From Riches to Rags, and Back? Finance and Growth in Argentina since the 1890s

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Abstract

Argentina is the only country in the world that was "developed" in 1900 and "developing" in 2000. Although various underlying reasons have been identified (chiefly political instability, financial development, inflation, trade openness, and international financial integration), no study has quantitatively assessed their relative importance. This paper tries to fill this gap. We use the power-ARCH framework and annual data since 1896 to study how important are these factors vis-à-vis both growth and growth volatility. Our results suggest that financial development, trade openness and political instability are the main factors, with important differences in terms of their short versus long-run behavior.

Keywords: economic growth, financial development, volatility, political instability, trade openness, power-GARCH;

JEL classification: C14, O40, E23, D72.

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1 Introduction

The general economic trend since the Industrial Revolution has clearly been one of economic betterment. Since 1850, a sustained increase in living standards is evident across the globe. Comparing the situation in 1900 with that in 2000, one can identify four different types of country trajectories. A handful of countries were rich or developed in, say, year 1900, and remain rich or developed in year 2000 (for example, the U.S. and the U.K.) A few other countries were developing in 1900, but turned around and by year 2000 were among the developed countries. Examples of this second group are Japan and most of the European periphery (including Portugal, Italy and Spain.) The vast majority of countries belongs to a third group of countries, those that were relatively poor in year 1900 and remain relatively poor or developing in year 2000. The fourth group of countries encompasses those that were developed in 1900 and are developing in 2000. Only one country falls into this category and that is Argentina.

Although placed among the highest incomes per capita in the world in 1900, "Argentina's ratio to OECD income fell to 84 percent in 1950, 65 percent in 1973, and a mere 43 percent in 1987... Argentina is therefore unique (della Paolera and Taylor, 2003, p. 5). Unsurprisingly, this "Argentine puzzle" has received a great deal of attention and scholars have identified several potential reasons, chiefly among them financial development, political instability (or institutions), macroeconomic volatility, inflation, trade openness, public deficit, and international financial integration. Surprisingly, we find no studies trying to quantify and assess the relative importance of this array of reasons. Hence this paper tries to fill this gap.

Within a power-ARCH (PARCH) framework and using annual time series data for Argentina covering the period from 1896 to 2000, the aim of this paper is to put forward answers to the following questions. What is the relationship between, on the one hand, financial development (domestic and international), public deficits and inflation, trade openness and political instability and, on the other, economic growth and volatility? Are the effects of these variables direct (on economic growth) or indirect (via the conditional growth volatility)? Does the intensity and sign of these impacts vary over time? Does the intensity of these effects vary with respect to short- versus long-run considerations? Is the intensity of these effects constant across the different eras or phases of Argentine economic history (in other words, are they independent from the main structural breaks we estimate)?

This paper tries to contribute to our understanding of the main causes of economic growth. Durlauf et al. (2005) and Acemoglu (2009) provide recent, authoritative surveys that support the view that there seems to be dissatisfaction with the empirical growth literature. This paper tries to improve matters in this regard by focusing on one the most undisputed and intriguing outliers (as opposed to follow the common practice of trying to learn something about growth by focusing on the mean or median country). We believe this study can further our understanding about economic growth because: (a) we study only one individual country over a very long period of time with annual frequency data, (b) we extensively use the economic history literature to guide our choice of potential important reasons for the Argentine decline, (c) we choose an econometric methodology that has been seldom used in the empirical growth literature despite the fact that it easily allow us to contrast the direct to the indirect (i.e., via the volatility channel) effects of each of our candidate reasons, sort out the short- from the long-run impacts, and distill the consequences of accounting for important structural breaks on the robustness of our key results.

Another important benefit of our choice of econometric framework is that it helps shedding light on an important and resilient puzzle on the relationship between output growth and its volatility. While Ramey and Ramey (1995) show that growth rates are adversely affected by volatility, Grier and Tullock (1989) argue that larger standard deviations of growth rates are associated with larger mean rates. The majority of ARCH papers examining the growth-volatility link are restricted to these two key variables. That is, they seldom assess whether the effects of the presence of other variables affect the relation and, in the rare occasions that happens, they are usually inflation and its volatility that comes into play.[1] One contribution of this paper is to study if and how the growth-volatility relationship changes in light of a much wider set of variables. Note also that the use of annual data allows us to perform a more appropriate test of the hypothesis that predicts a positive effect of output variability and uncertainty on

[1] For a comprehensive review of this literature see Fountas et al. (2006). In addition, Gillman and Kejak (2005) bring together for comparison several main approaches to modeling the inflation-growth effect by nesting them within a general monetary endogenous growth model with both human and physical capital.

the growth rate of output.[2]

Our results are presented following specific types of effects. That is, we discuss direct (on mean economic growth), indirect (via volatility), dynamic (short and long-run) and structural break effects. Moreover, in trying to satisfy both the time-series and economic growth literature traditions (the former mostly univariate and the latter multivariate), for each effect we report estimates for one variable at a time before discussing the full multivariate results.

As for the individual univariate direct effects on economic growth, we find evidence for direct influences on real GDP growth from financial development (ratio of private deposits to GDP), informal political instability,[3] international financial markets (interest rate in the United Kingdom), trade openness and public deficit. Equally importantly, we find no such evidence from formal political instability and inflation rates. The multivariate analysis helps to narrow down this set to the positive effect of financial development (private and savings banks deposits to GDP) and to the negative effect of informal political instability (guerilla warfare and general strikes), international financial integration and trade openness as major drivers of growth in Argentina since the 1890s.

How does this set of variables affect predicted growth volatility? Or in other words, how do they affect growth indirectly through their impact on growth volatility)? The strongest indirect impacts we find from the univariate evidence are the volatility-increasing effects of inflation, the UK interest rate, and public deficits and the volatility-decreasing effects of trade openness and constitutional changes. Importantly, however, our multivariate results show that the most robust indirect effects are those from informal political instability.

Our investigation of the dynamic effects shows important differences in terms of short and long run behavior of our key variables: the informal instability effects are larger in the short- than in the long-run, while those for financial development and trade openness are negative in the short- but positive in the long-run.

Finally, we subjected all these results to the presence of structural breaks. This is a crucial exercise given the very long-term nature of our data. We find that our basic results remain once we take into structural breaks into account, the notable exception being that the effects of international financial integration (proxied in this paper by the UK interest rates) disappear once breaks are accounted for.

In sum, our main results suggest that financial development and political instability (or institutions) exhibit the most robust first-order effects on growth and volatility. We also find that trade openness and international financial integration play important yet secondary roles because the effects of the former do not extend to the long-run (that is, they are restricted to the short-run) and those of the latter vanishing when structural breaks are fully accounted for.

The paper is organized as follows. Section 2 sets the historical context for the paper by documenting the decline of Argentina from a position of a rich or developed country in year 1900 to that of a middle-income or developing country in year 2000. More importantly, this section briefly reviews the Argentinean historiography stressing the main reasons that have been offered to explain the relative decline. Section 3 describes the data and Section 4 provides details and justification for our econometric methodology. Section 5 has our baseline econometric results and the results from various sensitivity tests are presented in Section 6. Section 7 concludes and suggests directions for future research.

2 The Argentine Riddle

Argentina was part of the Spanish colonial empire for about three centuries. Its name as well as the name of its main river indicates that the colonizers had clear expectations: they expected it to become one of the main transport routes of Potosi silver from what is today Bolivia to the then metropolis Spain. Argentina, as most of South America, became an independent country in the early XIXth century.

[2] Black (1987) argues that investments in riskier technologies will be pursued only if the expected return on these investments (expressed as the average rate of output growth) is large enough to compensate for the extra risk. As real investment takes time to materialize, such an effect would be more likely to obtain in empirical studies utilizing low-frequency data.

[3] We follow Campos and Karanasos (2008) in separating informal from formal poltical instability. The former is defined as instability outside of the government realm and measured here as guerilla warfare, while the latter is defined as instability within the government realm and measured in this paper by the number of constitutional changes.

