: The average growth rate of the richest 50 percent of countries in the sample prior to 1840 is 0.7153%. This growth rate becomes a benchmark growth rate - poorer countries must grow at least at the rate of 0.7153% to be able to catch up with richest countries in the sample. This measure is updated in 1841, when the benchmark growth rate for all countries becomes the average growth rate of the richest 50 percent prior to 1860 and so on. The measure is constructed by analogy with the principle used in the HPR analysis.

Table 1.3.5 Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Growth rate	4673	0.0198	0.0264	-0.1471	0.2053
Volume of Trade	4043	0.4682	0.3935	0.0116	3.6988
Government Expenditure	3751	0.1880	0.1352	0.0002	1.1382
Investment	3842	0.1859	0.0732	-0.0542	0.5288
Infant mortality rate	4336	0.0769	0.0655	0.0022	0.3920
log GDP	5078	8.2613	0.8268	6.4317	10.2763
VOT 3-year average	3882	0.4628	0.3854	0.0163	3.5234
Investment 3 year average	3695	0.1861	0.0713	-0.0382	0.4758
Government Expenditure 3 year average	3586	0.1850	0.1302	0.0127	0.9920
log GDP 4 year average	4870	8.2610	0.8152	6.5232	10.2604
Infant mortality 4 year average	4098	0.0765	0.0641	0.0027	0.3145
Polity 5 year average	4758	2.6407	6.9863	-10	10
log $GDP_{\overline{t}}$	5147	8.2594	0.5771	7.1746	9.1709
$VOT_{\overline{t}}$	5147	0.4488	0.1731	0.1716	0.9596
Infant $Mortality_{\overline{t}}$	5147	0.0831	0.0557	0.0076	0.2090
Government $Expenditure_{\overline{t}}$	5147	0.1811	0.0720	0.0713	0.2989
$Investment_{\overline{t}}$	5147	0.1758	0.0494	0.0715	0.2540
$Polity_{\overline{t}}$	5147	2.6855	2.7417	-7	7.9286

Table 1.4 Results (continued on the next page)

Dependent Variable: Year of a takeoff episode initiation: 0-1 binary variable

	Base Model (1-3)			*Base Model With Interaction Terms* (4-6)		
Variables	Coefficients	Marginal Effects	Marginal effects 1sd[8]	Marginal effects 1sd	Marginal effects 1sd	Marginal effects 1sd
	[1]	[2]	[3]	[4]	[5]	[6]
Positive regime change$_{t-1}$	0.1574	1.6261	2.3834	5.8531 †	6.2039 †	7.2273*
	0.1752					
Negative regime change$_{t-1}$	0.4295*	4.4375*	6.6504*	7.1988 †	7.6120	6.9713 †
	0.1928					
Polity$_{t-1,\ 5\text{-year average}}$	0.0250**	0.0054**	1.4330**	1.9970**	2.1146 †	2.3082**
	0.0091					
Control Variables						
Crisis$_{t-1}$	0.1926*	1.9893*	2.3209*	2.8648*	3.0620	1.7484
	0.0913					
Trade openness$_{t-1}$	1.3776*	0.1423*	8.6521*	9.2400*	9.6986*	9.5665 †
	0.7017					
Trade openness$_{t-2}$	-0.2421	-0.0250	-0.9082	-0.9595	-1.0213	-0.2703
	0.8317					
Trade openness$_{t-3,\ 3\text{-year average}}$	-0.8811	-0.0910	-2.6217	-2.7020	-2.8877	-3.0122
	0.6673					
Investment$_{t-1}$	-5.7614**	-0.5952**	-2.9718**	-2.9394**	-3.1434**	-3.2584**
	1.9132					
Investment$_{t-2}$	1.9432	0.2008	1.5792	1.4575	1.5447	1.6127
	2.0406					
Investment$_{t-3,\ 3\text{-year average}}$	-0.4907	-0.0507	-0.3406	-0.2853	-0.3032	0.3976
	1.4753					
Government Expenditure$_{t-3,\ 3\text{-year average}}$	-1.5170**	-0.1567**	-1.5609**	-1.6145**	-1.7208**	-1.7194*
	0.5740					
log GDP$_{t-1}$	-3.1432***	-0.3247***	-5.0084***	-4.9241***	-5.3131***	-5.0741***
	0.6673					
log GDP$_{t-2,\ 4\text{-year average}}$	2.6963***	0.2786***	61.3875***	61.7271***	62.6743***	46.8658**
	0.6327					

Table 1.4 Results (continued)

	Base Model (1-3)			*Base Model With Interaction Terms* (4-6)		
Variables	Coefficients	Marginal Effects	Marginal effects 1sd[8]	Marginal effects 1sd	Marginal effects 1sd	Marginal effects 1sd
	[1]	[2]	[3]	[4]	[5]	[6]
Infant mortality$_{t-1,\ 4\text{-year average}}$	-3.7839*	-0.3909*	-1.9093*	-1.9020*	-2.0286**	-1.6856
	1.8996					
Time control variables						
log GDP$_{\bar{t},t-1}$	-0.5915	-0.0611	-2.5773	-2.7074	-2.8935	-2.9132
	0.5051					
Trade Openness$_{\bar{t},t-1}$	-1.3399*	-0.1384*	-1.8952*	-1.7931*	-1.9119**	-0.5965
	0.5524					
Government Expenditure$_{\bar{t},t-1}$	0.5285	0.0546	0.3953	0.4755	0.5047	0.6470
	2.2736					
Investment$_{\bar{t},t-1}$	-1.2916	-0.1334	-0.5957	-0.5008	-0.5325	-1.4603
	2.9739					
Polity$_{\bar{t},t-1}$	0.0520†	0.0054†	1.4330†	1.2927	1.3704	1.0632
	0.0294					
Infant mortality$_{\bar{t},t-1}$	-9.6356**	-0.9955**	-3.4214**	-3.4465**	-3.6915**	-3.9411**
	3.5810					
Rate of return (US, UK)$_{t-1}$						0.2569
US, UK growth rate$_{t-1}$						0.7559*
Interaction Terms						
Crisis*Pos. reg. change$_{t-1}$				-3.4847 †	-3.3773	-3.7486 †
Crisis*Neg. reg. change$_{t-1}$				0.0401	1.0551	0.5590
Crisis*Polity 5-year av.$_{\cdot t-1}$					1.5185**	
Constant	9.6603**					
	3.5911					
Observations	2760			2760	2760	2351

[8]Calculated at the sample means of continuous variables. *Marginal effects 1sd* indicate a change in the probability of rapid growth episode initiation when the variable increases by 1 standard deviation from the mean. For dummy variables marginal effects are calculated for a variable change from 0 to 1.
In Tables 4, 5 and 6: $\dagger p < 0.1, *p < 0.05, **p < 0.01, ***p < 0.001$; standard errors in italics

Table 1.5 Threshold effects

Dependent Variable: Year of a takeoff episode initiation: 0-1 binary variable

Variables	Marginal Effects 1 std. dev. change from the mean, % [1]	Marginal Effects 1 std. dev. change from the mean, % [2]	Marginal Effects 1 std. dev. change from the mean, % [3]	Coefficients [4]
Crisis (t-1)	2.2212*	4.0017*	2.3611*	0.2053*
Positive regime change$_{t-1}$		4.8003	2.0053	0.1325
Pos. reg. change$_{t-1}$ (log gdp $\leq$ 8.6479)	-1.0870			
Pos. reg. change$_{t-1}$ (log gdp $>$ 8.6480)	15.9597**			
Negative reg change$_{t-1}$	6.6885*	11.7406*	6.5214*	0.4358*
Polity$_{t-1,\ 5\text{-year average}}$	1.8780**		1.7790**	0.0239**
Polity$_{t-1,\ 5\text{-year average}}$ (Polity $\leq$ 9)		0.8518		
Polity$_{t-1,\ 5\text{-year average}}$ (Polity $>$ 9)		0.0876***		
Volume of Trade$_{t-1}$	8.4601*	12.5615 †		
Volume of Trade$_{t-1}$ (VOT $\leq$ 0.634269)			3.9243*	1.5922*
VOT $_{t-1}$ (VOT $>$ 0.634269, $\leq$ 0.794905)			5.4240**	2.3122**
VOT $_{t-1}$ (VOT $>$ 0.794905)			10.9985†	1.3921 †
Volume of Trade$_{t-2}$	-1.1262	-1.5470	-0.9009	-0.2526
VOT$_{t-3,\ 3\text{-year average}}$	-2.5866	-4.3838	-2.5615	-0.9147
Investment$_{t-1}$	-3.0098**	-5.4181**	-2.8644**	-5.8828**
Investment$_{t-2}$	1.5058	2.4665	1.8336	2.3083
Investment$_{t-3,\ 3\text{-year average}}$	-0.3173	-0.4427	-0.3699**	-0.5604
Government Expenditure$_{t-3,\ 3\text{-year average}}$	-1.5970**	-2.7705**	-1.4737*	-1.5003*
log GDP$_{t-1}$	-4.9496***	-9.6804***	-4.7304***	-3.1734***
log GDP$_{t-2,\ 4\text{-year average}}$	60.7004***	70.3858***	61.9930***	2.6979***
Infant mortality$_{t-1,\ 4\text{-year average}}$	-1.7850**	-2.0604	-1.7966 †	-3.7274 †
log GDP$_{t,t-1}$	-2.9080	-2.9512	-2.0065	-0.4537
VOT$_{t,t-1}$	-1.8932*	-3.1841*	-2.0366 **	-1.5582**
Government Expenditure$_{t,t-1}$	0.4280	0.3273	0.1735	0.2467
Investment$_{t,t-1}$	-0.7232	-1.0651	-0.9150	-2.1502
Polity$_{t,t-1}$	1.4052**	2.6540	1.3979 †	0.0529 †
Infant mortality$_{t,t-1}$	-3.5515**	-5.8499	-3.2469 **	-9.6224**
Observations	2760	2760	2760	

Tests for the optimal sample split along a particular threshold

Table 1.6-a Sample split variable: Polity 5 -year average

Threshold variable: Polity 5-year average

	Estimate (threshold- Polity score)	Percentile	Bootstrap p-value
1st Threshold	9	68	0.033*
2nd Threshold	7	59	0.267

Table 1.6-b Sample split variable: Volume of Trade

Threshold variable: Volume of Trade

	Estimate (threshold -Volume of Trade as share of GDP)	Percentile	Bootstrap p-value
1st Threshold	0.7949	87	0.047*
2nd Threshold	0.6343	78	0.066†
3rd Threshold	0.2828	30	0.170

Table 1.6-c Sample split variable: Positive Enduring Regime Change

Threshold variable: log GDP per capita

	Estimate (threshold log GDP per capita)	Percentile	Bootstrap p-value
1st Threshold	8.6479	69	0.077†
2nd Threshold	7.5895	23	0.1262

Table 1.6-d Sample split variable: Negative Enduring Regime Change (t-1)

Threshold variable: log GDP per capita

	Estimate (threshold log GDP per capita)	Percentile	Bootstrap p-value
1st Threshold	7.467011	18	0.2085

Table 1.7 Probability forecast evaluation. Mean square errors and skill scores

	All Sample	Growth years	Non-growth years
MSE $(p, x)_{model}$	0.0734	0.75930	0.00982
MSE $(\mu, x)_{base}$	0.0776	0.8376	0.00719
Skill Score (SS)	**0.0545**	**0.095**	**- 0.3667**

Table 1.8 a-c Skill scores under different forecast rules and "success" definitions

Forecast rule:
When $(\text{Forecast Odds/Unconditional Odds})_{i,t}$ > Threshold (TH) - predict growth =1; When $(FO/UO)_t$ < TH, predict growth =0.

Definition of Success (a)
"hit" – $\text{forecast}_{i,t}$ =1, $\text{realization}_{i,t}$ =1
"miss" – $\text{forecast}_{i,t}$=0, $\text{realization}_{i,t}$ =1
"correct zero" – $\text{forecast}_{i,t}$ =0, $\text{realization}_{i,t}$ =0
"false alarm" – $\text{forecast}_{i,t}$ =1, $\text{realization}_{i,t}$ = 0

Table 1.8-a

	TH = 1	TH = 1.5	TH =2
KSS	0.3872	0.2992	0.2433
HSS	0.1947	0.2083	0.2055
ORSS	0.6850**	0.6549**	0.6322**

Note: in this and the following tables, in bold italics are the best results among the thresholds;
* indicates statistical significance on 5% level; ** indicates statistical significance on 10% level
Forecast Odds are based on the model, which incorporates all interaction terms and optimal thresholds.

Relaxing the definition of hits and misses under the forecast rule.

Definition of Success (b):
"hit" – $\text{forecast}_{i,t}$ =1, $\text{realization}_{i,t}$ =1 **or** $\text{realization}_{i,t+1/i,t-1}$ =1 (growth happens within a year of the forecast).
"miss" – $\text{forecast}_{i,t}$ =0, $\text{realization}_{i,t}$ =1 **or** $\text{realization}_{i,t+1/i,t-1}$ =1
"correct zero" – $\text{forecast}_{i,t}$ =0, $\text{realization}_{i,t}$ =0 **and** $\text{realization}_{i,t+1/i,t-1}$ =0 (nothing happens within a year of the forecast)
"false alarm" – $\text{forecast}_{i,t}$ =1, r $\text{realization}_{i,t}$ = 0 **and** $\text{realization}_{i,t+1/i,t-1}$ =0

Table 1.8-b

	TH = 1	TH = 1.5	TH =2
KSS	0.3475	0.2725	0.2252
HSS	0.2523	0.2559	0.2411
ORSS	0.6453**	0.6420**	0.6514**

Definition of Success (c):

"hit" – $forecast_{i,t} = 1$, $realization_{i,t} = 1$ **or** $realization_{i,t+1/t-1/t-2/t+2} = 1$ (growth happens within two years of the forecast).

"miss" – $forecast_{i,t} = 0$, $realization_{i,t} = 1$ **or** $realization_{i,t+1/t-1/t-2/t+2} = 1$

"correct zero" – $forecast_{i,t} = 0$, $realization_{i,t} = 0$ **and** $realization_{i,t+1/t-1/t-2/t+2} = 0$ (nothing happens within 2 years of the forecast)

"false alarm" – $forecast_{i,t} = 1$, $realization_{i,t} = 0$ **and** $realization_{i,t+1/t-1/t-2/t+2} = 0$

Table 1.8-c

	TH = 1	TH = 1.5	TH =2
KSS	0.3143	0.2502	0.1931
HSS	0.2769	0.2661	0.2269
ORSS	0.6111**	0.6256**	0.6186**

Chapter 2. The International Spillover Effects of Political Transitions

2.1 Introduction

In recent economic literature much attention has been given to democracy-growth nexus. The question of whether democracy is good for growth, whether democratic countries on average grow faster than their autocratic counterparts dates back to the 1960s.[18] Yet in recent years there has been a revival of interest in the topic. Economists are increasingly interested in the link between the quality of country's institutions and growth outcomes. Quality of political system in particular is seen as one of the most important parts of the overall institutional structure.

Moreover, since the end of the Cold War and the advent of globalization the world has seen profound changes in both political and economic structure in the countries of Eastern Europe, Asia, Latin America. These changes brought to the fore important questions: does globalization, trade, financial openness and technology spillovers help promote representative systems of government? Why in recent years did some countries experience political reversals from more representative forms of government (e.g. Belarus), and some others have found it challenging to maintain a fragile democracy against the possibility of such reversals (e.g. Ukraine, Georgia)? And, in turn, what are the likely growth consequences for the countries that have undergone such political transformations?

While it is too early to draw conclusions from most recent events, the historical data could provide us with valuable insights into the nature of the costs that countries face when

[18] Huntington, Samuel, *Political Order in Changing Societies.* New Haven: Yale University Press 1968 also de Schweinitz, Karl Jr., *Industrialization and Democracy*. New York: Free Press, 1964

they undergo political transformations, and how such costs could shape the path of the country's development.

2.2 Literature Review

The main purpose of this chapter is to investigate how political transitions impact countries' short and long run growth outcomes. In particular I am interested in whether countries surrounded by relatively more autocratic neighbors/trading partners are likely to grow slower as a result of democratic transitions than their counterparts in more democratic neighborhoods. On the other hand, I would also like to assess how a country's economic growth responds to the political transitions in the neighboring countries.

The question is important in part because empirical studies tend to report a positive, yet often a weak or inconclusive link between emergence of representative political institutions and economic growth.

For example, in a widely cited 1993 survey, Przeworski and Limongi examined 11 studies and 21 findings, of which 8 had found evidence in favor or democracy's positive impact on growth, 8 had found the evidence against, and 5 results had been inconclusive. Since the P&L survey, various authors have re-examined the problem of democracy-growth nexus by expanding the time frame of their sample, employing panel data techniques and trying to control for simultaneity bias between democracy and growth variables.

This research effort has produced a body of evidence, which points to a positive link between democratic political institutions and economic growth. Yet, the outcomes

largely depend upon the model specification and definition of 'democratization'. In one such recent study, Branko Milanovic (2006) employs a dynamic panel regression, where the dependent variable is GDP per capita growth rate averaged over 5 year non-overlapping periods. The country's Polity[19] score is one of the dependent variables.

Milanovic finds that a 1 point increase in the country's polity score is associated with 0.1 percent increase in the GDP per capita growth rate, and the effect of democratization increases as income per capita levels rise.

In the same paper, however, the results from a different model specification (using annual observations on growth rates, rather than 5 year averages) suggest that an increase in country's Polity score has a negative effect on growth.

In a related paper, Rodrik and Wacziarg (2005) ask whether democratic regime changes produce bad outcomes[20], and conclude that democratic changes have overall a positive *short run* effect (the results suggest that in the first 5 years following a democratization episode, countries on average grow 0.87 percent faster than their counterparts, which experienced no regime change). In the same time, the *long run* effects of democratic regime changes are positive but insignificant.[21]

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[19] Polity score is a measure of democratization employed by most of the studies outlined below. More precise definition in Marshall, Monty G. and Keith Jaggers. *Polity IV Dataset [Computer File; Version p4v2001]*. College Park, MD: Center for International Development and Conflict Management, University of Maryland, 2002.

[20] The authors use panel fixed effects model on the sample of 154 countries from 1950-2000.

[21] These results may be in part due to the fact that democratization usually follows a period of economic downturn. The spurs of growth in the first 5 years after democratization, likely reflect the recovery from a bad shock rather than growth gains.

Rodrik and Wacziarg results contrast with the findings of Papaioannou and Siourounis (2005) [22]. The authors of the study, which uses a somewhat different definition of democratization[23], examine long run growth effects of permanent political regime changes in a dynamic panel fixed effects model. They conclude that permanent democratizations are associated with about 0.7 percent increase in the long run growth rates.

A number of researchers, however, have pointed out that the effect of democratization on growth may potentially be underestimated. One of the reasons is significant heterogeneity in the countries' experience with democratization. Or, simply put, political transitions to more representative forms of government are often associated with very different growth outcomes for different countries.

For example, Milanovic (2005) study estimates a series of growth regressions with the measure of democratization as a dependent variable for 118 countries, using data from 1820 to 2000. The paper reports that the distribution of country-specific coefficients is very wide. Of total 118 coefficients, slightly more than half are statistically significant, and 70% of those are positive. The mean group estimator of the slopes is not significantly different from zero. The author concludes that assigning the same coefficient value to all countries seriously underestimates the variability of the growth outcomes resulting from democratic transitions.

[22] The authors rely on growth, investment and Polity data for 67 to 112 countries from 1960-2000

[23] "Democratization" in their definition is not a continuous index, but a dummy variable equal to 1 for countries with a positive Polity score, and zero otherwise.

Persson and Tabellini (2007) also argue that heterogeneity among countries in one of the main reasons why the effect of democracy on growth appears to be small. They re-estimate the average effect of political transition on economic growth by using a difference-in-difference method, which assesses the pre and post-reform growth outcomes for different countries.

In their analysis the authors use propensity score matching technique to give more weight to the comparison of countries that are similar in the probability of experiencing a democratic reform.

The political similarity between countries (their propensity to experience democratic reforms) is estimated as a function of per capita income and two "democratic capital" variables – the "domestic democratic capital" – length of country's own experience with democracy - and "foreign democratic capital" – the prevalence of democratic regimes among the country's neighbors. These variables are found to be significant predictors of whether the country will develop representative political system in the future or not (Persson and Tabellini (2006)).

Persson and Tabellini's research is particularly interesting, as it points in the direction of why some countries' experience with democratic reforms may be different from that of other countries with similar characteristics.

Most researchers estimate the effect of democracy on growth without taking into account the possibility that a country surrounded by autocratic neighbors may grow slower - even after a successful political transition - than a country surrounded by established democracies. In the same time, political transitions in other countries in the immediate neighborhood could also affect the country's own growth outcomes.

Due to these complex political spillover effects, the average economic impact of democratization in a panel of countries may be close to zero.

2.3 Methodology

2.3.1 Measuring Political Distance between countries

To what extent does the change in the political distance between countries affect their growth and contribute to the heterogeneity in the countries experience with democratization? To address this question we need a measure political distance between the country and its neighborhood.

Let us first consider the case of two neighboring countries i and j[24].

For a simple measure I consider the absolute value of the difference between the polity scores for each country. Thus, the $\mathbf{A_{i.t,}}$ the *absolute political distance* between the countries i and j in each year is:

$$A_{ij.t.} = |Polity_{i.t.} - Polity_{j,\,t}| \qquad (2.1)$$

Suppose country i undergoes political regime change in the year T*. The country i will then be considered to have moved away from country j on the political spectrum, if the average absolute political distance in the 5 years after the transition is greater than the same distance in the 5 years before the political transition has taken place.

The country is considered to have moved politically closer to its region if the average absolute political distance in the 5 years after the year T* is less than in the 5 years

[24] In this chapter I will rely on the polity score index (from Polity IV database) as an indicator of the how representative the country's political institutions are.

before the T*. More specifically, I define variable $Z_{ij,t}$ the *change in the absolute political distance* between countries i and j as follows:

$$Z_{ij,t} = \sum_{n=0}^{4} A_{ij,t+n} - \sum_{n=1}^{5} A_{ij,t-n} \quad (2.2)$$

A higher value of $Z_{ij,t}$, means that the country has on average moved further away from the country j in the 5 year period, and the lower value of $Z_{ij,t}$ would indicate that the country i has moved politically closer to country j[25].

In order to extend this measure to the political neighborhood of country i, we need to define the 'neighborhood' in a way suitable to the purposes of historical analysis. On one hand, we can consider the 'neighborhood' to be a historically defined group such as Western Europe, Eastern Europe, Latin America, etc. However, the membership in regional groups is subject to change over time. Therefore, the more historically appropriate measure of political distance would treat all the countries in the sample as the neighborhood of the country i., and use the great circle distance between countries as weights. Therefore, the measure of country's *absolute political distance* from its neighbors takes the following form:

$$A_{i.t} = | \text{Polity}_{i,t} - (\Sigma_j \text{Polity}_{j,t} * (1/\omega_t^{i,j})) / \Sigma(1/\omega^{i,j}) | \quad (2.3)$$

Where $\boldsymbol{\omega_t^{i,j}}$ is the geographical distance weight, equal to the great circle distance of country i from country j. $Z_{i,t}$ is consequently defined as:

$$Z_{i,t} = \sum_{n=0}^{4} A_{i,t+n} - \sum_{n=1}^{5} A_{i,t-n} \quad (2.4)$$

[25] During any given period of time t when country i is not experiencing a political transitions, the value of $Z_{ij,t}$ would measure the extent to which a political transition in the country j is affecting the absolute political distance between the two countries.

Figures 2.1-2.5 illustrate the absolute political distance change ($Z_{i,t}$) for a number of countries. The country's own Polity and the neighborhood (world) Polity graphs are also presented for comparison.

The proposed measure of political distance and political distance change has an advantage over the Persson and Tabellini's measure of "foreign democratic capital" in that it captures *relative* political distance between countries, taking into account the fact that in the 19th century most countries in the world were not democratic by modern standards. Most had polity scores below zero.

2.3.2 Strategies for estimating long and short run spillover effects of political transitions.

In order to assess the effect of democratization on growth as well as the role of political spillovers, it is necessary to account for the possibility of both the short and the long-run effects of the political transitions.

In recent literature, methodologies used to identify the impact of democratization range from cross-country regressions (e.g. Barro (1991), Tavares and Wacziarg (2001)) to dynamic panel estimations. The cross-sectional approach (used mainly in the earlier studies) may be less adequate in historical contexts, when a single country's coefficients are likely to be changing over time. Also, as Rodrik and Wacziarg (2005) have pointed out, cross-sectional approach could be useful only in identifying a long-run impact of the regressors.

In light of these considerations, most recent studies have relied on the time-series cross-sectional data from a large number of countries to account for both short and long run effects, and consequently have employed dynamic fixed effects methods (Milanovic

(2005), Rodrik and Wacziarg (2005), Papaioannou and Siourounis(2005))[26]. In these models, however, the short and long run effects have been estimated separately, with short run effects ordinarily captured with the dummies around the times of the transition.

The methodology I use in the chapter offers a variation on the regularly employed dynamic panel data estimators, such as dynamic fixed effects, and allows us to conveniently test for both short and long run effects in a single framework. This methodology, developed in a series of papers by Pesaran (1997), Pesaran, Shin and Smith (1999), Pesaran and Smith (1995), has been previously used to study the short and long run effects of financial development on growth (Loayza and Ranciere (2005)).

In the following section I will discuss in more detail the modified Autoregressive Distributed Lag (ARDL) model of Pesaran (1997), and look at the various estimation approaches that may be undertaken within its framework.

2.3.3 ARDL Error-Correction Model and the Three Dynamic Panel Data Estimators

When researchers are interested in characterizing long-run relationship between time-series variables as well as the dynamic adjustment to the long-run equilibrium, the error correction modeling (ECM) is commonly a method of choice. Indeed, the main advantage of the ECM representation is that we can model both the long run and the short run relationships between the series without explicitly observing their long and short run components (Loayza and Ranciere (2005)). Typically ECM is used when the time series in question are integrated (unit root) processes.

[26] The semi-parametric difference-in-difference with matching methodology used by Persson and Tabellini 2007, is also useful in identifying primarily the long-run effect of democratization on growth.

There has been some debate as to whether the ECM framework can be used in the context of stationary time series. Most recent studies, however, argue in favor of using ECM to estimate relationships between the stationary as well as integrated time series. In particular, Pesaran (1997) has argued that traditional methods, such as autoregressive distributed lag (ARDL) approach can be used for analyzing the long-run equilibrium relationship irrespective of whether the series are integrated or stationary.

The modified ARDL model, Pesaran argues, eliminates the need of pre-testing variables to identify unit root processes. On the other hand, this approach, unlike cointegration, takes as a given the existence of a long-run relationship between the series.

Following Pesaran, Shin and Smith (1999), I am starting with a standard ARDL(p,q) model:

$$y_{it} = \sum_{j=1}^{p} \lambda_{ij} y_{i,t-j} + \sum_{j=0}^{q} \delta_{ij} X_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (2.5)$$

where $y_{i,t}$ is the growth of GDP per capita , and $X_{i,t}$ a kx1 vector of explanatory variables, such as investment, government expenditure and volume of trade as a share of GDP; inflation rate; infant mortality rate. Part of the $X_{i,t}$ vector is also the variable of interest, $Z_{ij,t}$, the change in the absolute political distance between country and its neighborhood. In addition, I introduce an interaction term $Z_{ij,t}$ *$Dem_{i,t,}$ where $Dem_{i,t}$ is the dummy which takes the value of 1 in the years after a positive enduring regime change has taken place[27].

[27] Positive enduring regime change is defined as a 3-point increase in the country's Polity score in the course of 3 years, which lasted a minimum of 5 years. Democratization dummy takes the value of 0 in the years when the country either experiences negative enduring regime change or no change in its political status since the beginning of the sample

The explanatory variables represented by the X_{it} vector vary both by country and across time; μ_i denotes the time-invariant country-specific effect.

The transformation of equation (2.5) into error-correction form[28] yields the following representation:

$$\Delta y_{it} = \sum_{j=1}^{p-1} \lambda^*_{ij} \Delta(y_{i,t-j}) + \sum_{j=0}^{q-1} \delta^*_{ij} \Delta(x_{i,t-j}) + \phi_i \left[y_{i,t-1} - \{\beta_{i0} + \beta_{i1} x_{i,t-1}\} \right] + \varepsilon_{it} \qquad (2.6)$$

where $\lambda^*_{i,j}$ and $\delta^*_{i,j}$ are the short-run coefficients defined by (2.5.1) and (2.5.2). (footnote 28).

The term in square brackets is the forcing long-run equilibrium condition, with φ_i representing the speed of adjustment to the equilibrium. In terms of equation (2.5) parameters, $\varphi_i = -(1 - \sum_{j=1}^{p} \lambda_{ij})$; $\beta_{i,0} = -\frac{\mu_i}{\varphi_i}$; $\beta_{i1} = \frac{-\left(\sum_{j=0}^{q} \delta_{ij}\right)}{\varphi_i}$.

The model's parameters are then estimated using maximum likelihood approach, assuming that the error term is normally distributed, although for the asymptotic result this assumption is not required.

Certain assumptions must also be made to ensure consistency of the estimated parameters.

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[28] The transformation is achieved by adding and subtracting the following two terms to equation (2.5):

(2.5.1) $y_{i,t-1} + \sum_{j=1}^{p-1} \lambda^*_{ij} y_{i,t-j}$; where $\lambda^*_{ij} = \sum_{m=j+1}^{p} \lambda_{im}$.

(2.5.2) $\sum_{j=0}^{q-1} \delta^*_{ij} x_{i,t-j}$; where $\delta^*_{ij} = \sum_{m=j+1}^{q} \delta_{im}$

First, that the error term ε_{it} is independently distributed across i and t, with mean zero and variance $\sigma_i>0$; ε_{it} must also be distributed independently of the X_{it} regressors. To ensure the independence of regression residuals across countries, one of the strategies is to express all variables in the regression in the form of deviations from their cross-sectional means for each year[29].

Pesaran and Smith (1995) show that the assumption of independence between X_{it} and ε_{it} can be relaxed if the model is sufficiently augmented with the lagged values of X_{it}. It is not practical, however, to introduce lags for all of the explanatory variables, as this will result in the loss of degrees of freedom. Therefore, following Loayza and Ranciere, the ARDL model used in this chapter includes 3 lags of growth rate, 2 lags of the change in the absolute political distance variable $Z_{i,t}$ along with 2 lags of the interaction term between $Z_{i,t}$ and the Democratization dummy. The ARDL also includes 1 lag of each of the other explanatory variables in the model.

Given panel data where the number of cross sections N and the number of time periods T is sufficiently large, Pesaran et al. (1999) discuss three possible approaches to estimating the coefficients of equation (2.6). These approaches differ in their treatment of the long and short-run coefficients estimated by the model.

On one hand, we may estimate the model given by equation (2.6) for each country in the panel separately and then take the average of the resulting coefficients. This approach, the Mean Group (MG) estimator allows for consistent estimation of the average, and also for full heterogeneity of the model's parameters. However, if the parameters are

[29] See Loayza and Ranciere (2005) for the empirical application of the Pesaran's model to estimate the effects

common across countries, then MG estimator is still consistent but not efficient. Another drawback of the MG estimator is its sensitivity to the outliers, particular in small samples.

The second approach, the Pooled Mean Group (PMG) estimator developed by Pesaran, Shin and Smith (1998) allows for heterogeneity among the short run coefficients, but restricts long-run coefficients to be the same across countries[30]. The validity of this assumption can be tested using the Hausman specification test. If the assumption of homogeneity is not valid, the PMG estimates will be inconsistent.

Finally, the commonly used Dynamic Fixed Effects (DFE) estimator restricts all coefficients in the model to be homogeneous across countries.

In this chapter I will consider the results of all three approaches to estimate the political spillover effects between the neighboring countries.

2.4 Data and Results

The overall panel used in this chapter consists of 61 countries and the annual data covering the period from 1820-2003. However, not all variables appearing in the regression have observations in all years. For the purpose of the ARDL estimation I will consider the sample in which each country has at least 20 years of data is available for all the variables appearing in the regression[31.]

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of financial development and financial fragility on growth

[30] As Loayza and Ranciere point out, the PMG estimator (provided that the homogeneity assumption is valid) is less sensitive to the outliers, because it functions as a weighted average of the country-specific long-run coefficients. In the PMG model, long-run coefficients are weighted by the inverse of their variance-covariance matrix, with large variance coefficients being less prominent in the estimation of the total.

[31] Using more than 20 time observations is necessary to reduce a possible bias in the coefficients.

I also test that the ARDL model given by equation (2.5) is stable when applied to each country separately. I further exclude several countries (Hungary, Singapore, Indonesia) that have the roots of the lagged dependent variable outside the unit circle[32]. The estimation sample consists of 33 countries with an average of 70 years annual data.

Table 2.1 summarizes the results of the ARDL growth model as described by equation (2.5).

As noted before, in order to reduce the number of parameters in the model, and in the same time account for common period shocks, I express all continuous variables as deviations from the cross-section mean in each year.

2.4.1 Long- run effects

Consider first the PMG estimation of the long-run coefficients (Table 2.1 column 1). One may note that the long run coefficient on the Democratization dummy is significant and positive. This implies that the country experiencing a positive enduring regime change increases its long-run annual growth rate of GDP per capita by 0.33%. This finding is consistent with the literature. In Papaioannou and Siourounis (2005), for example, the coefficient on Democratization ranges from 0.4% to 0.7%[33]. Persson and Tabellini (2007) estimate the effect of democratization to range from 0.6% to 1.08%.

Of particular interest is the coefficient on the interaction term between Democratization and the change in the absolute political distance, $Z_{it.}$ The interaction term

[32]This stability condition requires that $\varphi_i = -(1 - \sum_{j=1}^{p} \lambda_{ij})$ be less than 2 in the absolute value.

[33] The smaller overall size of the coefficient is most likely due to the different definitions of democratization. In the P&S study democratization is defined as the Polity score above 0, while in this paper democratization

coefficient can be interpreted as the relative change in the GDP per capita growth rate for countries that in the process of democratization move away from their political neighborhood. The long-run coefficient is significant and negative. This suggests that countries, which after having democratized move away from their neighbors on the political spectrum, on average experience a decline in the growth rate of GDP per capita of 0.318%.[34]

This finding supports the hypothesis initially put forward in the chapter: political spillover effects do influence the country's growth rate in the wake of democratization.

The negative interaction coefficient helps answer the question of why countries may have different experiences with democratization: the country surrounded by neighbors that become relatively close on the political spectrum, would have easier time not only in solidifying the positive regime change (Persson and Tabellini (2007)), but also would gain economic advantage in the form of higher GDP per capita growth rates. On the other hand, a movement away from the neighbors on the political spectrum may decrease the growth rate of GDP per capita.

Not surprisingly then, the overall effect of democratization (the sum of the coefficients on Democratization and the interaction term) is indistinguishable from zero. The result echoes the finding by Milanovic (2005).

An interesting finding of this chapter is that there also seem to be regional differences when it comes to assessing the impact of political spillovers. Table 2.2 and

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is defined as a 3 point increase in the country's Polity index, irrespective of whether the index is positive or negative.

Table 2.3 present the results of the PMG estimation run separately on two groups of countries – Latin America and Europe.

For Latin American countries the coefficients on democratization and the interaction term are both significant and positive. In the process of democratization, the one point movement away from the political neighborhood seems to increase growth rate of GDP per capita by 0.43%.

In the same time, the coefficient on $Z_{i,t}$, the absolute political distance change is significant and negative, – 0.34% for each point increase in the political distance. This coefficient captures the effect of movement away from the neighborhood for countries that have not undergone democratization. This movement may occur either because a country is experiencing a negative political regime change at home, or because other countries in the neighborhood are undergoing positive political transitions, while the country in question remains relatively more autocratic.

Results for Europe are quite different. Democratization coefficient is positive, but not significant; the coefficient on the interaction term is significant and negative (as in the overall sample), and the coefficient on $Z_{i,t}$ is significant and positive. These results suggest that a European country undergoing positive political regime change would face a decrease in the growth rate of GDP per capita by 0.48% for each point increase in the political distance with its neighborhood. In the same time, the coefficient for Z_{it} is positive, suggesting that countries, which move away from their neighborhood while not experiencing democratization, may actually benefit in terms of growth.

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[34] Once again, one must note that the movement in $Z_{i,t}$ may be due either to the country's own political changes, or to the political processes in the neighboring countries. The interaction term thus captures the

The long-run coefficients on the control variables, such as volume of trade, government expenditure and investment as a share of GDP, infant mortality rate – all have signs consistent with the theory. For example the increase in the volume of trade, investment, increases growth in the long run, while increase in the government expenditure, infant mortality, inflation rate affects growth negatively. The initial log GDP per capita level (lagged 5 periods) is negative, suggesting the speed of convergence of about 2.6%, a number consistent with most empirical growth studies.