Uncharacteristically, Argentinean Independence was a rather complicated process. It started with the May Revolution of 1810, continued through the July 9th declaration in 1816 (when the United Spanish Provinces of South America declare independence from Spain, unilaterally) and concludes in 1824 with the defeat of the Spanish Empire in the battle of Ayacucho. Characteristically though, the following fifty or so years were marked by severe political instability. There was a long sequence of civil wars, mostly opposing the interests of Buenos Aires (the capital) to those of the provinces (Lynch 1985). Economically, this is a period of modest growth rates which ended with national unification. The Industrial Revolution in Europe fueled demand for primary products and provided new means to satisfy it through important technological innovations: around 1875 the transportation of meat from the other side of the world was made possible and it was made cheap.

There is little disagreement among economists that the period from 1875 to the eve of World War I is the Golden Age, or the Belle Époque, of Argentinean economic history (Taylor, 1992; Sanz-Villarroya, 2007). Just to illustrate this, note that for the year 1913, della Paolera and Taylor (2003) estimate income per capita in Argentina to be (in 1992 US Dollars) around USD 3,797. They provide evidence that this figure is higher than the corresponding figures for France and Germany (USD 3,452 and USD 3,134, respectively) and is substantially higher than those for Spain or Italy. Massive inflows of foreign capital (physical as well as human) supported the rapid expansion of the exports of primary products (grain, meat, wool and leather) which couple with favorable international conditions, ultimately fuelled very rapid rates of economic growth (Rock, 1985, Cortes Conde, 2009). There is also little disagreement that the Argentina's uniqueness is because no other country climbed down so dramatically from the selected group of advanced, rich or developed countries.

The major disagreement among economic historians to this day is not whether but actually when (and, of course, why) this unchecked decline started. Some argue that it started with the 1930 crisis (e.g., Diaz-Alejandro 1985), others argue for an earlier turning point (for instance, Taylor suggests 1913), while Sanz-Villarroya (2005) estimates that the first important structural break for Argentina happens in 1899.[4]

Irrespective of exactly when the decline started, its existence was not undisputed until the immediate post II World War. In 1947 Argentina was still ranked the 10th country in the world in terms of per capita income (Alston and Gallo, 2007, p. 6). della Paolera and Taylor (2003) note that "by 1900 Argentina's income per capita had risen from about 67 per cent of developed country-levels in 1870, to 90 percent in 1900, and 100 per cent in 1913 Whatever its exact status in 1913, for all practical purposes Argentina was an advance country" (2003, p. 5). They also calculate that since then the ratio of Argentina's income to OECD income fell to 84 percent in 1950, then to 65 percent in 1973, and then to 43 percent in 1987. This ratio rebounds in the 1990s but again reverts with the 2001 crisis.[5] Last, but not least, it should not go unnoticed that in a recent book on the Great Depressions of the XXth Century (Kehoe and Prescott, 2007), Argentina is the only country that has two chapters (out of 16) entirely and solely dedicated to its economy.

It is not surprising, therefore, that there is a vast literature on the Argentine puzzle, providing alternative explanations for its long-run relative economic decline. One argument is that increased direct competition in international markets during and after WWI (especially from the other areas of new settlement, i.e. Australia and Canada) has an important role to play, as does the sharp decline in immigration and foreign capital inflows. One other argument is that its relative decline is well explained by the fact that the agricultural frontier was reached much earlier in Argentina than in Australia and Canada. Australia's restrictive immigration policy contrasts with Argentina's liberal one, which has been blamed by Diaz-Alejandro (1985) among others, for the difficulties in sustaining and raising productivity levels. Solberg (1987) argues for another reason, this time in terms of Argentina's adoption of a land distribution policy that favored large farm holdings and sustained high levels of wealth inequality. In light of the very accommodating migration policy, the large inflows of workers end up concentrating in Buenos Aires and gave rise to a well-organized and increasingly powerful worker's union movement. It

[4] Below we present and discuss our Bai-Perron estimates of the date of structural breaks in Argentinean growth. We find (and adjust our estimates accordingly below) evidence for two structural breaks: 1922 and 1964 (for a full treatment of this issue, see Campos et al. 2008).

[5] Growth was negative from 1999 onwards culminating with around -10% in year 2002. The 2001 crisis entailed a default on large part of the external debt, devaluation, inflation, and the freezing of bank accounts (the corralito.) Riots, looting and anti-government demonstrations followed. See Kehoe (2003) for a discussion.

suffices to say that this movement was intimately tangled with the Peron governments, after WWII.

Finance has also received a great deal of attention in terms of its potential role in explaining the Argentinean decline (della Paolera and Taylor, 1998). For example, Prados de la Escosura and Sanz-Villarroya (2006) argue that contract intensive money is actually the key factor in explaining the Argentinean puzzle. Taylor (2003) associates the Argentine decline to extremely low savings rates (the high population dependency rate linked to the immigration policy). This argument combines with Solberg's view and highlights the issue of (restricted) access to finance as a way of perpetuating high inequality levels. Moreover, the role of the financial sector does not need to be limited to domestic or national aspects. Many believe that there may have been excessive dependence on foreign capital in the Belle Époque (British foreign capital to be precise) and the associated radical changes around WWI as an important cause of the Argentinean decline (Taylor, 1992).

Such radical shifts in market conditions extended from the financial to the goods markets, the emphasis here being on international trade. Until 1914, Argentina was an aggressive exporter exhibiting extremely high levels of openness to international trade (measured as the ratio of exports plus imports to GDP.) The data we use in this paper (more details below) shows that this ratio exceeds 50% in the years immediately before WWI, with a clearly declining trend in the inter-wars years (the ratio goes down from about 45% to 20% in these twenty years), and it never exceeds 25% from 1945 to almost 2000. If one believes that exports alone are a major driving force of economic growth, then these numbers surely provide fuel to placing openness as a major reason for the Argentine decline (Diaz-Alejandro, 1970). One important caveat that should be mentioned in this context is that it is unclear (and still much debated) what were the reasons for such a reversal. In particular, the debate is whether this was mainly the disruption and closing up of international markets first with WWI and then with the Great Depression, or was it mainly the adoption of excessively protectionist policies by successive Argentinean governments. Note that these policies inspired and were later reinforced by the import substitution model advocated by the leading Latin American economist of the time, Raul Prebish (from Argentina.)

In addition to trade policies, many scholars believe that standard macroeconomic policies, in general, and their inconsistency and the resulting macroeconomic instability, in particular, are also to blame. For instance, della Paollera et al. (2003) show how public deficits throughout Argentinean history (and inflation, mostly since the 1970s), also seem to play an important role in explaining the decline.

Although there is a large literature associating the long-run relative decline of the Argentinean economy with political and institutional factors,[6] we are unaware of studies that try to quantitatively evaluate this association. For instance, Acemoglu and Robinson (2006) observe that: "The political history of Argentina reveals an extraordinary pattern where democracy was created in 1912, undermined in 1930, re-created in 1946, undermined in 1955, fully re-created in 1973, undermined in 1976, and finally reestablished in 1983" (2006, p. 7). In a recent paper, Alston and Gallo (2007) identify the onset of widespread electoral fraud in the 1930s as a turning point for the erosion of the rule of law and one main reason for the Argentinean decline.

In what follows, we take these considerations on board in trying to provide a comprehensive quantitative account of the relative importance of the main reasons often identified with the Argentinean debacle, namely political instability, domestic financial development, trade openness, macroeconomic volatility (inflation and public deficits) and integration in the international financial system.