The magnitudes of the coefficients are also consistent with the findings of the previous studies. (For example, the estimated coefficient on trade in Papaioannou and Siourounis (2005) ranges from 0.02% to 2.2%.

The finding of this chapter is that an increase in the volume of trade/GDP ratio by one point, increases growth by 1.4% in the long run.

2.4.2. Short-run effects

The short run coefficients of the PMG estimator represent the initial response of the growth rate to the shocks affecting the explanatory variables in the model. The coefficients signs suggest that an initial increase in the political distance between the country and its neighborhood while the country is undergoing democratization, may boost growth in the short term. This effect, however, is not significantly different from zero. The Mean Group (MG) coefficient on $\Delta Z_{i,t}$ is significant and positive. This implies that an increase in the absolute political distance, while the country is not democratizing (or while the country is possibly undergoing a negative regime change) may temporarily increase growth. This may

political spillover effect of own as well as external political changes.

be due to the greater "predictability" of politically restrictive regime, which in turn may have a positive short run effect on economic growth.

2.4.3 Comparing MG and PMG estimators

The Mean Group Estimator allows the coefficients to be different across countries. This method, as noted earlier, is consistent, but not efficient, if the underlying parameters are in fact homogeneous across countries. On the other hand, the Dynamic Fixed Effects estimator, another widely used method, restricts all slopes to be the same across countries, but allows for individual intercepts. The DFE is consistent and efficient only if the slope coefficients are indeed the same. If they are not, the DFE is biased. Pesaran and Smith (1995) have noted that the Pooled mean groups estimator offers a compromise between these two methods – allowing the short run coefficients between the countries vary, but restricting the long-run coefficients to be the same.

However, we still need to test for the validity of the restrictions placed on the long-rung coefficients. This may be done via Hausman specification test on each individual long-run coefficient as well as the vector of coefficients (the joint Hausman test).

The null hypothesis of the Hausman test is that there exists no systematic difference between the coefficients in the restricted and the unrestricted models. The failure to reject the null would lead the conclusion that coefficient restrictions are valid, and the restricted model is both consistent and efficient.

The p-values of the Hausman test are presented in Table 2.1. The joint coefficient test rejects the null hypothesis, yet the test on individual parameters suggests that using PMG estimator is still warranted in the context of this study. While the long-run coefficients on investment and infant mortality rate may not be the same across countries,

the cross-country restrictions on the other coefficients are justified. Given that the main interest of this chapter is to assess the impact of Democratization and political distance changes on growth, the PMG estimator is preferred to MG in this context.

2.5 Conclusion

The results presented in this chapter offer one explanation as to why political changes, especially democratic regime changes may bring different economic outcomes to different countries. The chapter explores the cross-country political spillover effects, and seeks to answer the question of whether democratization is more difficult for countries surrounded by the relatively more autocratic neighbors - in part because of the political spillover impact on the economic growth.

The results point to a significant negative effect of the increase in the absolute distance between the country and its neighbors. Democratization affects economic growth positively in the long run but its influence may be counterbalanced by the country's movement away from its neighborhood on the political spectrum. The short-run coefficients on political variables do not seem to significantly affect economic growth.

However, in some specifications the countries that have not democratized seem to experience a temporary increase in the growth rate following the increase in the political distance with the neighborhood. As noted above, this result may be due to the greater "predictability" of politically restrictive regime in the times of change, which may impact short run growth.

There is some evidence, however, that the long-run effects of political variables may be region-specific. For Latin American countries in particular, democratization seems

to be benefiting growth even when the absolute political distance between countries is increasing.

Chapter 2 Appendix

Data coverage

There are overall 61 countries in the dataset. The bold script denotes the countries with more than 20 years annual observations.

Western/Northern Europe: **United Kingdom, Ireland, Netherlands, Belgium, France, Switzerland, Spain, Portugal, Prussia, Germany, Austria, Italy, Finland, Sweden, Norway, Denmark.**

Eastern Europe/Central Asia: **Poland, Hungary,** Czechoslovakia, Czech Republic, Slovakia, Albania, Macedonia, Croatia**, Yugoslavia,** Serbia-Montenegro, Bosnia**,** Slovenia**, Greece,** Bulgaria**,** Moldova, Romania, USSR, Russia, Estonia, Latvia, Lithuania, Ukraine, Belarus, Armenia, Georgia, Azerbaijan, **Turkey**.

Asia/Oceania: **Japan, Thailand, Malaysia, Singapore, Philippines, Indonesia, Australia, New Zealand.**

The Americas: **United States, Canada, Mexico, Colombia, Venezuela, Peru, Brazil, Chile, Argentina, Uruguay.**

Positive Political Regime change episodes:

Positive Enduring Regime (PER) change (lasting over 5 years) - 60 episodes

PER change, movement “closer” to the regional polity mean – 35 episodes

PER change, movement “away” from the regional polity mean – 25 episodes

Sample expansion overtime for PER change:

time period	# of episodes Closer	# of episodes Away
before 1900	5	9
1900-1924	8	3
1925-1949	6	5
1950-2000	16	8
Total	35	25

Number of episodes by region for PER change:

Time period	# of episodes Closer	# of episodes Away
Western Europe	12	14
Eastern Europe	1	3
Western Offshoots	0	1
Latin America	19	5
Asia	3	2
Total	35	25

Table 2.1
Dynamic specification: ARDL(3,2,2,1,1,1,1,1); Estimators: Pooled Mean Group, Mean Group and Dynamic Fixed Effects.
Sample: All countries with more than 20 observations*

	PMG Estimator		**MG Estimator**		**Hausman test**	**DFE Estimator**	
Variables	Coefficient	P-value	Coefficient	P-value	P-value	Coefficient	P-value
Long-Run Coefficients							
Z (Absolute political distance change)	0.00042	0.4730	-0.00157	0.2850	**0.1395**	-0.0014	0.055
Z*Democratization	**-0.00318**	0.0000	-0.00185	0.2420	**0.3039**	-0.0002	0.884
Democratization	**0.00326**	0.0470	0.0021	0.3250	**0.396**	0.0026	0.258
Volume of Trade	**0.0137**	0.0040	0.0273	0.2260	**0.538**	**0.0202**	0.004
Government Expenditure	**-0.035**	0.0000	**-0.1025**	0.0050	**0.054**	**-0.0591**	0.000
Investment	**0.0422**	0.0300	**0.1009**	0.0020	0.03	**0.0445**	0.076
Log Infant mortality	**-0.0178**	0.0000	**-0.0402**	0.0010	0.049	**-0.0252**	0.000
Inflation rate	**-0.0131**	0.0000	0.0027	0.7760	**0.076**	**-0.0093**	0.000
log GDP initial level	**-0.026**	0.0000	**-0.0414**	0.0000	**0.109**	**-0.0332**	0.000
Speed of Adjustment Coef.	**-0.9389**	0.0000	**-1.3367**	0.0000		**-0.8674**	0.000
Short-Run Coefficients			Joint Hausman test p-value: 0.000				
Δ Growth (t-1)	0.0267	0.3920	**0.2432**	0.0000		0.0146	0.575
Δ Growth (t-2)	-0.0304	0.1880	**0.0863**	0.0040		0.0192	0.328
Δ Z	-0.0027	0.6020	-0.0018	0.6730		-0.0010	0.529
Δ Z (t-1)	0.0074	0.1100	**0.0093**	0.0230		**0.0048**	0.006
Δ Z * Democ.	0.0012	0.2990	0.0017	0.3960		-0.0008	0.497
Δ Z (t-1)* Democ.	0.000004	0.9970	0.0011	0.4780		-0.0016	0.157
Δ Government Expenditure	-0.0229	0.7280	0.0324	0.6380		**0.0384**	0.094
Δ Volume of trade	0.0103	0.7730	-0.00168	0.9710		0.0278	0.131
Δ Infant mortal. (log)	-0.0199	0.3570	0.0257	0.1240		-0.0061	0.516
Δ Inflation	-0.004	0.4000	-0.0028	0.6610		**0.0024**	0.059
Δ Investment	**0.4686**	0.0000	**0.3714**	0.0000		**0.4035**	0.000
War years	0.0013	0.5090	0.0046	0.1060		**0.0092**	0.003
Crisis	**-0.0048**	0.0210	**-0.0058**	0.0100		**-0.0036**	0.041
Intercept	-0.0004	0.8370	-0.0104	0.4630		-0.0022	0.147
No of observations	2468		Number of countries: 33				

* Hungary, Singapore, Indonesia are also excluded from the sample due to the instability of adjustment coefficients in the individual country's ARDL equation

Table 2.2
Dynamic specification: ARDL(3,2,2,1,1,1,1,1); Estimators: PMG, MG and DFE
Sample: Latin America

	Pooled Mean Group Estimator		**Mean Group Estimator**		**Dynamic Fixed Effects Estimator**	
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Long-Run Coefficients						
Z (Absolute political distance change)	**-0.0034**	0.0010	**-0.0040**	0.0000	**-0.0025**	0.0360
Z*Democratization	**0.0043**	0.0040	**0.0046**	0.0000	**0.0032**	0.0990
Democratization	**0.0107**	0.0070	**0.0086**	0.0330	**0.0096**	0.0380
Volume of Trade	0.0166	0.1830	0.0743	0.2710	0.0250	0.1080
Government Expenditure	-0.0336	0.1590	-0.0486	0.4630	**-0.0728**	0.0330
Investment	**0.1037**	0.0240	**0.2258**	0.0030	**0.1435**	0.0080
Log Infant mortality	**-0.0256**	0.0010	**-0.0582**	0.0200	**-0.0229**	0.0070
Inflation rate	**-0.0065**	0.0000	0.0037	0.7430	**-0.0080**	0.0000
log GDP initial level	**-0.0713**	0.0000	**-0.0671**	0.0000	**-0.0561**	0.0000
Speed of Adjustment Coef.	**-1.1691**	0.0000	**-1.4885**	0.0000	**-1.0755**	0.0000
Short-Run Coefficients						
Δ Growth (t-1)	**0.2689**	0.0010	**0.4190**	0.0030	**0.1430**	0.0240
Δ Growth (t-2)	**0.0999**	0.0140	**0.1819**	0.0430	0.0718	0.1130
Δ Z	-0.0017	0.5830	-0.0034	0.3300	-0.0017	0.5530
Δ Z (t-1)	**0.0064**	0.0270	**0.0088**	0.0040	0.0032	0.3330
Δ Z * Democratization	-0.0023	0.2980	-0.0026	0.2370	-0.0011	0.6230
Δ Z (t-1)* Democratization	-0.0033	0.2960	-0.0021	0.4940	-0.0025	0.2630
Δ Government Expenditure	0.0396	0.7340	0.0533	0.6580	-0.0189	0.6940
Δ Volume of trade	-0.1166	0.1600	-0.1475	0.1380	-0.0623	0.1170
Δ Infant mortality (log)	**-0.0759**	0.0490	-0.0321	0.2760	**-0.0583**	0.0160
Δ Inflation	-0.0010	0.8370	-0.0050	0.4240	**0.0030**	0.0550
Δ Investment	**0.4587**	0.0010	**0.3231**	0.0550	**0.5145**	0.0000
War years	0.0016	0.3170	0.0029	0.3170	0.0058	0.8220
Crisis	**-0.0152**	0.0000	**-0.0162**	0.0000	**-0.0103**	0.0490
Intercept	-0.0092	0.2560	0.0286	0.3420	-0.0063	0.2300
No of observations	482		482		482	
No. of countries	8		8		8	

Table 2.3
Dynamic specification: ARDL(3,2,2,1,1,1,1,1); Estimators: PMG, MG and DFE
Sample: Europe, US and Canada

	Pooled Mean Group Estimator		**Mean Group Estimator**		**Dynamic Fixed Effects Estimator**	
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Long-Run Coefficients						
Z (Absolute political distance change)	**0.0013**	0.097	0.0194	0.344	-0.0006	0.547
Z*Democratization	**-0.0048**	0.000	**-0.1343**	0.009	-0.0019	0.195
Democratization	0.0021	0.247	0.0577	0.159	0.0003	0.921
Volume of Trade	0.0082	0.114	-0.0011	0.633	0.0140	0.117
Government Expenditure	**-0.0236**	0.025	**-0.0053**	0.026	**-0.0541**	0.001
Investment	0.0315	0.153	0.0008	0.809	-0.0103	0.746
Log Infant mortality	**-0.0093**	0.006	-0.0180	0.128	**-0.0171**	0.000
Inflation rate	**-0.0255**	0.004	0.0084	0.542	**-0.0271**	0.038
log GDP initial level	**-0.0149**	0.002	-0.0120	0.297	**-0.0205**	0.002
Speed of Adjustment Coef.	**-0.9677**	0.000	**-1.2169**	0.000	**-0.8466**	0.000
Short-Run Coefficients						
Δ Growth (t-1)	0.0207	0.636	**0.1482**	0.000	-0.0192	0.541
Δ Growth (t-2)	-0.0347	0.288	0.0201	0.386	-0.0036	0.879
Δ Z	-0.0045	0.585	-0.0030	0.658	-0.0006	0.792
Δ Z (t-1)	0.0072	0.234	**0.0112**	0.045	**0.0051**	0.029
Δ Z * Democratization	0.0019	0.284	0.0040	0.208	-0.0009	0.560
Δ Z (t-1)* Democratization	-0.0003	0.732	0.0022	0.324	-0.0013	0.408
Δ Government Expenditure	0.0214	0.797	0.0621	0.510	**0.0904**	0.001
Δ Volume of trade	0.0505	0.192	0.0395	0.363	**0.0835**	0.000
Δ Infant mortality (log)	0.0166	0.387	0.0285	0.172	0.0077	0.479
Δ Inflation	0.0032	0.665	-0.0026	0.804	-0.0019	0.826
Δ Investment	**0.3748**	0.000	**0.3427**	0.001	**0.2331**	0.000
War years	0.0017	0.420	0.0021	0.518	**0.0090**	0.007
Crisis	0.0003	0.910	0.0007	0.790	-0.0015	0.468
Intercept	0.0014	0.281	-0.0017	0.876	-0.0011	0.570
No of observations	1666		1666		1666	
No. of countries	19		19		19	

Table 2.4
Dynamic specification: ARDL(3,2,2,1,1,1,1,1); Estimators: PMG, MG and DFE
Sample: Asia and Oceania

	Pooled Mean Group Estimator		**Mean Group Estimator**		**Dynamic Fixed Effects Estimator**	
Variables	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Long-Run Equation Coefficients						
Z (Absolute political distance change)	**0.0020**	0.033	0.0002	0.957	0.0014	0.439
Z*Democratization	**-0.0045**	0.033	0.0005	0.669	0.0011	0.779
Democratization	-0.0003	0.954	-0.0023	0.120	0.0053	0.596
Volume of Trade	0.0172	0.193	-0.0107	0.858	**0.0391**	0.049
Government Expenditure	**-0.0645**	0.086	-0.0739	0.361	-0.0446	0.338
Investment	**0.0962**	0.058	0.0710	0.231	**0.1251**	0.027
Log Infant mortality	**-0.0346**	0.002	**-0.0867**	0.016	**-0.0385**	0.005
Inflation rate	**-0.0612**	0.000	-0.0169	0.482	**-0.0631**	0.006
log GDP initial level	**-0.0492**	0.000	**-0.1001**	0.000	**-0.0618**	0.000
Speed of Adjustment Coef.	**-1.1541**	0.000	**-1.5137**	0.000	**-0.9507**	0.000
Short-Run Coefficients						
Δ Growth (t-1)	**0.1274**	0.093	**0.3095**	0.000	0.0695	0.404
Δ Growth (t-2)	0.0233	0.748	**0.1685**	0.002	0.0850	0.174
Δ Z	0.0032	0.812	0.0042	0.643	-0.0023	0.656
Δ Z (t-1)	0.0103	0.612	0.0044	0.769	0.0001	0.984
Δ Z * Democratization	0.0001	0.941	-0.0001	0.892	-0.0036	0.336
Δ Z (t-1)* Democratization	0.0016	0.207	0.0018	0.270	0.0023	0.483
Δ Government Expenditure	-0.2084	0.284	-0.0896	0.633	-0.0446	0.652
Δ Volume of trade	0.0244	0.843	0.0625	0.716	-0.0027	0.959
Δ Infant mortality (log)	-0.0538	0.497	**0.0938**	0.013	-0.0042	0.869
Δ Inflation	0.0100	0.455	-0.0009	0.949	0.0221	0.129
Δ Investment	**0.5606**	0.000	**0.5266**	0.000	**0.5858**	0.000
War years	0.0066	0.603	0.0147	0.183	0.0053	0.451
Crisis	**-0.0065**	0.096	**-0.0122**	0.031	0.0017	0.724
Intercept	**-0.0226**	0.084	**-0.0901**	0.065	**-0.0194**	0.006
No of observations	282		282		282	
No. of countries	6		6		6	

Figures 2.1-2.2 Neighborhood Polity, Country Polity and the Absolute political distance change $Z_{i,t}$. The shaded areas represent the periods of democratization

.