3 Data

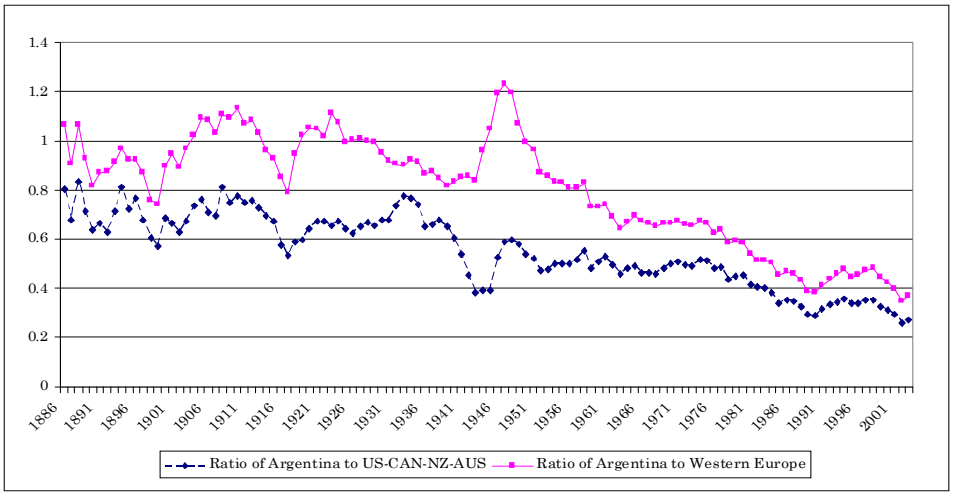
The data set we put together for this paper reflects the main factors identified by economic historians discussed above. The factors often associated with the relative economic decline of Argentina are the following: financial development, political instability (or institutions), macroeconomic volatility, inflation, trade openness, public deficit, and international financial integration.

Our basic data source is the Cross National Time Series Data set (Banks 2005) which contains historical series on income per capita and various dimensions of instability.[7] This is a commercial database that has been extensively used in the scholarship on growth and political instability (Durlauf et al., 2005.)

[6] See also della Paolera and Taylor (2003) and references therein.

[7] We have obtained GDP growth and level figures from various other sources (as well as industrial output series) and initial results (not reported) show that these different measures do not affect our results below.

Figure 1: Ratio of Argentina's GDP per Capita to Developed Countries' GDP per Capita, 1885-2003



Data are available yearly for Argentina from 1896 until 2000, for various instability series, excluding the two World War years (that is, 1914 to 1918 and 1939 to 1945).

We use various measures of financial development. Our two main measures of financial development try to capture the efficiency of the financial sector, not its relative size. The source for both is Mitchell (2003). The first is the bank deposits by the private sector over GDP (private deposits or PD), which we believe is a good proxy for the share of credit to the private sector over GDP. Our second measure from Mitchell (2003) is the total deposits in savings banks over GDP. Given its more restrictive nature and the fact that the exact definition of savings bank contains an unobservable legal element, we use this variable mostly for robustness check thereby attaching greater weight to PD. We also study two variables that instead of measuring the efficiency of the financial sector, better reflect its size. One is the ratio of M3 to GDP, from Alston and Gallo (2007). The main reason for considering this variable is that it has been used extensively in the finance-growth literature (King and Levine, 1993; Levine, 2005). One well-known drawback of this measure, however, is that the ratio of M3 to GDP reflects financial depth or the relative size of the financial system. It does not necessarily reflect how efficient the financial system actually is. We also use a narrower version of this variable (M1 over GDP) to check for the robustness of our results (source of the data for this measure is Bordo et al., 2001).

We also explore the hypothesis that different types of political instability have different effects on economic growth.[8] This is done by further developing the distinction between formal and informal political instability introduced in Campos and Karanasos (2008). The distinction is based on whether or not different forms of instability originate from within the political system: guerrilla warfare are thus informal political instability, while constitutional reforms are classified as formal instability. In addition to the obvious policy implications this taxonomy generates (in a literature in which policy implications are scarce), this distinction allows us to investigate questions that naturally have not been investigated so far, such as whether or not the effects of some forms of informal instability are more severe in the short- than in the long-run, and whether or not the main effect of formal instability occurs through growth volatility. One of our hypotheses is that the answer to these questions is the same ("yes") and below we provide further justification as well as full econometric support.

Our informal political instability variables[9] are strikes (a general strike of 1,000 or more workers in-

[8] Another puzzle we are interested in regards the duration of the political instability effects: while the conventional wisdom is that these are severe in the long-run, placeCityCampos and Nugent (2002) and Murdoch and Sandler (2004) argue that they are significantly stronger in the shorter- than in the long-run. In placeCityCampos and Nugent (2002), the long-run effect vanishes when the African countries are excluded from the estimation and when institutions are taken into account.

[9] Our political instability variables enter one by one in the econometric framework we use, so our results are not affected

Figure 2: Measures of Financial Development

volving more multiple employers and aimed at government policies) and guerrilla warfare (armed activity, sabotage, or bombings by independent bands of citizens and aimed at regime overthrow). For robustness purposes, we also discuss results using anti-government demonstrations (peaceful public gatherings of at least 100 people) and assassinations (defined as politically motivated murder or attempted murder of a high government official or politician). Most of these series are available since 1919.

Our formal political instability variables are as follows: the number of cabinet changes, the size of the cabinet, the number of constitutional changes and legislative elections.

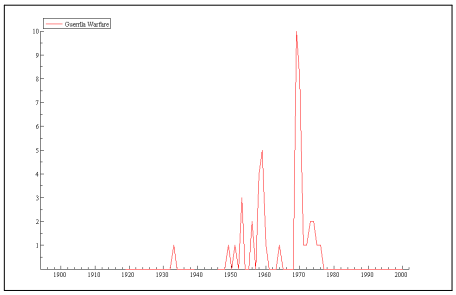
Our measures of inflation, trade openness and public deficit are from Alston and Gallo (2007). Inflation is measured as yearly changes in the consumer price index (CPI). Public deficit is proxied as the ratio of the federal deficit to GDP, but it does exclude state-owned enterprises.[10] Trade openness is measured in standard fashion as the ratio of imports plus exports to GDP. Alston and Gallo (2007) have carried out various necessary adjustments to underlying data from Venganzones and Winograd (1997), from the Ministry of Economy of Argentina and from the IMF's International Financial Statistics.

Finally, international financial sector developments have also been repeatedly blamed for Argentina's poor economic performance. There are two aspects of this issue that are often said to play a role: the first being the credit crunch associated with the onset of WWI and with the Great Crisis of 1929, and the second being the change in global financial leadership which went from London to New York during this period. We must say that we proceed as if the second aspect is less important, but also that we are absolutely sure it is much more difficult to measure than the first. Thus, in standard fashion in this type of study, we use the level of interest rates in the United Kingdom as our proxy for the overall conditions in international financial markets (the source of these data is Bordo et al. 2001). Because the transition to the U.S. financial leadership is often said to be even less beneficial to Argentina (mainly because American investors often refrained to take managerial control of Argentine firms), our estimates for this effect should be conservative and if at all biased will show a smaller than actual effect of the

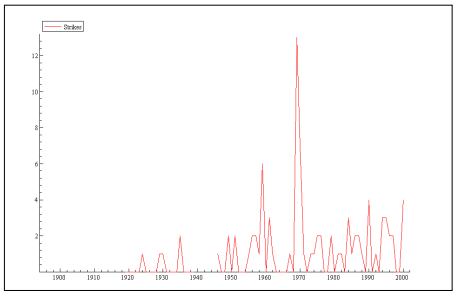
by the taxonomy and as such it is used simply to facilitate the interpretation.

[10] Because the original inflation series contain a number of obvious outliers between the years 1987 and 1991 (reaching almost 5,000% in 1989), we lower the relative weight of these observations for estimation.

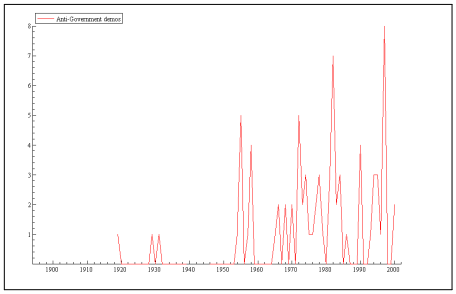
Figure 3: Measures of Informal Political Instabilit



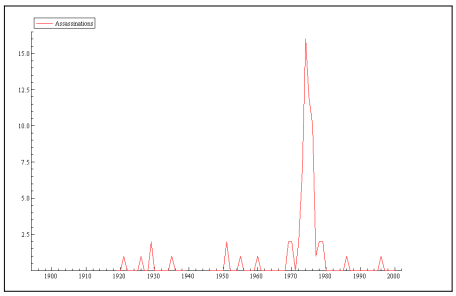
Guerilla Warfare



Strikes

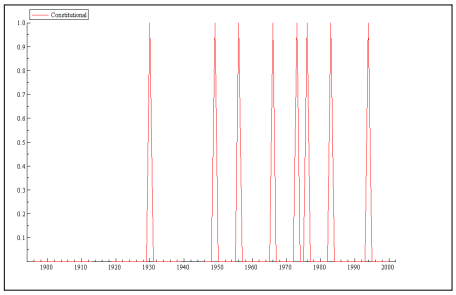


Anti-Government Demos

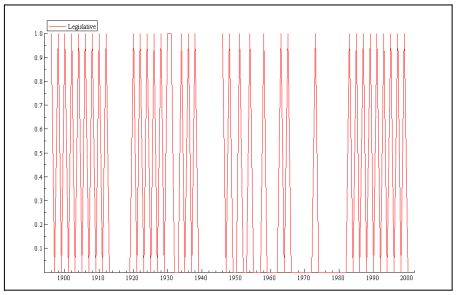


Assasinations

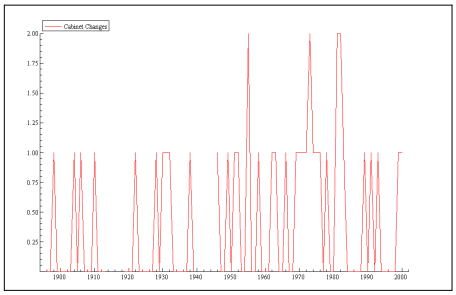
Figure 4: Measures of Formal Political Instabilit



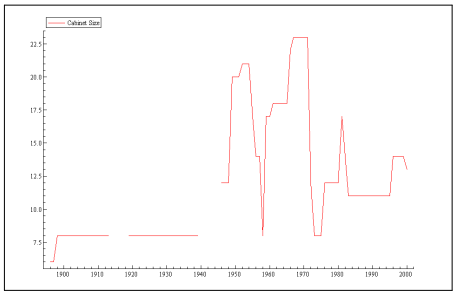
Constitutional Changes



Legislative Elections

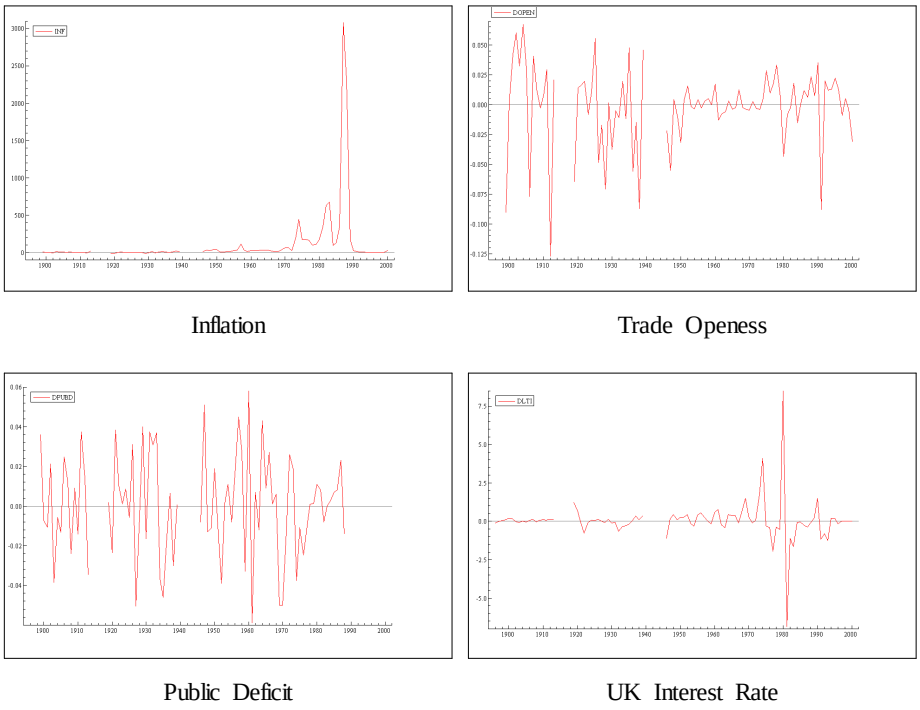


Cabinet Changes



Cabinet Size

Figure 5: Other Variables



international financial market in the Argentinean decline.

4 Econometric Framework

The PARCH model was introduced by Ding, Granger and Engle (1993) and quickly gained currency in the finance literature.[11] Let growth (y_t) follow a white noise process augmented by a risk premium defined in terms of volatility:

$$y_t = c + kh_t + \lambda x_{it} + \epsilon_t, \tag{1}$$

with

$$\epsilon_t = e_t h_t^{\frac{1}{2}},$$

where x_{it} is either the political instability or the financial development variable or one of the other explanatory variables.[12]

In addition, $\{e_t\}$ are independently and identically distributed (i.i.d) random variables with $E(e_t) = E(e_t^2 - 1) = 0$, while h_t is positive with probability one and is a measurable function of the sigma-algebra $\sum_{t-1}$, which is generated by $\{y_{t-1}, y_{t-2}, \ldots\}$.

In other words, h_t denotes the conditional variance of growth. In particular, h_t is specified as an asymmetric PARCH(1,1) process with lagged growth included in the variance equation:

$$h_t^{\frac{\delta}{2}} = \omega + \alpha h_{t-1}^{\frac{\delta}{2}} f\left(e_{t-1}\right) + \beta h_{t-1}^{\frac{\delta}{2}} + \gamma y_{t-l} + \phi x_{it}, \tag{2}$$

with

[11] See, for example, Karanasos and Kim (2006). Karanasos and Schurer, (2005, 2008) use this process to model output growth and inflation respectively.

[12] Because the original financial development, openness, public deficit and country-regionplace UK interest rate variables, are I(1), they enter our models in first differences.

$$f\left(e_{t-1}\right)=\left[\left|e_{t-1}\right|-\varsigma e_{t-1}\right]^{\delta},$$

where δ (with $\delta>0$) is the heteroscedasticity parameter, α and β are the ARCH and GARCH coefficients respectively, ς with $|\varsigma|<1$ is the leverage term and γ is the level term for the lth lag of growth.[13] In order to distinguish the general PARCH model from a version in which δ is fixed (but not necessarily equal to two) we refer to the latter as (P)ARCH.

The PARCH model increases the flexibility of the conditional variance specification by allowing the data to determine the power of growth for which the predictable structure in the volatility pattern is the strongest. This feature in the volatility process has important implications for the relationship between political instability, finance, inflation, and growth and its volatility. There is no strong reason for assuming that the conditional variance is a linear function of lagged squared errors. The common use of a squared term in this role is most likely to be a reflection of the normality assumption traditionally invoked. However, if we accept that growth data are very likely to have a non-normal error distribution, then the superiority of a squared term is unwarranted and other power transformations may be more appropriate.