Figure 2.1-a

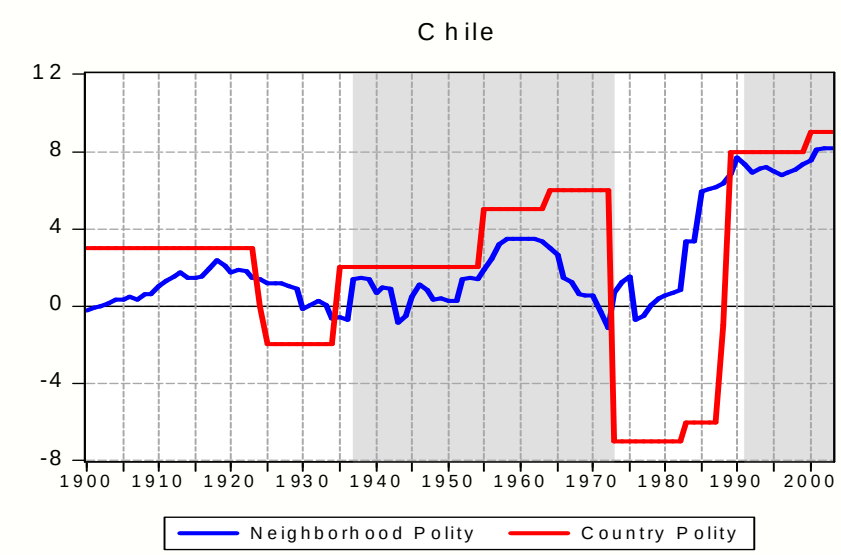


Figure 2.1-b

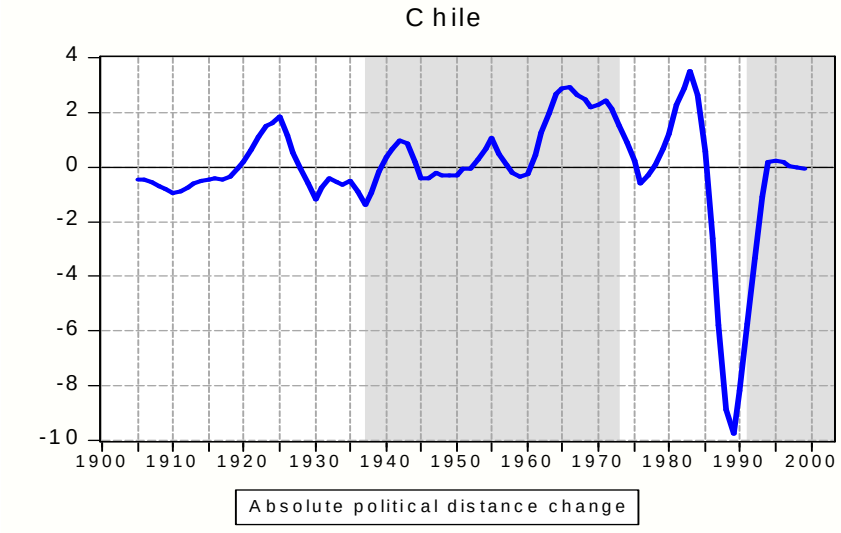


Figure 2.2 –a

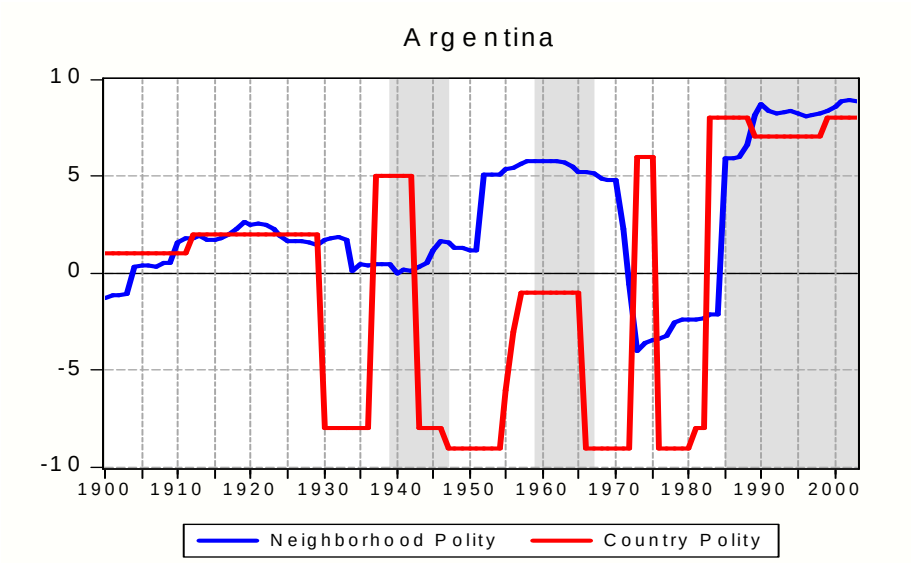


Figure 2.2 –b

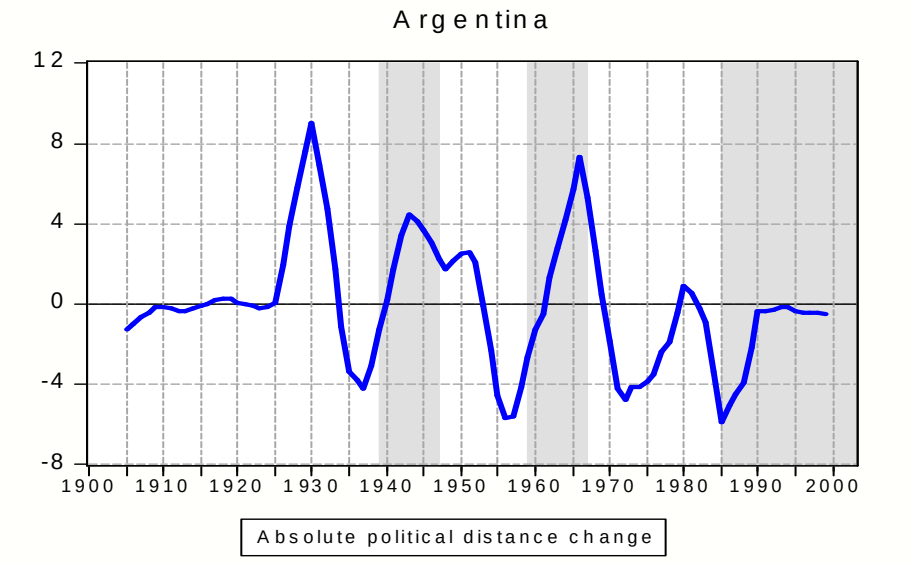


Figure 2.3 –a

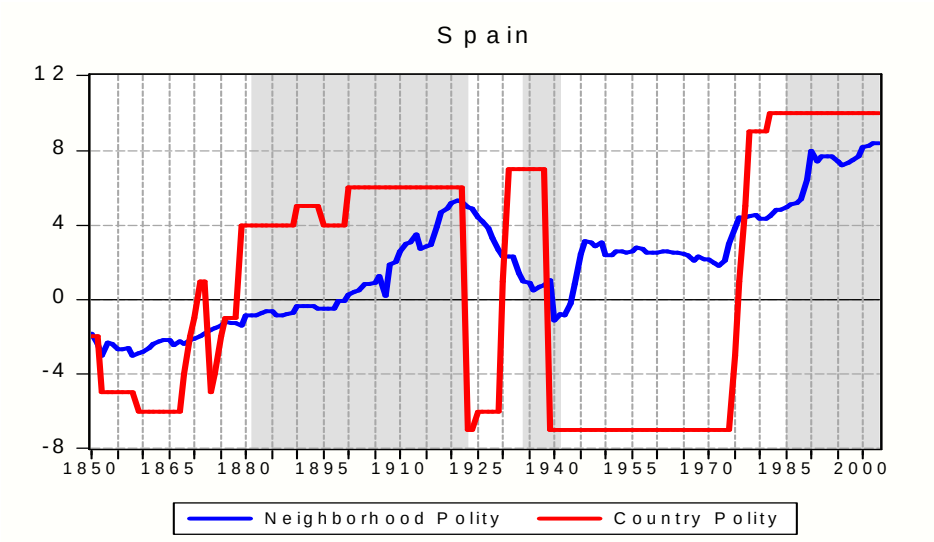


Figure 2.3 –b

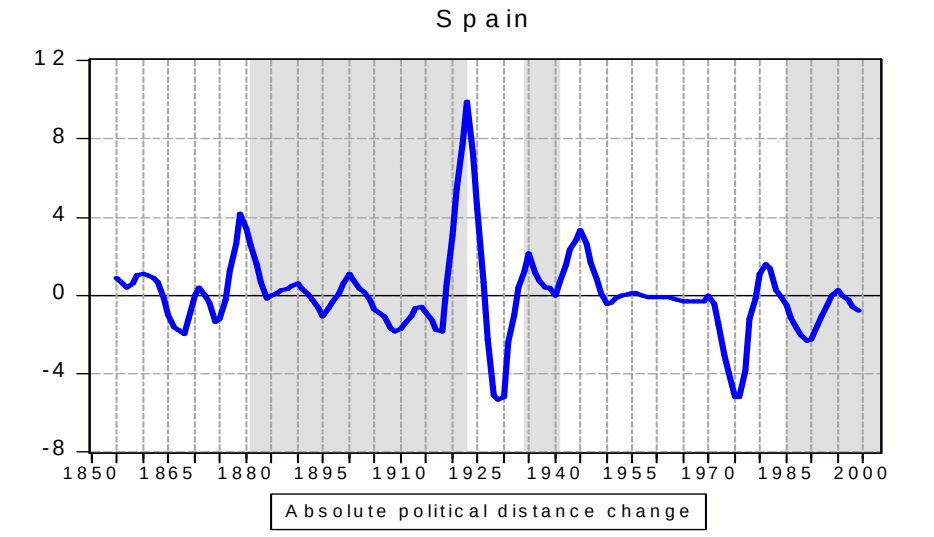


Figure 2.4–a

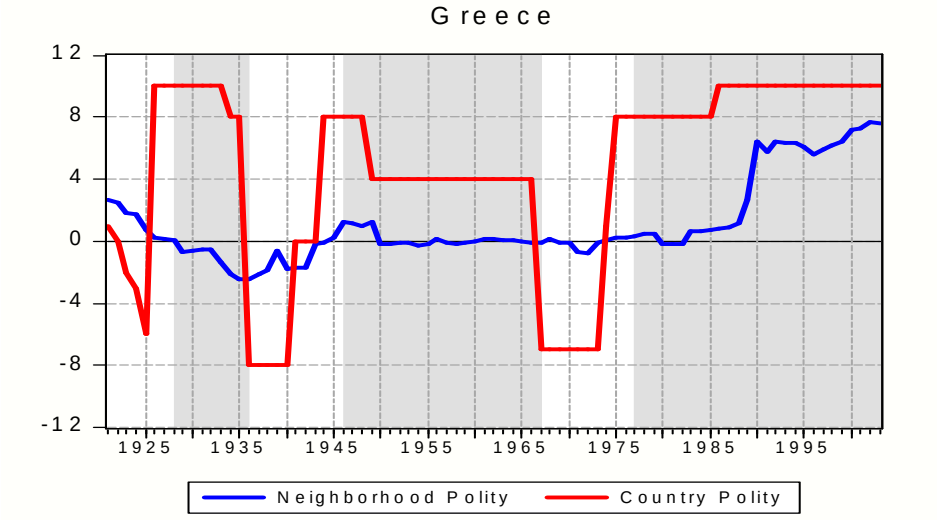
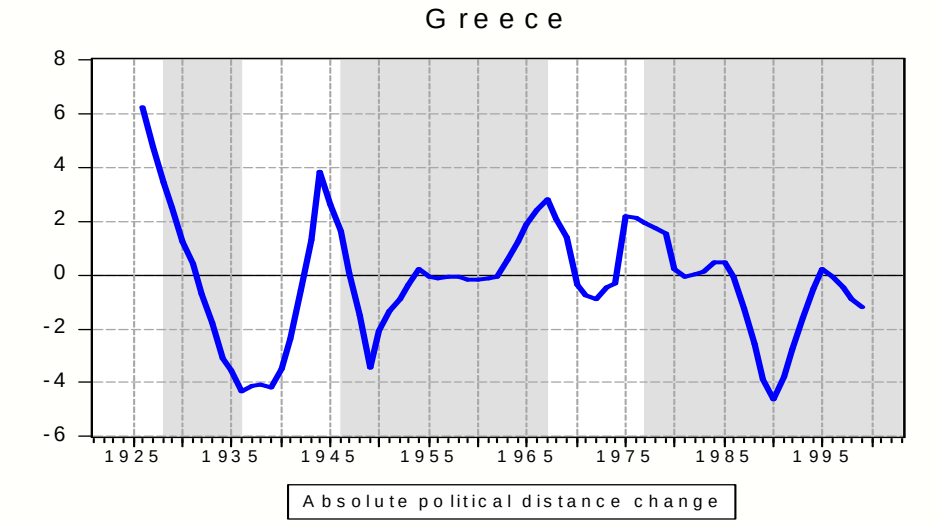


Figure 2.4 –b



Chapter 3. Financial Crises and Economic Growth – The Long Run Perspective

3.1 Introduction

The question of how financial crises impact economic growth has long been debated in the economic literature. The empirical studies have documented significant costs associated with the currency, banking and the twin crises episodes since the 1870s. The studies also find that these financial upheavals have had different impact on the output depending on the type of crisis in question. For example, the stand-alone currency crises are estimated to be the least costly in terms of the output lost. The currency crises are also on average shorter in duration, as compared to for example the twin crises, the combined banking and currency crises episodes. These episodes are found to be the most durable and costly. The stand-alone banking crises typically fall in the mid-range in terms of both duration and the output loss.

Few papers, however, investigated the long-run effect of financial crises on growth – the impact lasting beyond the average crises duration. The aim of this chapter is to fill the gap in the literature, and present a unified framework for empirically assessing the potential positive and negative long-run effects of various types of financial crises on economic growth.

3.2 Review of the Empirical Evidence

The current empirical evidence points unambiguously to the substantial costs associated with financial crises. Typically the costs of crises are represented as the cumulative output losses associated with deviation from the growth trend at the onset of the

crisis until the time GDP growth reverts to the trend. Bordo et. al. (2001) report that output losses associated with financial crises can range from 3.81% of GDP to 15.67% of GDP[35].

The authors estimate the output cost of crises to be the highest during the twin episodes, when currency and banking crises occur simultaneously or follow very closely in each others' wake. The currency crises are determined to be the least costly, while the costs from stand-alone banking crises typically fall in the mid-range. Other measures of crises costs have also been introduced. Some studies have focused particular attention on estimating the fiscal costs of banking sector bailout and growth shortfall associated with banking crises.[36]

According to the evidence, longer crises typically mean more severe output losses for the economy.[37] In addition, when the severity and duration of crises for both the industrialized countries and emerging markets are assessed, the emerging markets seem to

[35]Bordo et. al. (2001) report that during the first era of financial globalization, the period from 1880 to 1913, financial crises (currency, banking and twin crises) on average were associated with 9.8% of cumulative output loss. The second era of financial globalization, 1973-1997 was associated with the average of 8.3% cumulative GDP loss. Of these crises twin crises were the most damaging, averaging 14.5% output loss prior to 1914 and 15.67% after 1973. Currency crises were least damaging of the three types, averaging 8.31% cumulative loss prior to 1913 and 3.81% after 1973. The output losses from financial crises reported by G. Kaufman (1999) follow a similar pattern – twin crises after 1975 are the most damaging, with 14.4% cumulative output loss, while currency crises are the least damaging with 4.3% output loss.
A recent paper by Hutchinson and Noy (2006) distinguish between various types of balance of payments crises. The authors estimate the output costs of currency crises, the sudden stop episodes and capital inflow reversals. They find that while currency crises are associated with 2-3% output drop, while a sudden stop reduces output by further 6-8%. The cumulative cost of a sudden stop episode is 13-15% over a 3 year period.

[36] Reinhart and Rogoff (2008b) report that bailout costs are difficult to pinpoint, and difference in estimates can be as wide as 51% of GDP, depending on the methodology used. Frydl (1999) estimates that growth shortfall during the crisis can be substantial. The difference between average growth rate 10 years prior to the crisis and the average growth rate during the crises can reach 4.22% for a 7 year long crisis.

[37] The average recovery from various types of crises has been summarized in Bordo et al (2001), Eichengreen and Bordo (2002) and Kaufman (1999). According to the evidence from twin crises lasted on average between 3.2 and 3.8 years since 1973 and 2.2 years prior to 1914. Currency crises lasted on average between 1.6 and 2.1 years since 1973 and 2.6 years before 1914. Banking crises duration once again fell in the mid range – between 2.6 and 3.1 years in the second era of globalization as compared to 2.3 years prior to 1914.

experience deeper crises (higher cumulative output losses) but shorter recovery times [38] than their industrialized counterparts.

Recent studies, however, have emphasized the positive aspects of the financial upheavals. Viewed in this light, the crises are a common byproduct of financial liberalization episodes. To the extent that the countries' institutions are weak in the years following liberalization, occasional crises might be expected. However, the cost of the occasional crises is potentially outweighed by the benefits of relieving the credit constraint. This view in particular has been articulated in Ranciere, Tornell and Westermann's (RTW) widely sited paper "Systemic Crises and Growth" (2008). The authors argue that credit constraints generated by weak institutions may lead to financial bottlenecks and low growth, whereas financial liberalization and explicit or implicit bailout guarantees in the case of a systemic crisis may lead to higher risk taking, credit growth, and alleviation of the financial bottleneck.

The authors are careful to point out that crises in themselves are not good for growth. Rather they are a common feature of financial liberalization process. In addition, systemic risk-taking is growth enhancing only in countries where institutions are "weak but not too weak" – suggesting that in the countries with initially low contract enforceability financial constraint cannot be alleviated enough in good times to compensate for the high cost of crises.

Empirically, RTW (2001) estimate that lower credit skewness is associated with higher long run GDP growth. In other words, the countries which had been subject to

[38] Eichengreen and Bordo (2002) Reinhart and Rogoff (2008c)

occasional significant declines in credit, have also experienced higher average growth rates in the period from 1960-2000. These results are also supported by the empirical findings[39] that financial boom and busts cycles are severe in the early years following financial liberalization, but with time become less pronounced in the liberalized economies.

The argument that crises may pave the way to enhanced growth in the future is an intriguing one, due in part to powerful policy implications: setting up institutions in a way that encourages risk-taking may put a country on a higher growth path, help perfect financial institutions, and alleviate credit market imperfections in the long run. In the same time, the debate raises important questions, hitherto rarely addressed in the empirical literature, about a long-term impact of financial crises on growth, beyond the typical measures of crisis duration.

The empirical studies so far have focused either on the classification of financial crises based on their duration and the associated output losses in different historical periods[40], or, as RTW (2001), looked at the average growth rates for nations which experienced significant downturns of credit availability (associated primarily with banking crises). In this context, it is important to systematically address the possibility of both positive and negative long-term effects associated with different types of financial crises.

Another question suggested by the current research is the possible differences in the way crises might have affected the economy in different historical periods (namely, the Gold Standard period between 1870-1913, as well as the inter-war period and the post WWII years).

[39] Kaminsky and Schmukler, 2007

Some studies, including Goodhart and Delargy (1998), McKinnon (2000), McKinnon (1996) maintained that during the Gold Standard era (unlike in the Bretton Woods or post-Bretton Woods periods) countries adhered to the so called "resumption rule" – the implicit commitment to return to the original pre-crisis exchange parity with gold. This implicit rule arguably facilitated the return of gold flows, as the investors took advantage of the decreased asset prices. Eichengreen and Bordo (2001), however, point out that despite the existence of the resumption rule, currency crises prior to 1914 were deeper and of longer duration than the currency crises in the post-WWII era.

This chapter investigates how the long-run impact of currency crises (as well as banking and twin crises) differed in the different eras of financial development as well as discusses the possible reasons behind the Eichengreen and Bordo findings.