The PARCH model may also be viewed as a standard GARCH model for observations that have been changed by a sign-preserving power transformation implied by a (modified) PARCH parameterization. He and Teräsvirta (1999) emphasize that if the standard Bollerslev type of model is augmented by the heteroscedasticity parameter (the power term), the estimates of the ARCH and GARCH coefficients almost certainly change.[14]

We present our main reasons in three interdependent blocs: the direct, indirect and dynamic (short and long-run) effects. We proceed with the estimation of the PARCH(1,1) model in equations (1) and (2) in order to take into account the serial correlation observed in the levels and power transformations of our time series data. The Tables below report the estimated parameters of interest for the period 1896-2000. These were obtained by quasi-maximum likelihood estimation (QMLE) as implemented in EVIEWS. The best fitting specification is chosen according to the Likelihood Ratio (LR) results and the minimum value of the Information Criteria (IC) (not reported). Once heteroscedasticity has been accounted for, our specifications appear to capture the serial correlation in the power transformed growth series.[15]

Our set of variables tries to reflect the different explanations for the Argentinean puzzle previously put forward by economic historians. This set comprises domestic and international financial developments, informal and formal political instability, inflation and public deficit, and the degree of openness to international trade. In order to study the direct effects of our set of explanatory variables, we specify model 1 with $\phi=\gamma=0$ in equation (2), while model 2 with $\lambda=0$ in equation (1) allows us to investigate their indirect impacts on growth. [16]

5 Empirical Results

Our results are presented following specific types of effects. That is, we discuss direct (on mean economic growth), indirect (via volatility), dynamic (short and long-run) and structural break effects. Moreover, in trying to satisfy both the time-series and economic growth literature traditions (the former mostly univariate and the latter multivariate), for each effect we report estimates for one variable at a time before discussing the full multivariate results.

[13] The model imposes a Box-Cox power transformation of the conditional standard deviation process and the asymmetric absolute residuals.

[14] Karanasos and Schurer (2008) find that the relationship between the variable and its conditional variance is sensitive to changes in the values of the heteroscedasticity parameter. Put differently, the estimated values of the in-mean and the level effects are fragile to changes in the power term.

[15] For all cases, we find that the leverage term is insignificant, so we re-estimate **our models** excluding this parameter.

[16] As indicated in the previous section we jointly estimate the conditional mean and variance of growth in order to take into account PARCH effects. At the same time, with a limited number of time-series observations the non-linear structure should not be overextended as this imposes excessive requirements on the data. Therefore, we estimate the direct (model 1) and indirect (model 2) effects separately.

Table 1: Direct Effects on Economic Growth: (P)ARCH estimates, Argentina 1896-2003

$x_{it} \downarrow$	k	λ	α	β	δ
Inflation	1.05	-4×10^{-5}	0.48	0.69	0.80
	(2.42)	(0.71)	(4.34)	(7.66)	–
Trade Openness	0.90	−0.06	0.77	0.47	0.80
	(1.95)	(1.73)	(3.63)	(2.28)	–
Public Deficit	0.72	−0.07	0.95	0.43	0.90
	(1.94)	(3.13)	(3.05)	(2.00)	–
UK Interest Rate	0.94	−0.0007	0.82	0.44	0.90
	(3.86)	(0.37)	(3.64)	(1.61)	–
Guerilla Warfare	1.00	−0.0013	0.77	0.47	0.90
	(3.69)	(4.35)	(5.43)	(3.13)	–
Constitutional Changes	1.80	−0.0027	0.56	0.48	0.80
	(1.99)	(1.35)	(3.01)	(1.25)	–
Private bank deposits	0.76	0.98	0.70	0.57	0.80
	(2.66)	(9.21)	(4.99)	(4.94)	–

Note: This table reports parameter estimates for the following model:

$y_t = c + kh_t + \lambda x_{it} + \varepsilon_t$, $h_t^{\frac{\delta}{2}} = \omega + \alpha h_{t-1}^{\frac{\delta}{2}} \mid e_{t-1} \mid^{\delta} + \beta h_{t-1}^{\frac{\delta}{2}}$

The numbers in parentheses are absolute t statistics.

5.1 Direct Growth Effects

Table 1 reports the results from our estimation of the PGARCH(1,1) model for each one of the elements in our set of explanatory variables. The parameter we are most interested in is λ (in the third column.) The results reveal that the direct effect of financial development (private deposits) on per capita economic growth rates are positive and statistically significant, those of informal political instability (guerrilla warfare), international financial developments (interest rate in the United Kingdom), trade openness, and public deficit are negative,[17] whereas the effects of formal political instability, and inflation are not statistically significant, at conventional levels.

As for the in-mean parameter (k), notice that in all cases the estimates are statistically significant and positive which is in line with the theoretical argument of Black (1987). Also the power term coefficients δ are rather stable, with the Akaike IC (AIC) criteria choosing a (P)ARCH specification with power term ranging from 0.8 (e.g., inflation) to 0.9 (e.g., public deficit.) [18]

How robust are these baseline individual results? As discussed above, previous research on Argentina has given considerable weight to the roles of informal political instability and financial development. It is not as surprising therefore that these are the two dominant influences since they are the ones we estimate with greatest precision. One first robustness test would be to investigate whether or not such powerful and precise effects obtain in the presence of the other explanatory variables. In other words, we want to be sure that they remain if we add to the baseline specification any of our four additional variables. Tables 2 has these results.[19]

Table 2 only report these results for informal political instability because we have shown above that formal instability has no direct impact.[20] λ_1, λ_2, λ_3 and λ_4 now reflecting respectively the direct effects of informal political instability, financial development, UK interest rates and trade openness. In all four combinations, informal political instability variables show the expected negative and statistically significant direct effects. As for the direct impact of financial development, it is always positive and statistically significant in all cases. It is very interesting to see that UK interest rate show the expected negative influence in all cases but only significant when combined with savings bank deposit. Finally, the effects of trade openness tend to retain their negtive sign, however, statistically significant in only half of

[17] This result for trade openness is clearly unexpected. Notice, however, that we show below that its short-run effects are negative but the long-run impact is positive.

[18] Notice that in all our estimations the ARCH and GARCH parameters (α and β) are highly significant in the majority of the cases. (see Tables 1-9). Also the estimated power term coefficients are stable ranging from 0.80 to 1.10.

[19] The complete results are available from the authors' upon request.

[20] Although formal political instability does not affect growth directly, as we will see below, we find it affects growth volatility (that is, it has important indirect effects.) We return to these issues in great detail in sub-section 5.2 below.

Table 2: Table 2. Direct Effect of Guerilla Warfare/Strikes, Private Deposits/Savings Bank Deposits, UK Interest Rate, and Trade Openness on Economic Growth. (P)ARCH estimates

	k	λ_1	λ_2	λ_3	λ_4	α	β	δ
				Guerilla Warfare				
Private Deposits/GDP	0.81 (2.06)	−0.001 (3.32)	0.328 (1.98)	−0.001 (1.40)	−0.011 (1.18)	0.81 (4.42)	0.51 (4.31)	1.00 –
Savings Bank Deposits/GDP	0.75 (1.54)	−0.001 (2.63)	0.147 (2.16)	−0.004 (7.18)	−0.014 (2.50)	0.96 (5.07)	0.52 (7.46)	1.10 –
				Strikes				
Private Deposits/GDP	0.74 (2.15)	−0.002 (2.14)	0.263 (1.69)	−0.001 (1.50)	−0.046 (6.89)	0.89 (4.60)	0.43 (2.86)	0.80 –
Savings Bank Deposits/GDP	0.73 (1.62)	−0.001 (2.01)	0.308 (1.79)	−0.004 (5.17)	−0.127 (1.46)	1.00 (3.87)	0.51 (5.05)	1.10 –

Table 2 reports parameter estimates for the following model:

$y_t = c + kh_t + \lambda_1 x_{it}^{(pi)} + \lambda_2 x_{it}^{(fd)} + \lambda_3 x_{uk,t} + \lambda_4 x_{to,t} + \varepsilon_t$, $h_t^{\frac{\delta}{2}} = \omega + \alpha h_{t-1}^{\frac{\delta}{2}} \mid e_{t-1} \mid^{\delta} + \beta h_{t-1}^{\frac{\delta}{2}}$,

where $x_{it}^{(pi)}$ is either guerilla warfare or strikes, $x_{it}^{(fd)}$ is either private deposits/GDP or savings bank deposits/GDP, $x_{uk,t}$ is UK interest rate, and $x_{to,t}$ is trade openess.