3.3 Methodology

3.3.1 Estimating the effect of crises on growth takeoffs and growth collapses

One of the ways to gauge the long-run effect of financial crises is to assess whether they are associated with the long-term events in the country's growth history – growth takeoffs as well as growth collapses.

Growth takeoffs are defined as sufficiently long periods (8 years or above) during which the country's average growth rate is significantly higher than its historical rate of growth. The takeoffs are relatively rare in a country's overall economic history, yet focusing on these events in the context of crises is particularly important, The takeoffs are

[40] Bordo et. al. (2001)

seen as the turning point episodes that can put the country on a higher growth path and help avoid the poverty trap.[41]

Equally important are the episodes of growth collapses, defined as the prolonged periods of below-average growth, which can suspend the country's economic progress, stifle technological development and contribute to the income divergence with the rest of the industrialized world.

At first I will consider the formal way to identify both growth takeoffs and growth collapses.

3.3.1.1 Identifying growth takeoffs

Several prior studies have proposed ways to identify takeoff episodes. Jones and Olken (2005), for example, use the Bai-Perron structural break method to define both the up- and down-turns. The problem with using this method is the inclusion of many pseudo-takeoffs, which are simply recoveries from bad shocks. Hausmann, Pritchett and Rodrik (2005) propose a method which eliminates the episodes of pure recoveries. This method, however, has limitations insofar it cannot be applied in the historical context. The HPR method adapted to accommodate historical data is based on the following conditions[42]:

1) $g_{t, t+n}$, defined as the average forward looking growth rate at time t over horizon n (typically set to be 8 years) must be at least 1 standard deviation above the mean growth rate up to time t. This condition ensures that the growth is rapid and above average based on the country's own growth experience.

[41] Hausmann, Pritchett and Rodrik (2005).

[42] For the detailed discussion and comparison of the two methods see Chapter 1 of the dissertation.

2) $\Delta g_{t,\,t}$ (defined as the difference between the forward looking 8 year average at time t and the 8 year average growth preceding time t) must be greater that the average growth rate of countries in the top 50^{th} income percentile. This condition ensures that growth is accelerating – i.e. rules out the cases when the growth improves only slightly compared to a very low level of growth in the past.

3) y_{t+n} defined as level of GDP per capita at the end of the 8 year window starting from time t must be higher than any value of GDP per capita in the years prior to time t. This condition rules out pure recovery episodes.

In the event that several consecutive years are thus identified as the possible rapid growth initiation years, a linear spline regression is fitted through the log GDP series with a break in one of the years in question. The spline regression with the best fit (highest F statistic) determines the growth takeoff initiation year.

3.3.1.2 Identifying growth collapses.

Very few papers have tried to empirically identify growth collapses. The Bai-Perron structural break method could be employed, except that as in the case of takeoff, one is in danger of identifying pseudo-collapses, the periods of economic cool-down, following the burst of a speculative bubble or a short-term boom with unsustainable initial growth rates. These episodes may ultimately turn out to be growth collapses, however not necessarily so.

In a recent paper, Becker and Mauro (2006) analyze the "output drops" – collapses in output which are defined as events "starting in the year of a decline in GDP per capita

and ending when GDP per capita returns to its pre-event level"[43]. In order to rule out the drops associated with temporary growth booms, the authors set additional set of restrictions: output drop must last at least 2 years and the total loss of output must be at least 5% of the pre-event GDP. Such definition is likely to capture many smaller events - recessions, which may not be necessarily prolonged, given a 2 year time window. Therefore, they would not capture the long-run effect of financial crisis on growth.

For the sake of the consistency of the results, the methodology for identifying an output collapse follows closely HPR historical method for identifying takeoffs.

The year of the initiation of an output collapse is defined using the following set of conditions:

1) The average growth rate in a country from time to time t+n (typically an 8 year window) must be at least one standard deviation below the historic average growth rate for that country prior to time t.
2) The output in one of the final three years of the 8-year window following time t, must be less or equal to the minimum output in the preceding decade.

As before, the year of the initiation of a growth collapse is determined via a spline regression with a break in each of the candidate years.

The first condition ensures that the period of low growth is prolonged and results in below-average growth for a given country. The second condition ensures against counting growth collapses which were followed by periods of high growth and a complete recovery of output towards the end of the 8 year window.

[43] Becker and Mauro (2006) , p.10

The GDP series with the years of collapse for select countries are presented in the appendix.

3.3.2 The Base Model

The base model for estimating the long-term effect of crises on growth takeoffs and growth collapses is the distributed-lag random effects probit model of the following form:

$$Y_{it} = \alpha + \beta_1' D_{i,t-1} + \beta_2' \sum_{k=1}^{n} Z_{i,t-k} + \beta_2' (\sum_{n}^{d} Z_{i,t-n+1})/d + \beta_3' \overline{Z}_{t-1} + (u_i + e_{i,t}) \qquad (3.1)$$

Y_{it} – is a binary indicator which takes the value of 1 in the year of a growth takeoff (or growth collapse) initiation, as well as years t-1 and t+1 around the initiation year.

$D_{i,t}$ – the dummy variables in the regression. The crises indicator takes the value of 1 in the year of the financial crisis (and the year t-1 and t+1 around the crisis episode). The war control dummies take the value of one in the years 1907-1918 and 1932-1945. The reason for extending the set of war dummies is to control for possible years of output collapse (or output takeoff) initiation due to the two world wars of 1914-1918 and 1939-1945. For the same reason the Great Depression dummy variable takes the value of one in the years 1922-1933.

Z_{it} – other own-country factors potentially contributing to the takeoff (collapse) initiation, such as volume of trade, total government expenditure and investment as a share of GDP and the level of a country's polity (measure of political development).

These variables enter the regression with lags to partially control for endogeneity. The distributed lags (the lagged 3 or 4 year averages of variables) of total government expenditure and the GDP level capture the cumulative effect of these variables on takeoff and collapse probabilities, the effect which is manifested over several periods.

$\overline{Z}_{t-1}$ - the time averages of continuous variables used to control for the time specific effects in the regression in lieu of year dummies.

3.4 Data and Results

3.4.1 Summarizing growth takeoffs and growth collapses

The data is a panel of 61 of countries from 1820-2003. In various years some countries enter and some exit the dataset, such that there are at most 57 countries in any given year.

The countries can be grouped into 4 main regions: Western Europe – 15 countries[44] account for about 46% of all country – year observations, Eastern Europe – 24 countries (11 countries until 1990) account for 19% of all country-year observations ; the Americas[45] - 10 countries account for 22.5% of observations ; Asia and Oceania – 8 countries account for 12.5% of all country-year observations.

Tables 3.1 and 3.2 summarize the number of growth takeoff and growth collapse episodes by region and time period. The time periods roughly correspond to the pre-World War I years, encompassing the first era of financial globalization and the Gold Standard from 1870 to 1913, The World War I and the inter-war period prior to 1939; World War II and the Bretton Woods era, as well as post-Bretton Woods period from 1974 to 2003.

Overall there are 76 episodes of growth collapses, the earliest collapse initiation year occurring in 1854 (Netherlands) and the last one in 1996 (Argentina, Uruguay and Venezuela). There are 154 episodes of growth takeoffs the earliest occurring in 1842

[44] For the list of countries see data appendix

(Denmark, Sweden, United Kingdom), the latest growth takeoffs taking place in 1996 (Sweden, Hungary, Albania, Canada, Spain).

The majority of growth collapses happened before World War II: 33% prior to 1914, and 30.3% in the World War I and the inter-war years prior to 1939. The takeoff occurrence, on the other hand was just slightly above 50% prior to 1939, with about 47.5% taking place after World War II.

Most of the takeoffs – 50.6% took place in Western Europe, with only 10.4% in Eastern Europe, and 10.3% in Asian and Oceania. The Americas accounted for 28.6% of all takeoff episodes. Western Europe also accounted for 39.5% of all growth collapses (less than the share of country-year observations for this region), while Eastern Europe accounted for 19.7% of all collapse episodes. The America's share of growth collapses is 31.6%, Asia and Oceania accounted for 9.2% of all growth collapses.

3.4.2 Crises and takeoffs

Table 3.5 (a -b) reports the coefficients and the marginal effects of the base model regression respectively, with the takeoff initiation year as the dependent variable. The marginal effects (Table 3.5b) represent the percentage change in probability associated with one standard deviation increase from the estimated sample mean (for continuous variables); with the increase from 0 to 1 (for dummy variables); or with 1 point increase from the mean (for polity index variables) .

The crises are classified according to Eichengreen and Bordo (2002) financial crises dataset. Since Eichengreen and Bordo classification does not start until 1870s, the

[45] Including Latin America, Canada and the US.

regression sample period also begins in 1870. The crises enter regression with 2 or 3 lags. The choice of the lag structure is motivated by the fact that all types of crises are typically damaging in the short run. The GDP per capita would not reach the local minimum until a short time after the crisis.

The results (Table 3.5(a-b), columns 1 and 2) for the entire sample show that currency crises are significant positive predictors of growth takeoffs. This result is interesting, as it supports the idea that crises, damaging as they are in the short run, may be paving the way to growth-spurs in long-run.[46] The result appears to be in unison with the Ranciere, Tornell and Westermann's idea that crises can be predictor of growth in the long run, although RTW (2001) emphasized the credit constraint easing properties of the banking crises, rather than the currency crises.

In particular, a currency crisis increases the probability of a growth takeoff by 3.1-3.8%. This is significant, considering that the unconditional probability of a takeoff for the base model's sample is approximately 8.75%.

The coefficients on the banking crises are positive, but not significantly different from zero. The twin crises' (3^{rd} lag) effect on takeoffs is, on the other hand, statistically significant and negative. This result is consistent with the fact that twin crises are typically the most costly and protracted of all three types of crises. This result suggests that twin crises, although commonly preceded by growth in credit availability and investment

[46] Gupta, Mishra, Sahay (2006) using the sample from 1970-2000 showed that about 60% of currency crises are contractionary in the first tranquil years, while 40% of the currency crises in that period are expansionary. The authors, however, do not discuss the behavior of output following the currency crises in the long-run. Using a comparable sample, Milesi-Ferretti, Razin (1998) report that output growth on average recovers in the 3 years following a currency crash; and the post-crisis growth is higher in countries more open to trade, as well as in countries which exhibited higher output growth rates before the crisis.

booms, may do little to promote higher growth in the future, and would dampen rather than stimulate the economic activity in the long-run.

The estimation shows that a twin crisis episode initiated 3 years prior to time t, reduces the probability of a growth takeoff in time t by about 2.74%.

When the sample is further subdivided into different time periods (i.e. the Gold Standard years (controlling for World War I and the Great Depression years); The Bretton Woods period, and the years since the oil shock of 1973-1974), interesting results emerge. In particular, during the Gold Standard years the coefficient on currency crises is negative and significant, suggesting that during this particular period currency crises were strong negative predictors of takeoffs. This result is consistent with Bordo et. al (2001) finding that currency crises during this period were more severe and lasted on average longer than their mid-20th century counterparts. In the same time, currency crises during the Bretton Woods era and the post-oil shock years are strong positive predictors of growth takeoffs. For example, during the Gold Standard era (including the inter-war period, but controlling for the years of World War I and the Great Depression) a stand-alone currency crisis ***reduced*** the probability of a growth takeoff by 8.04%, while a currency crisis from 1946 on ***increased*** the probability of a growth takeoff by approximately 3-4%. [47]

Certain features of the international monetary system suggest an explanation to this result. In the 1993 article "The Rules of the Game" R. McKinnon describes the various salient features of the monetary system under the Gold Standard versus the Bretton Woods

[47] Interestingly, the banking crises in the post World War II era are also strong predictors of growth takeoffs (associated with a 7.1% increase in the probability of a takeoff). This result confirms the empirical findings of Ranciere Tornell and Westermann (2008)

system. He points out that during the Gold Standard years, if the official parity to gold had been temporarily suspended, the convertibility was usually restored at the original parity as soon as possible. This is the so called "resumption rule" of the Gold Standard period. During the Bretton Woods system, on the other hand, the long-run exchange rate was not expected to return to the original parity with the anchor currency.

The Bretton Woods system called for maintaining the par value of the currency "only in the short run, leaving open the possibility that exchange rates could change substantially in the long run"[48]. Does the difference between the two "rules of the game" help explain the difference in the currency crises coefficients during these different periods?

Goodhart and Delargy (1998) argued that the resumption rule would have a positive effect on growth, as the expectation of the return to the original parity would restore the capital flows quickly. The countries could thus avoid the burden created by the currency mismatch prior to the crisis. Bordo et. al (2001), however, have pointed out that this idea runs contrary to the empirical evidence, at least in the case of currency crises. The results suggest that the lack of commitment to the long-run parity may have produced beneficial effects on growth following a stand-alone currency crisis. The lack of commitment to the original parity in the long run could have helped to align the currency value and the interest rates more closely with the fundamentals, and allow the automatic stabilizer effects to set in.

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[48] McKinnon (1998) p.14

Thus, the difference in the "rules of the game" may explain the difference in the long-run impact of currency crises on output growth "then" and "now".

3.4.3 Testing the "rules of the game" hypothesis

One way to test whether implicit financial system "rules of the game" played a role in changing the way financial crises impact long run growth, is to examine the trajectory of export and import growth in the years prior to and after the currency crises.

From a theoretical standpoint, a "resumption rule" of the Gold Standard era could have contributed to the misalignment of the nominal exchange rate with its long-run value, and consequently to the overvaluation of the real exchange rate and the slowdown in export growth. To see this, consider the standard textbook definition of the real exchange rate (i.e. the price of the domestic good in terms of the foreign goods):

$$q = \frac{P}{EP^*} \tag{3.2}$$

Where q is the real exchange rate defined as the price of a domestic good in terms of foreign goods; P is the domestic price level; P* - foreign price level; E – nominal exchange rate defined as the price of one unit of foreign currency in terms of the domestic currency. Thus an increase in E (nominal depreciation of the domestic currency) would lead to a decrease in q – real depreciation, or the lowering of the value of a domestic good in terms of foreign goods.

According to the relative purchasing power parity condition the change in q is zero in the long run. Either a change in the nominal exchange rate or the price level would cause q to deviate from its long run level. Thus, a currency crisis (an increase in E) initially causes real depreciation – lowering of the value of domestic goods vis-à-vis the foreign

goods. The depreciation would cause increase in exports and inflow of foreign capital (gold) into the country. The domestic price level would then trend up, restoring the real exchange rate to its original value. However, if the monetary authorities strive to restore the original parity with gold, and E declines, the real exchange rate would appreciate as a result, and consequently lead to a drop in exports/ increase in imports. The effect on the domestic price level in this case would remain ambiguous. On one hand, real appreciation should lead to the outflow of gold and the eventual decrease in the price level. However, in accordance with the argument by Goodhart and Delargy (1998), the expectation of the return to original parity is likely to lead to the restoration of capital flows into the country. This could for some time prevent the domestic price level from falling in response to real appreciation of the domestic currency.

In order to test whether the "resumption rule" during the Gold Standard era may have stalled the growth of exports in the aftermath of the currency crisis, I examine the trajectory of export and import growth around the currency crises episodes. I compare the results for the period prior to 1933 (controlling for World War I years and the Great Depression).

3.4.4 Exports and Imports growth around the crises episode.

Table 3.7 summarizes the import and export growth in different time periods – in terms of deviation from the historical mean. The quantities in rows I, II and III represent the deviation of the forward looking 5 year average export (import) growth rate from the mean, and can be calculated according to the following formula:

$$\left\{1/5\sum_{t}^{t+4}\exp(imp) - 1/t\sum_{t=0}^{t}\exp(imp)\right\}_{Crisis_{t-1}} \qquad (3.3)$$

i.e. the difference between a 5 year forward looking average of export(import) growth (from time t to t+4) and the historical growth rate (average growth rate of exports(imports) from time t= 0 to t) ***conditional*** on the currency crisis occurring at t-1.

For tranquil times the same formula is used – excluding the years of the crisis as well as one year before and after the crisis.

$$\left\{1/5\sum_{t}^{t+4}\exp(imp)-1/t\sum_{t=0}^{t}\exp(imp)\right\}_{Tranquil_{t-1}} \tag{3.4}$$

The results show that export growth in the 5 years after currency crises was above the historical mean by about 4.3% for the entire sample. During the Gold Standard era, however, the deviation of export and import growth from the mean is indistinguishable from zero. In the same time, the post-currency crises export growth was positive and significant at 5.6% above the mean in the years after World War II. The post-currency crises import growth is around 4.2% above the mean during this time period.

Moreover, in the years after 1946, the post-currency crises export and import deviation from the mean are significantly above the equivalent measures during the tranquil times – i.e. the difference between equations (3.3) and (3.4) is significantly greater than zero for both exports and imports. The same is not true for the Gold Standard period.

These results may be interpreted as the evidence that the precipitant return to the original parity with gold, i.e. the "resumption rule" during the Gold Standard era, may not have allowed exports to recover after a currency crisis episode in the same way they did during the Bretton Woods period as well as during the post- Bretton Woods years.

However, in accordance with Goodhart and Delargy (1998) argument, the resumption rule may have benefited economic growth in the aftermath of the twin crises

episodes. The expectation of a return to the original parity with gold could have had a positive effect on the capital flows from abroad, making the impact of twin crises less severe. The evidence can again be found by comparing the export and import growth rates in the years after the twin crises in the two periods. During the Gold Standard years, exports recovered more quickly in the aftermath of a twin crises, as compared to the post World War II period. The significant drop of import growth in the aftermath of twin crises is once again associated with the post World War II era, but not the Gold Standard era. The drop in imports is likely to have been precipitated by the drying up of capital flows from abroad. This result goes hand in hand with the findings of Bordo et al (2001), which showed that twin crises were less severe during the Gold Standard era, as compared to the post World War II years.

3.4.5 Other determinants of growth takeoffs.

Table 3.5 (a-b) also summarizes the effects of other economic variables on the probability of growth takeoffs. The results presented in the table are consistent with the theory. For example, in the overall sample, the higher volume of trade in the previous period helps predict the takeoff episode, while higher government expenditure reduces the probability of the takeoff initiation. In particular, a one standard deviation increase of the volume of trade from 47% of GDP to 86.7% of GDP increases the probability of a growth takeoff by as much as 10.3%. A more modest increase in the volume of trade from 47% to 57% of GDP (roughly equal to the change in the volume of trade in Thailand from 1983 to 1987) increases the probability of a takeoff by nearly 2%. A one standard deviation increase in the country's own total government expenditure over 3 years period from 19% of GDP to 32% of GDP (roughly equivalent to the change from the level of total

government expenditure in Portugal in 1995 to the level of Ireland in the same year) reduces the probability of a takeoff by about 2.1%. Once again, the results are economically significant, given that the unconditional probability of a takeoff is about 8.75%

Coefficient on country's investment is negative and significant, possibly capturing the negative effects of the investment booms. For example, and increase in the investment share of GDP from 19% to 26% (level of Brazil in 1969 to Brazil in 1974) reduces the probability of a growth takeoff by nearly 5%. The country's polity score (the level of democratization) is a positive and significant predictor of growth takeoffs, pointing to a beneficial role of stronger representative political institutions, even though the impact of institutional change on growth is quantitatively small – a 1 standard deviation increase in the country's own polity score (from 3 points – Portugal in 1975 to 10 points – Portugal in 1982) increases the probability of a takeoff by about 1.89%.