The numbers in parentheses are absolute t statistics.

the four cases.

In summary, we find that the main explanatory factors, solely in terms of their direct effects on economic growth in Argentina, turn out to be financial development and informal political instability.

5.2 Indirect Effects (Via Growth Volatility)

One of the main advantages of the (P)GARCH framework is that it allow us to study not only the direct growth effects from the full set of explanatory variables described above, but also their indirect effects on economic growth through the predicted component of growth volatility (conditional on its past values). As we can see from Tables 1 and 2 above and from Tables 3 and 4 in this section, the effect of conditional or predicted volatility on growth is in all cases positive ($k > 0$) and statistically significant at conventional levels. By construction, an increase in the unconditional or unexpected volatility should decrease economic growth rates. In the current section, we present our results for such indirect effects in two parts and follow the same format as before: we first discuss the indirect effects of each one of our explanatory variables and then we present results for our complete set (that is, including all explanatory variables).[21]

Table 3 reports the estimation results for each one of the elements in our data set for what we call the indirect effect, which is the effect on growth via the volatility channel.[22] The parameter we are most interested in is ϕ (in the fourth column.) Our results show that the indirect effects of trade openness and formal political instability (in this case, constitutional changes) on the conditional volatility of per capita economic growth rates are negative and statistically significant whereas those of inflation and public deficit are positive and significant.

Larger public deficits and escalating inflation rates are associated with a larger fraction of growth volatility that is anticipated by the relevant economic agents. And the larger the share of the total growth volatility that is anticipated, the higher the per capita growth rates we observe. Therefore, inflation and public deficits both register a negative direct impact on growth but a negative and substantial impact on the expected or conditional share of growth volatility.

On the other hand, we find that exogenous increases in trade openness has a negative and significant impact on the conditional growth volatility. This results reflects one of the costs many economists

[21] For the sake of space, we do not report the results for the intermediate steps (namely, between the results for one by one variables and for all variables together). These results for the indirect effects for each pair of variables, each three and each four are thus available upon request

[22] In the expressions for the conditional variances reported in the Tables, various lags of growth (from 1 to 12) were considered with the best model (l = 6) chosen on the basis of the minimum value of the AIC.

Table 3: Indirect effect on Economic Growth. (P)ARCH estimates

$x_{it} \downarrow$	k	α	β	ϕ	γ	δ
Inflation	1.66	0.60	0.54	5×10^{-5}	0.24	0.80
	(3.03)	(5.36	(7.52)	(2.98)	(2.44)	–
Trade Openness	1.65	0.75	0.28	−0.200	0.19	0.80
	(2.72)	(6.41)	(0.16)	(3.48)	(2.69)	–
Public Deficit	1.02	0.69	0.45	0.120	0.29	0.80
	(2.73)	(5.45)	(5.15)	(2.44)	(4.76)	–
UK Interest Rate	1.55	0.50	0.55	0.004	0.15	1.00
	(2.26)	(2.98)	(5.35)	(1.57)	(4.67)	–
Guerilla Warfare	1.12	0.73	0.46	0.001	0.10	0.90
	(2.46)	(4.80)	(4.00)	(0.82)	(2.00)	–
Constitutional Changes	1.18	0.69	0.45	−0.008	0.18	1.00
	(1.94)	(4.40)	(4.15)	(3.40)	(3.75)	–
Private Deposits/GDP	2.05	0.41	0.62	0.580	0.40	0.80
	(2.23)	(3.04)	(6.75)	(0.53)	(5.69)	–

Note: This table reports parameter estimates for the following model:

$y_t = c + kh_t + \varepsilon_t$, $h_t^{\frac{\delta}{2}} = \omega + \alpha h_{t-1}^{\frac{\delta}{2}} \mid e_{t-1} \mid^{\delta} + \beta h_{t-1}^{\frac{\delta}{2}} + \phi x_{it} + \gamma y_{t-6}$

The numbers in parentheses are absolute t statistics.

associate with trade liberalization efforts: in the short-run, changes in the share of trade in GDP decrease the conditional or expected share of growth volatility (or, equivalently, increase the amount of growth volatility that economic agents are not able to anticipate.) Therefore such a decrease in conditional volatility driven by trade openness translate into lower rates of economic growth (because $k > 0$).

We also find supporting evidence for a differential impact of formal political instability: the estimated coefficient of its indirect effect is negative and statistically significant, while we find little or no evidence for its direct effect on economic growth rates. Notice we find the exact opposite for informal political instability (negative direct effect and insignificant indirect effect.)

Last, and also of interest, is that we could not detect any significant indirect effects from domestic and international financial development (proxied by private deposits and UK interest rate, respectively) or informal political instability (proxied by the occurrence of guerilla warfare). There is no evidence that such factors affect growth in Argentina indirectly, through the conditional volatility of growth. Recall, however, that we do find that the direct effects of both domestic financial development and guerrilla warfare are substantial (see Table 2)

We now proceed by investigating the robustness of these results. Specifically, and for comparability purposes, we ask how the results from the various aspects of financial development and political instability change if we add to the baseline model the complete set of explanatory variables (as opposed to assess their effects one by one).

Table 4 shows that after adding this full set of controls, the indirect negative effect of formal political instability remains statistically significant throughout. Focusing our attention first on the ϕ_1 and k parameters, note that all forms of formal instability (in this case, the occurrence of changes in the constitution or of legislative elections in a given year) are found to affect conditional volatility negatively ϕ_1 ($\phi_1 < 0$). Since $k > 0$, these affect growth negatively as well. Economic agents have severe difficulties in anticipating the consequences of changes in the rules of the game (constitutions) and in the composition of the legislature following democratic elections. Such changes increase the share of unanticipated uncertainty (unconditional volatility) and this accordingly reduces growth. Of course, these results reinforce the notion that the type of political instability matters vis-à-vis economic growth: while informal may have a direct effect, the impact of formal instability operates indirectly, via growth volatility.

There a number of additional important results from Table 4. In terms of the effects of financial globalization (or, more specifically, of the international dimensions of financial development), we find that they tend to be positive and significant ($\phi_2 > 0$) on anticipated growth volatility when proxied by the interest rate in the United Kingdom. This is intuitive as reductions in the UK interest rate translate into the reduction of the price of money internationally with the latter pricing accounting for risk. On the other hand, we find evidence that increases in trade openness are associated with decreases in conditional volatility ($\phi_3 < 0$) or, in other words, with increases in the unconditional volatility of per capita growth

Table 4: Indirect Effect of Constitutional Changes/Legislative Elections, UK Interest Rate, Trade Openness, and Public Deficit on Economic Growth. (P)ARCH estimates

	k	α	β	δ	ϕ_1	ϕ_2	ϕ_3	ϕ_4	γ
Constitutional Changes	1.52 (3.09)	0.46 (4.04)	0.69 (7.03)	1.00 –	−0.022 (6.19)	0.010 (2.99)	−0.174 (5.91)	0.082 (2.96)	0.04 (0.74) $l=7$
Legislative Elections	5.24 (1.39)	0.13 (0.76)	0.96 (7.72)	0.90 –	−0.008 (1.74)	0.013 (2.43)	−0.107 (2.35)	0.121 (3.69)	−0.06 (0.49) $l=6$

Note: This table reports parameter estimates for the following model: $y_t = c + kh_t + \varepsilon_t$,
$h_t^{\frac{\delta}{2}} = \omega + \alpha h_{t-1}^{\frac{\delta}{2}} \mid e_{t-1} \mid^{\delta} + \beta h_{t-1}^{\frac{\delta}{2}} + \phi_1 x_{it}^{(pi)} + \phi_2 x_{uk,t} + \phi_3 x_{to,t} + \phi_4 x_{pd,t} + \gamma y_{t-l}$,
where $x_{it}^{(pi)}$ indicates either constitutional changes or legislative elections,
$x_{uk,t}$ is UK interest rate, $x_{to,t}$ is trade openness, and $x_{pd,t}$ is public deficit.
The numbers in parentheses are absolute t statistics.

in Argentina.