3.4.6 Crises and collapses

Table 3.6 (a-b) presents the results of the base model regression, where the dependent variable is the growth collapse episode. Unlike the growth takeoffs, growth collapses depend mostly on the external factors – such as wars, global economic shocks and growth rates in the global financial centers. Notable exceptions are the coefficients on the country's own investment as a share of GDP (Investment), total government expenditure (TGE), and the country's own Polity score – the level of democratization.

As one would expect, both the War dummy and the Great Depression dummy variables have coefficients that are positive and highly significant, increasing the likelihood of a growth collapse by 16.6% and 18.7% respectively. The coefficient on twin crisis

initiation year dummy is positive but insignificant in the base model specification. This is primarily due to the inclusion of the dummy variables capturing the two world wars and the Great Depression, including the seven years prior to their start.

In Table 3.6 (a-b) columns 7 and 8, US and UK interest rates and growth rates are added as additional controls for the external economic conditions. The inclusion of these variables is important in light of the empirical studies which highlight the effect of high US (large countries') interest rates on the capital outflows from the rest of the world[49]. According to the argument presented in these studies, high interest rates in large industrialized countries lead to the reallocation of the investors' portfolio and withdrawal of funds from developing and emerging markets. By the same argument, periods of high growth in large industrialized countries would have similar effect on the emerging markets' capital flows.

The inclusion of the UK (before 1913) and the US (after 1913) rates of return and growth rates do not significantly change the results of the basic model. It is worth noting, however, that an increase in the UK/US growth rate significantly increases the probability of a growth collapse for the other countries in the sample.

An increase in the country's investment as a share of GDP from 0.19 to 0.26 in the previous period, increases the likelihood of a growth collapse by 1.8-1.9%. Once again, this result most likely highlights the effect of over-investment in the years prior to a severe economic downturn.

[49] Calvo and Reinhart (1996), Giovanni and Shambaugh (2006)

An increase in the total government expenditure as a share of GDP from 0.19 to 0.32 increases the probability of a collapse by 0.75%. Theses results are consistent with those presented in numerous other empirical studies, which typically documents a negative link between economic growth and the size of the government sector[50].

In the same time, a shift in regime toward democratization - an increase in the country's polity score by 3 points – decreases the probability of a growth collapse by 0.3%. This result is interesting, given that most of the previous studies linking democratization and growth find a positive relationship between the level of democratization and the country's growth outcomes. However, none of the studies discuss the evidence on the possible "protective" effects of democratization.

In the period from 1870-1933, growth collapses were driven primarily by the external factors (Table 3.6 (a-b) columns 3 and 4). In this period none of the country's own characteristics had significant effect on the probability of a growth collapse. The internal factors start playing a role in the period 1980-2003[51]. For example, an increase in the total government expenditure as a share of GDP by one standard deviation from the mean (from 0.27 to 0.4) increases the probability of a growth collapse by 0.038%, whereas an increase in the country's own polity score decreases the probability of a collapse by 0.017%. The twin crises initiation year becomes a positive and significant predictor of a growth collapse

[50] See Barro (1991) and Tavares and Wacziarg (2006) review of the existing literature on the link between growth and the size of the government sector.

[51] The choice of time period is motivated by the focus on the effect of the financial crises on growth collapses. The twin crises were very rare between 1946 and 1980, whereas no banking crises occur during that period.

in this period. For example a twin crisis in the previous year increases the probability of a growth collapse by 0.32%[52].

Interestingly, while approximately half of the twin crises episodes occurred during the Gold Standard years, the regression results suggest that the aftermath was not as damaging. The twin crises might have been reducing the probability of a growth takeoff, but were not increasing the probability of a growth collapse, unlike the twin crises after 1980s. This long-run result is once again, consistent with the findings of Bordo et al (2001) on the depth and duration of the twin crises in different eras. This might have been due, once again, to the difference in the monetary systems, the "rules of the game" described by McKinnon (1988). The resumption rule of the Gold Standard era would have mitigated the effect of the banking crisis occurring simultaneously with the currency crisis, restoring the capital flows and minimizing the crippling effect of the currency mismatch on the banking system.

3.5 Conclusion

The chapter provides additional insights into the effect of financial crises on long-term growth. One of the main results of the chapter is that the various types of financial crises affect long-term growth differently. While currency crises may help pave the way to a growth spur in the future, the twin crises episodes are likely to significantly dampen the economic activity for many years to come.

[52] Currency crises and/or banking crises are excluded from the regression (Table 3.6 (a-b) column 5 and column 6) due to large standard errors of their estimated coefficients. The instability of the coefficients is likely due to the fact that no currency or banking crises have preceded growth collapses during the period 1980-2003 (at 2 lags) and no banking crises have occurred before the growth collapses (at 3 lags) during this period.

In previous studies the focus was mainly on the output costs associated with various types of crises. The result that crises can help predict growth takeoffs is in line with more recent theoretical models and empirical findings, where crises are seen as a by-product of financial liberalization. The financial openness helps ease the credit constraint and promotes long-run growth, while weak institutions in the initial periods of liberalization result in the higher incidence of financial crises. Thus, countries which experience occasional crises grow faster in the long run. The results put forward in this chapter, however, caution that different types of financial crises are not likely to have the same effect on growth. The combination of banking and balance of payments problems in a financially liberalized economy can be potentially damaging even in the long run.

Another result of chapter is that the long-run effects of crises were different in the different historical eras of financial development. For example, during the Gold Standard era currency crises were strong negative predictors of takeoffs, while the opposite was true for the Bretton Woods period and the post oil shock period of 1975-2003.

One of the possible reasons could be the existence of the resumption rule during the Gold Standard era, whereby the countries implicitly committed to restoring in the long-run the original parity of their currency with gold. While the existence of the resumption rule could have restored the capital flows more readily and mitigated the possible effects of currency mismatches, the same rule may have contributed to a longer duration and bigger damage from the stand-alone currency crises.

Since the World War II, however, countries no longer committed to the long-run parity to the anchor currency or to gold, which allowed the exchange rate and interest rates

to align more closely with the fundamentals and set in motion the automatic stabilizer effects of investment and trade.

The chapter presents some evidence in support of the hypothesis outlined above. In particular, I find that during the Gold Standard period, export and import growth did not significantly deviate from their historical mean following a currency crisis. During the Bretton Woods and post-Bretton Woods periods, however, export growth was nearly 5.6% above its historical mean in the years following the currency crisis, as well as significantly above the average export growth in tranquil times.

One of the results of the chapter is that the twin crises in the modern period were significant predictors of growth collapse episodes. This was not true of the Gold Standard era. The evidence is in line with other empirical findings in the literature, which indicate that twin crises were shorter, and less severe during the Gold Standard years. The result might be due to the differences in the monetary system rules during these historical periods. The lack of long-run parity commitment would have hindered the return of capital flows and made currency mismatch problems more onerous for the countries' banking systems.

Chapter 3 Appendix

Data Coverage

There are overall 61 countries in the dataset. Since some European countries leave the sample as others enter, there are at most 54 countries in the sample in any given year.

Western/Northern Europe: United Kingdom, Ireland, Netherlands, Belgium, France, Switzerland, Spain, Portugal, Prussia, Germany, Austria, Italy, Finland, Sweden, Norway, Denmark.

Eastern Europe/Central Asia: Poland, Hungary, Czechoslovakia, Czech Republic, Slovakia, Albania, Macedonia, Croatia, Yugoslavia, Serbia-Montenegro, Bosnia, Slovenia, Greece, Bulgaria, Moldova, Romania, USSR, Russia, Estonia, Latvia, Lithuania, Ukraine, Belarus, Armenia, Georgia, Azerbaijan, Turkey.

Asia/Oceania: Japan, Thailand, Malaysia, Singapore, Philippines, Indonesia, Australia, New Zealand.

The Americas: United States, Canada, Mexico, Colombia, Venezuela, Peru, Brazil, Chile, Argentina, Uruguay.

Data Sources:

Data used in calculating export and import growth around the crises episodes is from Global Financial Data International Trade database available at https://www.globalfinancialdata.com

All other data - See Chapter 1 Appendix

Table 3.1 Growth Takeoffs.

	Western Europe	Eastern Europe	Americas	Asia and Oceania	Total number	Share of the total episodes
Share of the country- year observations	45.6%	19.3%	22.5%	12.5%		
1820-1914	27	---	8	3	38	24.7%
1915-1938	20	3	16	4	43	27.9%
1939- 1971	22	10	4	5	51	33.1%
1972-2003	9	3	6	4	22	14.3%
Total number	78	16	44	16	154 total episodes	
Share of the total episodes	50.6%	10.4%	28.6%	10.3%		

Table 3.2 Growth Collapses

	Western Europe	Eastern Europe	Americas	Asia and Oceania	Total	Share of the total episodes
Share of the country-year observations	45.6%	19.3%	22.5%	12.5%		
1820-1914	18	---	5	2	25	32.9%
1915-1938	9	3	9	2	23	30.3%
1939- 1971	3	2	2	2	9	11.8%
1972-2003	0	10	8	1	19	25%
Total number	30	15	24	7	76 total episodes	
Share of the total episodes	39.5%	19.7%	31.6%	9.2%		

Table 3.3 Rapid growth episodes Historic Definition (continued on the next pages)

* growth episode occurred within 3 years after a currency crisis
** growth episode occurred within 3 year after a banking crisis
*** growth episode occurred within 3 years after a twin crisis

The Americas	year	average 8-year growth rate
US	1877	0.0402
	1896	0.0380
	1922	0.0249
	1938	0.1178
	1961*	**0.0396**
Canada	1877	0.0446
	1896	0.0567
	1921	0.0576
	1937	0.0894
	1949	0.0252
	1962	0.0365
	1996	0.0279
Mexico	1936	0.0229
Colombia	1923	0.0315
	1933	0.0325
	1943	0.0259
	1967	0.0390
Venezuela	1907	0.0369
	1922	0.1633
	1932	0.0775
	1942	0.1384
Peru	1922	0.0473
	1931	0.0483
	1948	0.0378
	1959	0.0448
Brazil	1905	0.0162
	1916**	**0.0406**
	1931*	**0.0379**
	1945	0.0312
	1955	0.0442
	1967*	**0.0715**
Chile	1922	0.0337
	1974	0.0403
	1990*	**0.0663**
Argentina	1921	0.0264
	1942	0.0323
	1964*	**0.0328**
	1990*, ***	**0.0400**

The Americas	year	average 8-year growth rate
Uruguay	1881	0.0385
	1905	0.0488
	1923	0.0423
	1943	0.0469
	1973	0.0388
	1988*	**0.0258**
	1990	0.0400

Europe West	year	average 8-year growth rate
UK	1842	0.0348
	1893**	**0.0241**
	1910	0.0256
	1922	0.0238
	1936	0.0413
	1950*	**0.0228**
	1982	0.0359
Ireland	1946	0.0308
	1958	0.0401
	1994	0.0840
Netherlands	**1845****	**0.0136**
	1860	0.0187
	1879	0.0259
	1896	0.0114
	1921	0.0382
	1944	0.1357
	1984	0.0236
Belgium	1918	0.0674
	1943	0.0488
	1959	0.0423
France	1853	0.0262
	1887	0.0225
	1906	0.0239
	1918	0.0801
	1932**	**0.0222**
	1944	0.1291
Switzerland	1883	0.0325
	1892	0.0275
	1918	0.0486
	1943	0.0650

Europe West	year	average 8-year growth rate
Portugal	1880	0.0236
	1894* **	**0.0271**
	1918	0.0381
	1942	0.0273
	1959	0.0597
	1984*	**0.0524**
Germany	1923	0.0524
	1932* **	**0.0700**
	1951*	**0.0711**
Austria	**1922** **	**0.0406**
	1934	0.0657
	1950	0.0664
Italy	1881	0.0157
	1902	0.0432
	1911	0.0540
	1933 **	**0.0303**
	1945	0.0965
Spain	1870	0.0365
	1896	0.0251
	1920	0.0230
	1950	0.0454
	1960*	**0.0812**
	1984	0.0405
	1996*	**0.0388**

Europe East/South	year	average 8-year growth rate
Poland	1992	0.0558
Hungary	1948	0.0446
	1956	0.0495
	1996	0.0455
Czechoslovakia	1934	0.0587
	1953	0.0543
Yugoslavia	1932	0.0335
	1943	0.0591
	1957	0.0563

Europe East/South	year	average 8-year growth rate
Greece	1931	0.0319
	1963	0.0680
Bulgaria	1945	0.0924
	1956	0.0707
Romania	1960	0.0597
USSR	1942	0.1128
Albania	1996	0.0577

Europe North	year	average 8-year growth rate
Finland	1868	0.0231
	1892	0.0386
	1918*	**0.0712**
	1931*	0.0541
	1948	0.0381
	1958	0.0478
	1967	0.0561
	1993* **	**0.0416**
Sweden	1842	0.0143
	1853	0.0264
	1867	0.0450
	1891	0.0246
	1923	0.0395
	1932* **	**0.0479**
	1958	0.0446
	1996	0.0284
Norway	1909	0.0317
	1926	0.0293
	1944	0.0661
	1991	0.0375
Denmark	1842	0.0214
	1921	0.0255
	1941	0.0447
	1958	0.0421

Asia/Oceania	year	average 8-year growth rate
Japan	1888	0.0304
	1914	0.0433
	1934*	0.0545
	1951	0.0629
	1960	0.0839
Thailand	1961	0.0520
	1986**	0.0885
Malaysia	1972	0.0564
	1987**	0.0689
Singapore	1966	0.1118
	1958	0.0421
Indonesia	1967	0.0766
	1988*	0.0606
Australia	**1918***	0.0277
	1931	0.0451
New Zealand	1899	0.0316
	1932	0.0668

Table 3.4 ***Growth collapses***
(continued on the next page)

*** growth collapse episode occurred within 3 years after a currency crisis**
**** occurred within 3 year after a banking crisis**
***** occurred within 3 years after a twin crisis**

The Americas	year	average 8-year growth rate	Europe West	year	average 8-year growth rate
US	1927	-0.0517	UK	**1915***	**-0.0296**
Canada	**1916***	**-0.0368**	Netherlands	1854	-0.0046
	1927	-0.0600		1889	-0.0077
				1911	-0.0180
Mexico	1926	-0.0464		1928	-0.0268
	1981	-0.0206		**1938***	**-0.1023**
Venezuela	1978	-0.0416	Belgium	1912	-0.0434
	1996***	**-0.0302**		**1937*****	**-0.0372**
Peru	**1978***	**-0.0213**	France	1912	-0.0422
	1986***	**-0.0507**		**1938***	**-0.0953**
Brazil	1887	-0.0354	Switzerland	1861	0.0002
	1926**	**-0.0030**		1911	-0.0197
Chile	**1908****	**-0.0164**	Spain	1863	-0.0116
	1916**	**-0.0175**		1890	-0.0058
	1926**	**-0.0592**		**1932*****	**-0.0575**
	1970	-0.0321			
			Portugal	1901	-0.0058
Argentina	**1910***	**-0.0449**		1912	-0.0119
	1927	-0.0251			
	1978*	**-0.0213**	Germany	1912	-0.0381
	1996***	**-0.0231**		1941	-0.1375
Uruguay	1894	-0.0296	Austria	1912	-0.0570
	1910	-0.0362		1928	-0.0434
	1927	-0.0427		1940	-0.1180
	1956	-0.0165			
	1996	-0.0240			

Europe East/South	year	average 8-year growth rate
East Germany	1983	0.0059
Poland	1976	-0.0176
	1986	-0.0296
Hungary	1940	-0.0679
	1987	-0.0384
Czechoslovakia	1928	-0.0355
	1985	-0.0197

Asia/Oceania	year	average 8-year growth rate
Turkey	1938	-0.0580
Japan	1888	0.0304
Philippines	1980	-0.0314
Indonesia	1960	-0.0147
Australia	1912	-0.0149
	1925	-0.0366
New Zealand	1877	-0.0170
	1926	-0.0160

Table 3.5-a (columns 1-4)

Base Model Results (Coefficients)

Crises and Takeoffs

Dependent variable: rapid growth episode 0-1	All years 1870-2003		1870-1933 Gold Standard[53]	
	1	2	3	4
	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis
Currency crisis (lag)	**0.206†**	**0.248***	**-1.163***	-0.534
Banking crisis (lag)	0.077	0.248	-0.141	0.172
Twin crisis (lag)	-0.259	**-0.313†**	**-0.840***	**-0.653†**
War Dummy	0.052	0.050	0.369	0.197
Great Depression dummy	0.072	0.055	-0.197	-0.395
Volume of Trade(t-1)	**1.364***	**1.413***	-0.166	-0.424
Volume of Trade(t-2)	-0.950	-0.986	1.348	1.574
Investment(t-1)	**-7.547*****	**-7.622*****	-4.836	-3.512
Investment(t-2)	**3.682***	**3.613***	-0.030	-1.323
TGE 3year av.(t-1)	**-1.417****	**-1.457****	**-3.770***	**-3.956***
log gdp(t-1)	**-2.994*****	**-3.021*****	**-3.969****	**-4.148****
log gdp 4year av.(t-2)	**2.625*****	**2.656*****	**2.865***	**3.057***
Polity (t-1)	**0.019***	**0.019***	**0.066*****	**0.063*****
log gdp_t (t-1)	-0.616	-0.682	2.437	1.852
VOT_t (t-1)	**-1.364***	**-1.318***	1.279	0.214
Investment_t (t-1)	-0.030	0.170	-9.320	-6.130
Polity_t (t-1)	0.051	0.048	-0.085	-0.088
Infant mortality_t(t-1)	**-10.880*****	**-11.428*****	-15.278	-18.849
TGE_t (t-1)	0.953	0.984	**9.002†**	7.434
Constant	**8.620***	**9.129****	-9.014	-3.851
N	2969	2969	687	687

† p<0.1 * p<0.05, ** p<0.01, *** p<0.001

[53] Excluding years 1914-1918

Table 3.5-a (columns 5-8)

Base Model Results (Coefficients)

Crises and Takeoffs

Dependent variable: rapid growth episode 0-1	1946-1971 Bretton Woods		1975-2003 Post-Oil Shock years	
	5	6	7	8
	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis
Currency crisis (lag)	**0.994*** **	**0.710** **	**0.441**†	**0.6877** **
Banking crisis (lag)			0.583	**0.7585**†
Twin crisis (lag)			-0.012	-0.3592
War Dummy				
Great Depression dummy				
Volume of Trade(t-1)	2.757	2.584	**4.915*** **	**5.330*** **
Volume of Trade(t-2)	-1.423	-1.317	**-4.667** **	**-5.030** **
Investment(t-1)	**-11.831** **	**-12.383** **	**-14.042** **	**-15.343** **
Investment(t-2)	**9.956***	**10.318***	5.592	6.575
TGE 3year av.(t-1)	-2.066	-1.900	-0.691	-0.943
log gdp(t-1)	**-9.749*** **	**-9.683*** **	-1.206	-2.150
log gdp 4year av.(t-2)	**8.930*** **	**8.931*** **	0.736	1.685
Polity (t-1)	0.000042	-0.004	**0.074***	**0.074***
log gdp_t (t-1)	0.683	0.775	**-5.594**†	**-6.585***
VOT_t (t-1)	-1.827	-0.882	**-5.870***	**-5.909***
Investment_t (t-1)	**-24.698**†	**-27.663**†	20.700	23.289
Polity_t (t-1)	**0.729** **	**0.693** **	0.139	0.132
Infant mortality_t(t-1)	**-58.288** **	**-56.923** **	-123.637	-139.822
TGE_t (t-1)	**-17.845**†	**-20.393**†	**22.249**†	**23.649**†
Constant	10.166	9.684	48.412	**56.710**†
N	966	966	1161	1161

† p<0.1 * p<0.05, ** p<0.01, *** p<0.001

Table 3.5-b (columns 1-6)

Base Model Results

Marginal Effects[54] **Crises and Takeoffs**

Dependent variable: rapid growth episode 0-1	All years 1870-2003		1870-1933 Gold Standard[55]		1946-1971 Bretton Woods	
	1	2	3	4	5	6
	2 lags of crisis, %	3 lags of crisis, %	2 lags of crisis, %	3 lags of crisis, %	2 lags of crisis, %	3 lags of crisis, %
Currency crisis (lag)	**3.166†**	**3.878***	**-8.038***	-6.875	**19.653*****	**12.351****
Banking crisis (lag)	1.345	4.082	-2.140	3.097		
Twin crisis (lag)	-2.403	**-2.745†**	**-7.320***	**-7.485†**		
War Dummy	0.893	0.916	4.145	0.927		
Great Depression years dummy	1.211	1.037	-2.903	-5.075		
Volume of Trade(t-1)	**10.308***	**10.739***	-0.566	-1.431	19.083	17.650
Volume of Trade(t-2)	-3.680	-3.740	5.972	7.457	-3.452	-3.394
Investment(t-1)	**-4.687*****	**-4.666*****	-3.350	-2.689	**-4.369****	**-4.603****
Investment(t-2)	**4.210****	**4.084****	-0.025	-1.094	**11.025***	**11.857***
TGE 3year av.(t-1)	**-2.127****	**-2.158****	**-3.180***	**-3.438***	-2.178	-2.099
log gdp(t-1)	**-6.798*****	**-6.720*****	**-7.410****	**-7.781****	**-5.274*****	**-5.466*****
log gdp 4year av.(t-2)	**65.525*****	**66.235*****	**43.645***	**48.191***	**94.725*****	**94.533*****
Polity (t-1)	**1.933****	**1.897****	**7.784*****	**7.698*****	0.003	-0.297
log gdp_t (t-1)	-3.356	-3.580	6.427	4.773	1.634	1.931
VOT_t (t-1)	**-2.535***	**-2.440***	0.644	0.109	-1.140	-0.595
Investment_t (t-1)	-0.018	0.102	-2.891	-2.105	**-3.635†**	**-4.000†**
Polity_t (t-1)	1.503	1.419	-1.703	-1.825	**5.223****	**5.021****
Infant mortality_t(t-1)	**-4.811*****	**-4.893****	-3.993	-4.807	**-4.423****	**-4.529****
TGE_t (t-1)	**0.913***	**0.936***	**4.076†**	3.383	**-2.349†**	**-2.681†**
N	2969	2969	687	687	750	750

† p<0.1 * p<0.05, ** p<0.01, *** p<0.001

[54]The marginal effect of 1 standard deviation change from the estimation sample mean (for continuous variables) or a 1 point change from the sample mean for the Polity variables, and the change from 0 to 1 for dummy variables.

[55] Excluding years 1914-1918

Table 3.5-b (columns 7-10)

Base Model Results

Marginal Effects[56] **Crises and Takeoffs**

Dependent variable: rapid growth episode 0-1	1975-2003 Post-Oil Shock years		1946-2003 Post World War II years	
	7	8	9	10
	2 lags of crisis, %	3 lags of crisis, %	2 lags of crisis, %	3 lags of crisis, %
Currency crisis (lag)	**0.620†**	**1.127****	**2.993****	**4.006****
Banking crisis (lag)	1.100	**1.410†**	4.049	**7.199†**
Twin crisis (lag)	0.035	0.123	-0.792	-0.492
War Dummy				
Great Depression years dummy				
Volume of Trade(t-1)	**34.710*****	**32.689*****	**11.448***	**14.337***
Volume of Trade(t-2)	**-0.266****	**-0.202****	**-1.509***	**-2.340†**
Investment(t-1)	**-0.248****	**-0.188****	**-1.387*****	**-2.147*****
Investment(t-2)	0.412	0.332	**1.324†**	**1.840†**
TGE 3year av.(t-1)	-0.065	-0.055	-0.436	-0.635
log gdp(t-1)	-0.251	-0.199	**-1.731*****	**-2.776*****
log gdp 4year av.(t-2)	0.844	1.698	**57.303****	**63.465****
Polity (t-1)	**0.796***	**0.692***	**0.823†**	**1.125†**
log gdp_t (t-1)	**-0.201†**	**-0.166***	**-1.552****	**-2.459†**
VOT_t (t-1)	**-0.247***	**-0.190***	**-1.579*****	**-2.474*****
Investment_t (t-1)	0.312	0.258	0.542	0.693
Polity_t (t-1)	0.357	0.199	**1.702†**	**2.132†**
Infant mortality_t(t-1)	-0.250	-0.195	**-1.689*****	**-2.696*****
TGE_t (t-1)	**0.528†**	**0.417**	0.131	0.172
N	1161	1161	2028	2028

[56]The marginal effect of 1 standard deviation change from the estimation sample mean (for continuous variables) or a 1 point change from the sample mean for the Polity variables, and the change from 0 to 1 for dummy variables.

Table 3.6-a (columns 1-4)

Base Model Results (Coefficients) **Crises and Growth Collapses**

Dependent variable: growth collapse episode 0-1	All years after 1870		1870-1933 Gold Standard[57]	
	1	2	3	4
	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis
Currency crisis (lag)	-0.041	-0.033	0.126	0.182
Banking crisis (lag)	-0.380	0.114	-0.270	0.288
Twin crisis (lag)	0.266	0.235	-0.384	-0.694
War Dummy	**1.095*** **	**1.104*** **	**0.761***	**0.760***
Great Depression dummy	**0.983*** **	**0.964*** **	0.669	0.581
Volume of Trade(t-1)	0.413	0.460	1.041	1.460
Volume of Trade(t-2)	-1.132	-1.215	-1.107	-1.503
Investment(t-1)	**3.899†**	**3.675†**	-1.208	-1.296
Investment(t-2)	-2.612	-2.307	-0.952	-1.147
TGE 3year av.(t-1)	**0.947†**	**0.975†**	-3.025	-3.351
log gdp(t-1)	0.053	0.154	1.042	1.307
log gdp 4year av.(t-2)	0.043	-0.069	-0.577	-0.846
Polity (t-1)	**-0.023***	**-0.021***	-0.018	-0.014
log gdp_t (t-1)	**1.780***	**1.637†**	2.767	2.570
VOT_t (t-1)	1.001	1.212	-2.420	-2.935
Investment_t (t-1)	2.831	3.372	-6.726	-6.445
Polity_t (t-1)	-0.048	-0.057	-0.170	-0.195
Infant mortality_t(t-1)	**20.414*** **	**20.112*** **	-19.243	-21.879
TGE_t (t-1)	-1.597	-1.120	**-25.753** **	**-25.211** **
US/UK Interest rate (t-1)				
US/UK Growth rate (t-1)				
Constant	**-20.004** **	**-18.995** **	-18.864	-16.772
N	2969	2969	687	687

† p<0.1 * p<0.05, ** p<0.01, *** p<0.001

[57] Excluding years 1914-1918

Table 3.6-a columns (5-8)

Base Model Results

(Coefficients) **Crises and Growth Collapses**

Dependent variable: growth collapse episode 0-1	1980-2003		All years after 1870	
	5	6	7	8
	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis
Currency crisis (lag)		**-1.281***	-0.180	-0.108
Banking crisis (lag)			-0.442	0.059
Twin crisis (lag)	**0.843***	0.430	0.210	0.210
War Dummy			**1.289*****	**1.288*****
Great Depression dummy			**1.260*****	**1.227*****
Volume of Trade(t-1)	0.062	0.336	0.408	0.503
Volume of Trade(t-2)	-2.550	-3.271	-1.174	-1.303
Investment(t-1)	6.777	5.653	**3.945†**	**3.781†**
Investment(t-2)	-4.094	-4.272	-2.474	-2.205
TGE 3year av.(t-1)	**2.057†**	1.877	**0.873†**	**0.923†**
log gdp(t-1)	**4.166†**	**4.929†**	-0.318	-0.167
log gdp 4year av.(t-2)	**-4.522†**	**-5.308***	0.484	0.320
Polity (t-1)	**-0.055***	**-0.068***	**-0.023***	**-0.021***
log gdp_t (t-1)	-7.907	-8.724	**1.992***	**1.857†**
VOT_t (t-1)	7.409	8.260	**2.776***	**2.940***
Investment_t (t-1)	**-68.658****	**-62.838****	-0.107	0.441
Polity_t (t-1)	-0.626	-0.504	-0.104	**-0.111†**
Infant mortality_t(t-1)	50.034	115.673	**16.959****	**16.932****
TGE_t (t-1)	18.107	28.139	-5.124	-4.618
US/UK Interest rate (t-1)			1.782	1.796
US/UK Growth rate (t-1)			**4.173****	**4.110****
Constant	79.734	81.168	**-21.651****	**-20.721****
N	966	966	2562	2562

† p<0.1 * p<0.05, ** p<0.01, *** p<0.001

Table 3.6-b (columns 1-4)

Base Model Results,

Marginal Effects[58]

Crises and Growth Collapses

Dependent variable: growth collapse episode 0-1	All years after 1870		1870-1933 Gold Standard[59]	
	1	2	3	4
	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis
Currency crisis (lag)	0.891	0.952	2.695	2.949
Banking crisis (lag)	-0.259	1.743	0.310	3.909
Twin crisis (lag)	2.819	2.574	-0.115	-0.775
War Dummy	**12.309*** **	**12.365*** **	**8.547***	**8.010***
Great Depression dummy	**12.043*** **	**11.581*** **	7.230	5.840
Volume of Trade(t-1)	1.014	1.134	2.405	3.478
Volume of Trade(t-2)	-1.500	-1.534	-1.552	-1.776
Investment(t-1)	**1.934†**	**1.769†**	-0.495	-0.491
Investment(t-2)	-0.816	-0.725	-0.391	-0.433
TGE 3year av.(t-1)	**0.741†**	**0.755†**	-1.315	-1.320
log gdp(t-1)	0.233	0.731	6.346	8.435
log gdp 4year av.(t-2)	0.184	-0.267	-1.614	-1.925
Polity (t-1)	**-0.726***	**-0.660***	-0.714	-0.532
log gdp_t (t-1)	**12.131***	**10.351†**	4.088	3.474
VOT_t (t-1)	1.048	1.295	-0.549	-0.608
Investment_t (t-1)	0.780	0.938	-1.067	-0.956
Polity_t (t-1)	-0.476	-0.551	-1.497	-1.532
Infant mortality_t(t-1)	**14.793*** **	**14.245*** **	-2.156	-2.138
TGE_t (t-1)	-0.521	-0.371	**-2.641** **	**-2.413** **
UK/US Interest rate(t-1)				
US/UK growth rate (t-1)				
N	2969	2969	687	687

† p<0.1 * p<0.05, ** p<0.01, *** p<0.001

[58]The marginal effect of 1 standard deviation change from the estimation sample mean (for continuous variables) or a 1 point change from the sample mean for the Polity variables, and the change from 0 to 1 for dummy variables.

[59] Excluding years 1914-1918

Table 3.6-b (columns 5-8)

Base Model Results,

Marginal Effects[60]

Crises and Growth Collapses

Dependent variable: growth collapse episode 0-1	1980-2003		All years after 1870	
	5	6	7	8
	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis
Currency crisis (lag)		**-0.008***	0.481	2.302
Banking crisis (lag)			-0.284	3.625
Twin crisis (lag)	**0.321***	0.027	2.599	5.202
War Dummy			**16.666*****	**16.423*****
Great Depression dummy			**18.796*****	**25.660*****
Volume of Trade(t-1)	0.003	0.009	0.776	1.666
Volume of Trade(t-2)	-0.023	-0.005	-1.903	-3.355
Investment(t-1)	0.065	0.020	**1.738†**	**2.506†**
Investment(t-2)	-0.014	-0.003	-1.097	-1.664
TGE 3year av.(t-1)	**0.038†**	0.014	**0.409†**	**0.709†**
log gdp(t-1)	**27.224†**	**35.770†**	-1.368	-1.503
log gdp 4year av.(t-2)	**-0.023†**	**-0.005***	2.748	2.281
Polity (t-1)	**-0.017***	**-0.004***	**-1.051***	**-1.607****
log gdp_t (t-1)	-0.020	-0.005	**14.874***	**17.988†**
VOT_t (t-1)	0.471	0.280	**3.784***	**6.148***
Investment_t (t-1)	**-0.022****	**-0.005****	-0.313	-0.281
Polity_t (t-1)	-0.023	-0.005	-1.241	**-2.123†**
Infant mortality_t(t-1)	0.034	0.059	**10.537*****	**14.709****
TGE_t (t-1)	0.038	0.032	-1.648	-2.572
UK/US Interest rate(t-1)			0.225	0.358
US/UK growth rate (t-1)			**1.087****	**1.645****
N	966	966	2562	2562

† p<0.1 * p<0.05, ** p<0.01, *** p<0.001

[60]The marginal effect of 1 standard deviation change from the estimation sample mean (for continuous variables) or a 1 point change from the sample mean for the Polity variables, and the change from 0 to 1 for dummy variables.

Table 3. 7: Export and Import growth –deviation from the historical mean[61]
(continued on the next page)

		Post-currency crisis		**Post-Banking crisis**	
		Imports	Exports	Imports	Exports
I	All time periods[62]	**.02916*** **(.007806)** [63]	**.043046*** (.00782)	**-.02501**** (.01017)	-.00406 (.00946)
II	Before 1933[64]	-.01672 (.01631)	-0.0055 (.01565)	**-.02805**** (.01251)	-.00253 (.01235)
III	After 1946	**.042095*** (.00796)	**.05554*** (.00803)	-.01868 (.01963)	-.00429 (.01585)
IV	Difference: After - Before	**.05881*** (.01815)	**.061008*** (.01759)	.009367 (.02327)	-.001758 (.02009)
V	Difference: Crises- Tranquil (Before 1933)	.02075 (.02453)	.01972 (.01877)	-.00966 (.01278)	.01253 (.01256)
VI	Difference: Crises- Tranquil (After 1946)	**.02896*** (.00831)	**.04240*** (.00837)	**-.03182†** (.019772)	-.02146 (.016001)

[61] Difference between a 5 year forward-looking (time t to t+4) average growth rate of exports(imports), and their historical growth mean, conditional on a financial crisis occurring at time t-1. The historical mean is calculated as the average export(import) growth rate from time t=0 to time t, excluding the crises years.

[62] Excluding the WWI years, and the Great Depression years.

[63] Standard errors in parentheses. *** denotes significance on at least 1% level; ** significance on 5% level, * significance on 10% level, † denotes significance of a one-tailed test on at least 10% level.

[64] Excluding 1914-1918 and 1929-1933 (World War I and the Great Depression years) for all countries.

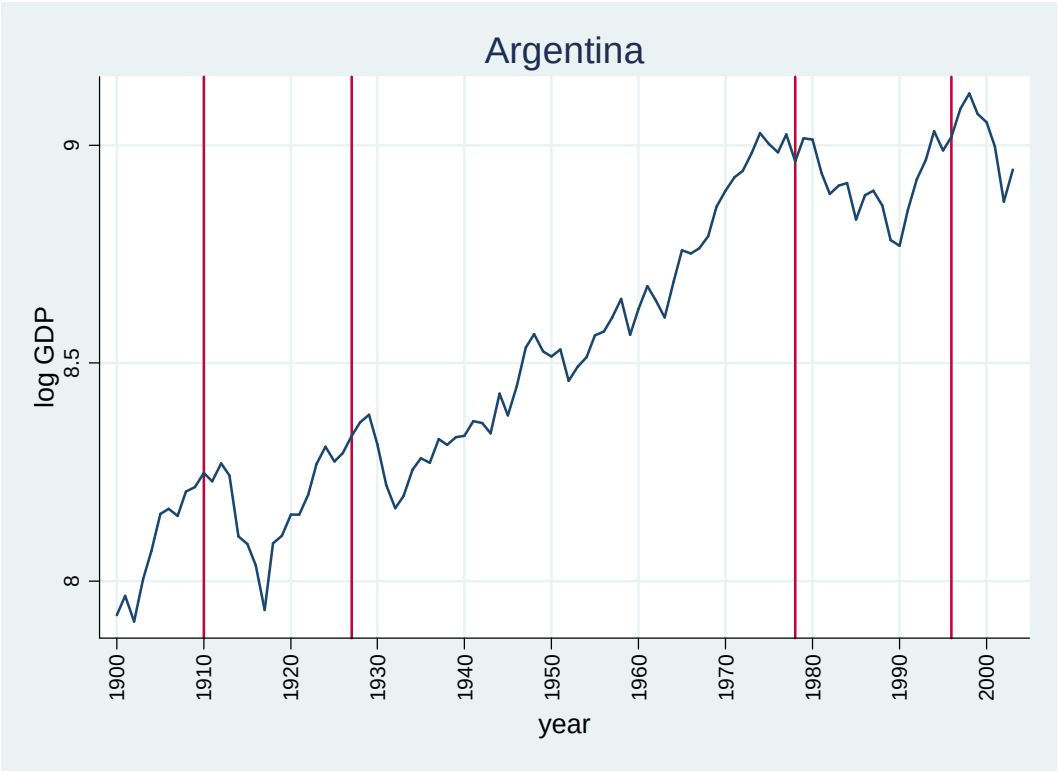
Table 3.7 (continued)

		Post-Twin crisis		**Tranquil times**	
		Imports	Exports	Imports	Exports
I	All time periods[65]	**-.02435†** (.01546)	.00737 (.00947)	.000747 (.001756)	**.00367**** (.00160)
II	Before 1933[66]	.00311 (.014453)	**.022968†** (.01417)	**-.01838***** (.00260)	**-.01506***** (.00230)
III	After 1946	**-.03485†** (.02214)	.00181 (.012704)	**.01313***** (.00237)	**.01717***** (.00218)
IV	Difference: After - Before	**-.03798†** (.02644)	-.021155 (.019032)	**.03152***** (.00352)	**.03223***** (.00317)
V	Difference: Crises- Tranquil (Before 1933)	**.02150†** (.014686)	**.03803**** (.014357)		
VI	Difference: Crises- Tranquil (After 1946)	**-.0479**** (.022275)	-.01536 (.01289)		

[65] Excluding the WWI years, and the Great Depression years.