Moreover, evidence for a positive impact of public deficit (or inflation, the latter not reported) on volatility also remains positive ($\phi_4 > 0$) and statistically significant which is in line with the theoretical arguments put forward by, among others, Dortsey and Sarte (2000).

It is also worth noting that since the estimates for the in-mean parameter (k) and the level coefficient (γ) are statistically significant and positive they offer string strong evidence for a positive bidirectional feedback relationship between growth and its volatility,[23] which seems robust to the presence of various finance and instability variables.

In summary, we find strong evidence that both informal political instability and trade openness affect growth indirectly through its volatility. No other variables in our set of explanatory variables seem to exhibit equally robust estimates of their indirect effects.

5.3 Dynamic Aspects

In this section we investigate how short- and long-run considerations help us refine our baseline results. Another potential benefit from this exercise is that the required use of lags may help ameliorate any lingering concerns about endogeneity. In order to estimate short- and long- run relationships we employ the following error correction (P)ARCH form

$$\Delta y_t = \theta \Delta x_{i,t-l} + \varphi(y_{t-1} - c - \zeta x_{i,t-1}) + u_t, \tag{3}$$

where θ and ζ capture the short and long-run effects respectively, and φ is the speed of adjustment to the long-run relationship.[24] This is accomplished by embedding a long-run growth regression into an ARDL model.[25] In other words, the term in parenthesis contains the long-run growth regression, which acts as a forcing equilibrium condition

$$y_t = c + \zeta x_{it} + \epsilon_t, \tag{4}$$

where ϵ_t is $I(0)$. The lag of the first difference of either the political instability or financial development variable or one of the explanatory variables ($\Delta x_{i,t-l}$) characterizes the short-run effect. The condition for the existence of a long-run relationship (dynamic stability) requires that the coefficient on the error-correction term be negative and not lower than -2 (that is, $-2 < \varphi < 0$). We also take into account the PARCH effects by specifying the error term u_t as follows

$$u_t = e_t h_t^{\frac{1}{2}}, \tag{5}$$

[23] The existing empirical literature focuses mainly on the effect of volatility on growth, see Fountas et al. (2006) and Fountas and Karanasos (2007).

[24] As pointed out by Loayaza and Rancière (2006) the requirements for the validity of this methodology are that: i) there exists a long-run relationship between the variables of interest and, ii) the dynamic specification of the model is sufficiently augmented so that the regressors are strictly exogenous and the resulting residual is serially uncorrelated.

[25] For details on the "ARDL approach," see Pesaran (1997) and Pesaran and Shin (1999).

Table 5: The short- and long-run effects on Growth effects

$x_{it} \downarrow$	θ	φ	ζ	α	β	δ
Inflation	-5×10^{-5} (0.75) $l=0$	-0.88 (9.98)	0.0001 (1.53)	0.91 (5.22)	0.42 (4.81)	0.90 –
Trade Openness	-0.100 (1.45) $l=3$	-0.58 (4.83)	0.2500 (2.01)	0.65 (5.16)	0.61 (7.64)	0.90 –
Public Deficit	-0.110 (9.08) $l=0$	-0.60 (25.94)	-0.1700 (5.88)	1.42 (4.08)	0.22 (2.16)	0.80 –
UK Interest Rate	-0.015 (4.77) $l=5$	-0.39 (7.47)	0.0160 (4.21)	1.27 (3.81)	0.14 (0.95)	0.90 –
Guerilla Warfare	-0.0014 (3.38) $l=3$	-0.60 (7.20)	-0.0007 (2.59)	1.10 (4.19)	0.36 (3.59)	0.90 –
Private Deposits/GDP	-1.35 (1.81) $l=5$	-0.44 (4.64)	0.9399 (23.72)	0.37 (2.63)	0.80 (6.69)	0.90

Note: This table reports parameter estimates for the following model:
$\Delta y_t = \mu + \theta \Delta x_{i,t-l} + \varphi(y_{t-1} - c - \zeta x_{i,t-1}) + u_t$,
$h_t^{\frac{\delta}{2}} = \omega + \alpha \left|u_{t-1}\right|^{\delta} + \beta h_{t-1}^{\frac{\delta}{2}}$. θ (l is the order of the lag)
and ζ capture the short- and long-run effects respectively.
φ indicates the speed of adjustment to the long-run relationship.
The numbers in parentheses are absolute t statistics.

where

$$h_t^{\frac{\delta}{2}} = \omega + \alpha \left|u_{t-1}\right|^{\delta} + \beta h_{t-1}^{\frac{\delta}{2}}. \tag{6}$$

Table 5 presents the results on the estimation of short and long-run parameters linking the four explanatory variables with growth. In all cases, the estimated coefficient on the error correction term (φ) lies within the dynamically stable range $(-2, 0)$. From investigating whether dynamic considerations affect our conclusions, we find important differences in terms of short and long-run behavior of our explanatory variables, more specifically, while the effect of public deficit (negative) is similar in the long- and short-run, that of the UK interest rate is negative in the short- and positive in the long-run. Interestingly, trade openness has only a positive long-run impact on growth.

Table 6 presents the results on the estimation of the dynamic parameters linking informal instability and financial development with growth. In all cases, the estimated coefficient on the error correction term (φ) lies within the dynamically stable range $(-2, 0)$. More precisely, the estimates of φ for informal instability and financial development lie within the range -0.74 to $-0.43$and -0.85 to -0.44, respectively.

Regarding the short and long-run estimates, θ and ζ we focus our analysis first on those obtained from the informal instability variables. All four estimates of the short-run coefficients are highly significant and negative and for two cases their absolute values are higher than the corresponding values for the long-run coefficients (for assassinations, the long-run effect is not significantly different from zero). This provides supporting evidence for the notion that the duration of the political instability effect does indeed matter and, for antigovernment demos and assassinations, such effects tend to be considerably stronger in the short- than in the long-run as previously noted by Campos and Nugent (2002) and Murdoch and Sandler (2004).

Next we discuss the results regarding the financial development variables. In the long-run, we find that financial development affects growth positively. This result is very much in line with the large empirical literature reviewed by Levine (2005) and it is interesting we can reproduce it with our rather different methodology. Maybe more interestingly, the short-run coefficients tell a very differently story: we find that the short-run impact of financial development on growth is negative and significant. Thus our results square well with recent findings by Loayaza and Rancière (2006), among others, in that the sign of the relationship between economic growth and financial development depends on whether the movements are temporary or permanent (the effect being negative in the former and positive in the latter.) Finally,

it is noteworthy that our results are robust to various measures of financial development and also that the stronger long-run effects we obtain are for our measures of financial efficiency rather than for our measures of the size of the financial sector (according to Levine, 2005, this is also in line with the recent evidence).