[66] Excluding 1914-1918 and 1929-1933 (World War I and the Great Depression years) for all countries.

Figure 3.1 a-b Output Collapses



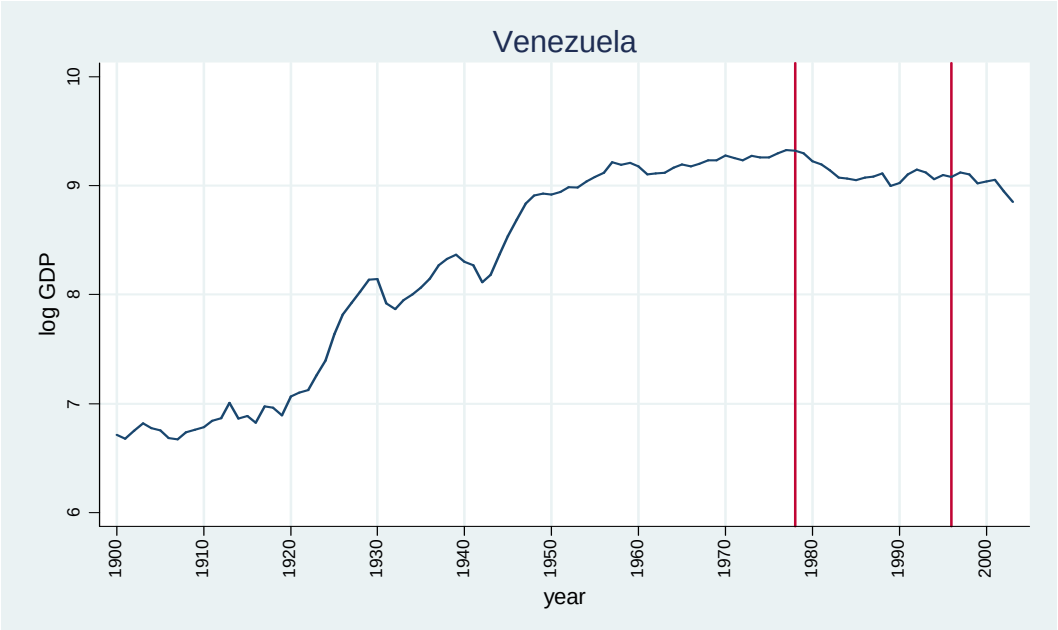
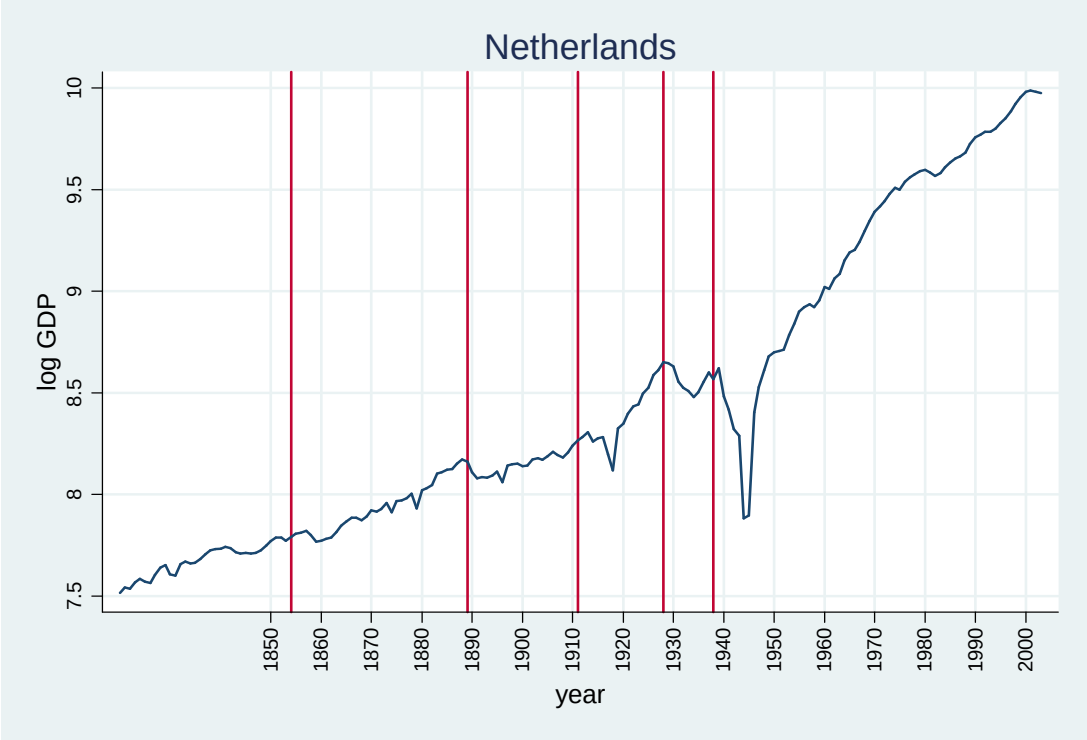


Figure 3.1 c-d Output Collapses



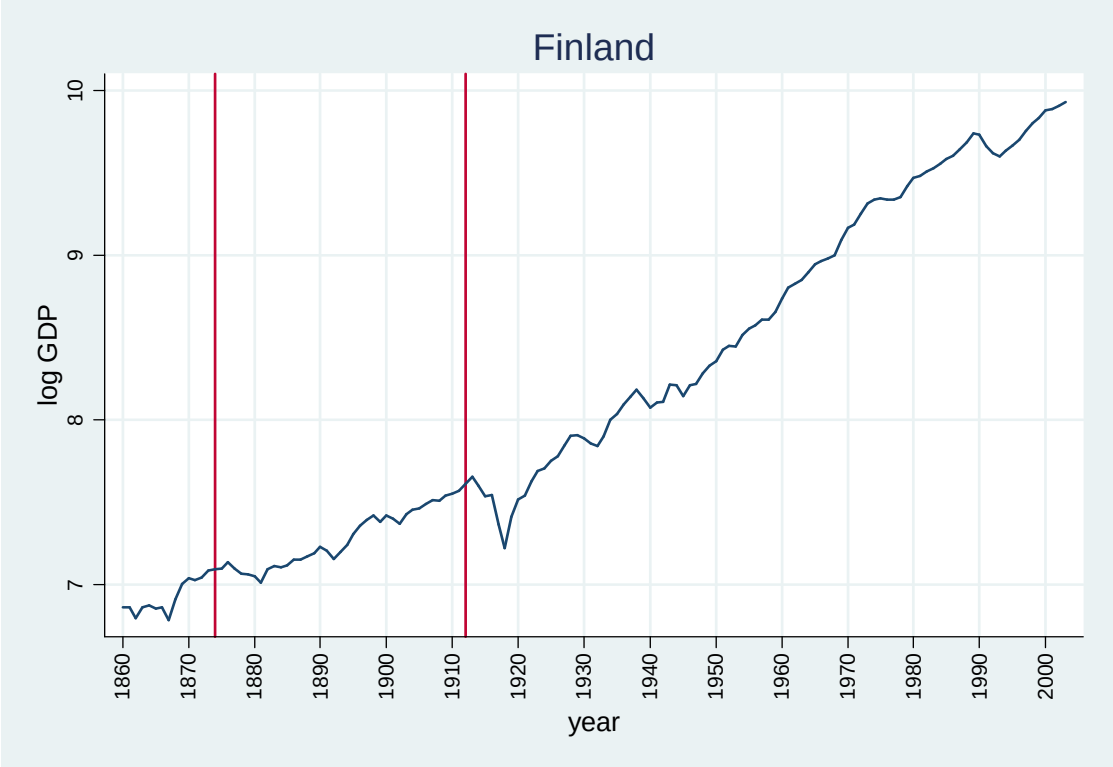
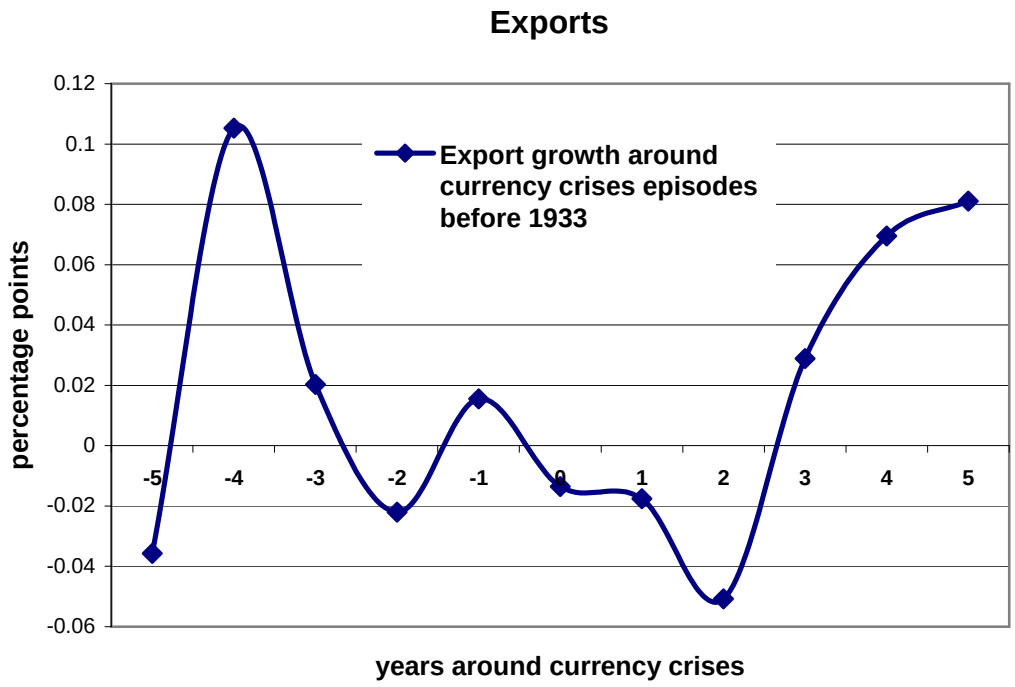


Figure 3.2 a-b
Export growth (deviation from historical mean) around currency crises episodes.



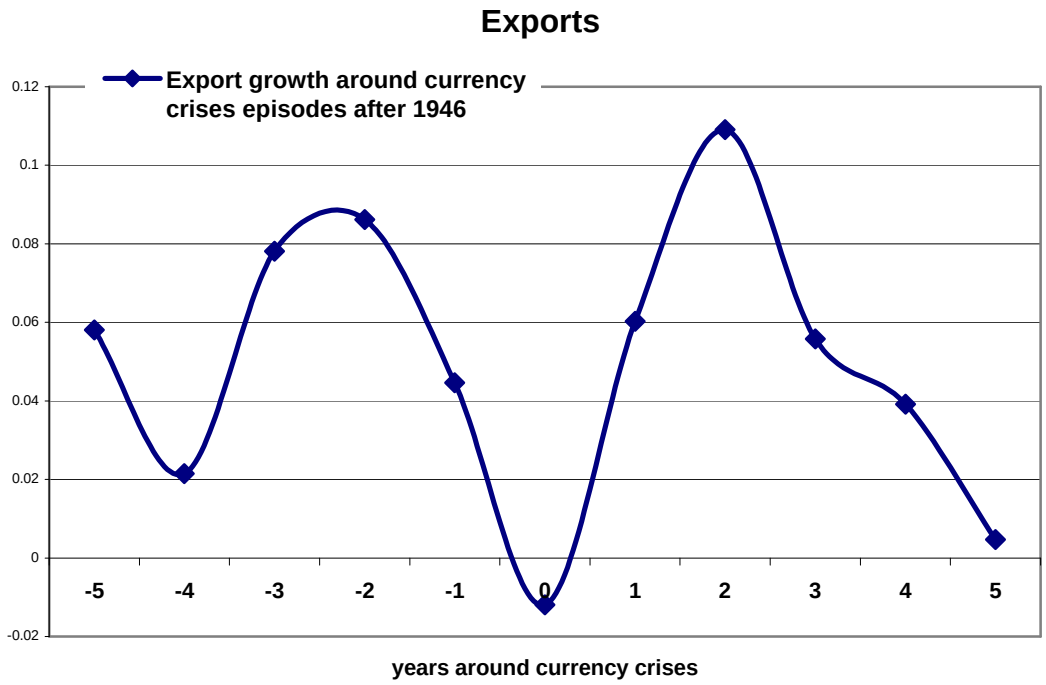
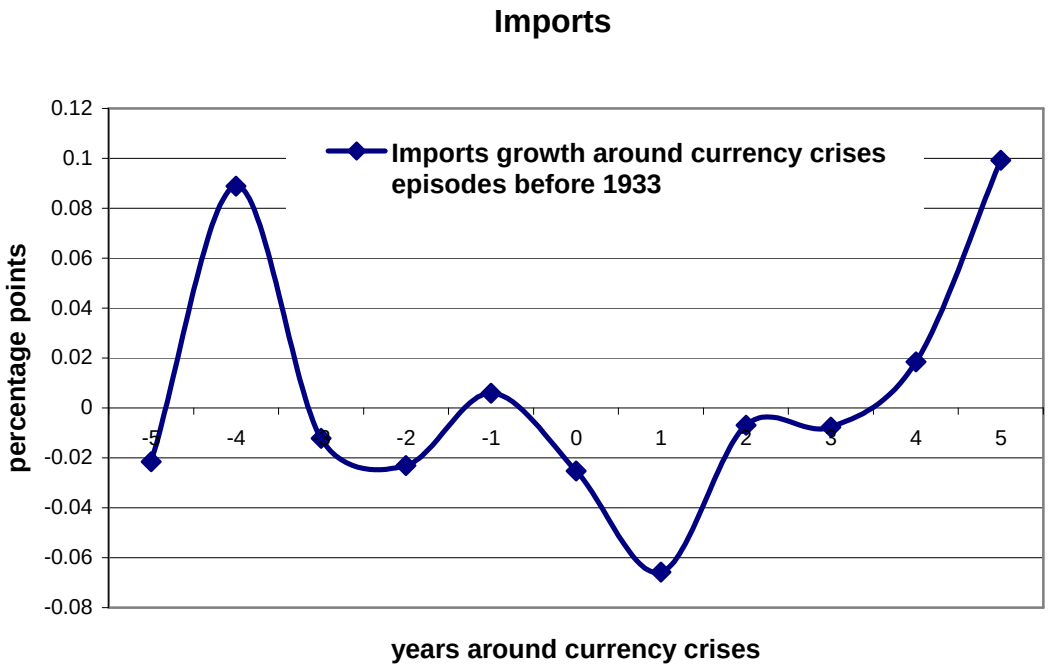
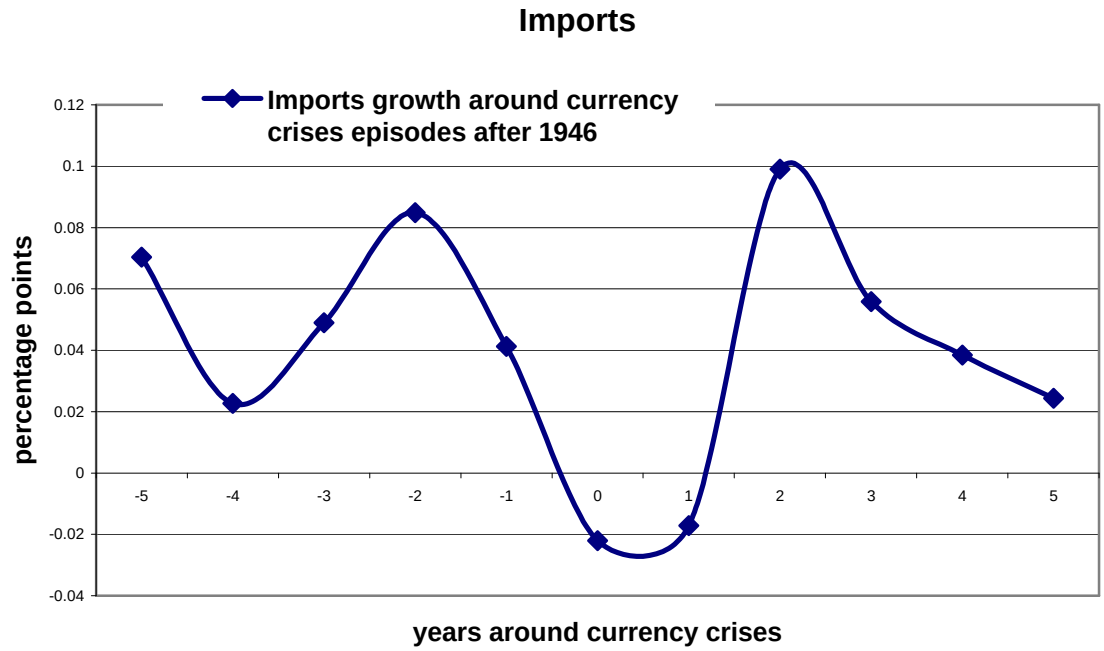


Figure 3.2 c-d
Import growth (deviation from historical mean) around currency crises episodes





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