Table 6: The short- and long-run Growth effects of Guerrila Warfare/Strikes, Private Deposits/ Savings Bank Deposits, UK Interest Rate and Trade Openness

	θ_1	θ_2	θ_3	θ_4	φ	ζ_1	ζ_2	ζ_3	ζ_4	δ
$x_{it}^{(fd)} \downarrow$					Guerrila Warfare					
Private Deposits/GDP	−0.0084 (2.24) $l=2$	−0.1114 (1.69) $l=3$	−0.0020 (4.44) $l=0$	−0.0237 5.22 $l=0$	−0.6814 (5.69)	−0.0012 (3.65)	0.2348 (1.51)	−0.0034 (3.05)	−0.0084 (1.40)	0.80 –
Savings Bank Deposits/GDP	−0.0018 (3.28) $l=3$	−0.3117 (4.27) $l=3$	−0.0053 (25.48) $l=0$	−0.0058 (3.91) $l=1$	−0.4593 (4.31)	−0.0009 (2.84)	0.1708 (2.21)	−0.0039 (5.54)	−0.0108 (1.43)	0.80 –
					Strikes					
Private Deposits/GDP	−0.0023 (7.70) $l=3$	−0.0949 (2.48) $l=1$	−0.0056 (19.57) $l=0$	−0.0112 (8.41) $l=3$	−0.4516 (9.60)	−0.0010 (2.23)	0.3205 (1.57)	−0.00395 (4.95)	−0.0059 (0.67)	0.80 –
Savings Bank Deposits/GDP	−0.0015 (3.54) $l=3$	−0.2052 (2.02) $l=1$	−0.0025 (5.21) $l=0$	−0.0194 (3.79) $l=0$	−0.3582 (7.13)	−0.0006 (1.95)	0.3779 (3.47)	−0.00378 (5.08)	−0.0092 (1.19)	0.80 –

Note: This table reports parameter (mean) estimates for the following model:

$\Delta y_t = \mu + \theta_1 \Delta x_{i,t-l}^{(pi)} + \theta_2 \Delta x_{i,t-l}^{(fd)} + \theta_3 \Delta x_{uk,t-l} + \theta_4 \Delta x_{to,t-l} + \varphi(y_{t-1} - c - \zeta_1 x_{i,t-1}^{(pi)} - \zeta_2 x_{i,t-1}^{(fd)} - \zeta_3 x_{uk,t-1} - \zeta_4 x_{to,t-1}) + u_t,$

$h_t^{\frac{\delta}{2}} = \omega + \alpha \left| u_{t-1} \right|^{\delta} + \beta h_{t-1}^{\frac{\delta}{2}}$. The four θ's (l is the order of the lag) and ζ's capture the short- and long-run effects respectively.

φ indicates the speed of adjustment to the long-run relationship.

$x_{i,t-1}^{(pi)}$denotes an informal political instability (either guerilla warfare or strikes) variable.

$x_{i,t-1}^{(fd)}$ denotes a financial development (either private deposits/GDP or savings bank deposits/GDP) variable.

$x_{uk,t-1}$ is UK interest rate, $x_{to,t-1}$ is trade openness and $x_{pd,t-1}$ is public deficit.

The numbers in parentheses are absolute t statistics.

5.4 Structural Breaks

One final important robustness test regards the role of structural breaks. We use the methodology developed by Bai and Perron (2003) to examine whether there are any structural breaks in growth, its volatility, the various political instability series and the first differences of the four financial development variables. Bai and Perron (2003) address the problem of testing for multiple structural changes under very general conditions on the data and the errors. In addition to testing for the existence of breaks, these statistics identify the number and location of multiple breaks.

In the case of the economic growth series (and, interestingly, also for growth volatility) the Bai-Perron methodology supports two structural break points.[26] The first occurs for year 1922 and the second for year 1964. For our political instability variables, we find no structural breaks for the assassinations, guerilla warfare, cabinet and constitutional changes series,[27] and we also find no breaks in the four financial development variables.
However, our Bai-Perron results support that general strikes have one structural break, which is dated for year 1955. This is a result of great importance: 1955 is the year of the military coup in which President Juan Domingo Perón was overthrown by the military thus concluding a defining chapter in Argentine history. Further, we also find one structural break in cabinet size and legislative elections (they are dated 1946 and 1949, respectively) while in anti-government demonstrations we find two breaks dated 1954 and 1972.[28]

In what follows, we incorporate dummy variables in the equations (1), (2) (3) and (6), thus taking into account breaks in the political instability variables and in the volatility of growth. First, we introduce the following notation. D_{1t}, D_{2t} are (intercept) dummies defined as D_{1t}, $D_{2t} = 1$ in the periods 1922-2000 and 1964-2000, respectively, and D_{1t}, $D_{2t} = 0$ otherwise. Similarly, D_{it} is a (slope) dummy indicating the period which starts from the year of the break in the political instability variable (x_{it}). For example for strikes and government crises $D_{it} = 1$ in the period from 1955 to 2000 whereas for cabinet size $D_{it} = 1$ during the period from 1946 until the end of the sample.
The augmented model is given by

$$y_t = c + c_1 D_{1t} + c_2 D_{2t} + k h_t + \lambda x_{it} + \lambda_d D_{it} x_{it} + \epsilon_t, \tag{7}$$

and

$$h_t^{\frac{\delta}{2}} = \omega + \omega_1 D_{1t} + \omega_2 D_{2t} + \alpha h_{t-1}^{\frac{\delta}{2}} f\left(e_{t-1}\right) + \beta h_{t-1}^{\frac{\delta}{2}} + \gamma y_{t-l} + \phi x_{it} + \phi_d D_{it} x_{it}. \tag{8}$$

Recall that the coefficients φ and λ capture the impacts of the political instability variable on growth and its volatility respectively. Similarly, φ_d and λ_d correspond to the two effects from the year of the break onwards. Thus the two effects are captured by φ and λ in the period up to the year of the structural break, and by $\varphi + \varphi_d$ and $\lambda + \lambda_d$ during the period from the year of the break until the end of the sample. As above in order to study the direct effects of political instability and financial development we specify model 1 with $\varphi = \varphi_d = 0$, while model 2 with $\lambda = \lambda_d = 0$ allows us to investigate their indirect impacts on growth.

We also incorporate intercept dummies and level effects in the error correction equation (3) and conditional variance equation (6), as follows

$$\Delta y_t = \mu_1 D_{1t} + \mu_2 D_{2t} + \theta \Delta x_{i,t-l} + \varphi(y_{t-1} - c - \zeta x_{i,t-1}) + u_t, \tag{9}$$

$$h_t^{\frac{\delta}{2}} = \omega + \omega_1 D_{1t} + \omega_2 D_{2t} + \alpha \left|u_{t-1}\right|^{\delta} + \beta h_{t-1}^{\frac{\delta}{2}} + \gamma y_{t-l}. \tag{10}$$

[26] As a measure of volatility we use the power transformed absolute growth $|y_t|^d$

[27] Our data shows no guerilla warfare before 1948 and after 1977.

[28] With arguably one exception (anti-government demonstrations in 1972, which were motivated by demands for the return of Perón from exile), all the structural breaks in our political instability series occur during Perón governments. Perón was elected president three times. His first term is from 1946 to 1952. He is re-elected in 1951, his second term starts in 1952 and ends abruptly in 1955. His third term is between 1973 (allowed to return from country-regionplaceSpain after 18-year exile) and 1974 (suffers fatal heart attack.) Although marked by severe economic problems, the second term (1951 to 1955) is more often remembered by the political instability (the various terrorist attacks being a sad prelude to the so-called "Dirty War" of 1970s.)

Overall, we find our results (see tables 7, 8 and 9) to be quite robust to the inclusion of the structural break dummies. That is, (i) informal instability have a direct negative effect on growth, while formal instability have an indirect (through volatility) negative impact on growth, (ii) financial development affects growth positively in the long-run but negatively in the short-run, (iii) the effects of the informal instability are significantly stronger in the short- than in the long-run.

It is also noteworthy that the causal negative effect of strikes reflects the period 1955-2000, which is not surprising given the intricate relationship between the Peron government and organized labor. Interestingly, before 1949 there is no causal effect from legislative elections to growth volatility, whereas after 1949 a negative impact began to exist. Finally, the coefficient of M3 over GDP also becomes insignificant, while the same does not happen to the other measures, which go beyond the size of the financial sector.

Table 7: Direct Effect of Guerrila Warfare/Strikes, Private Deposits/Savings Bank Deposits,UK Interest Rate and Trade Openness on Economic Growth. Dummies and (P)ARCH estimates

	c_1	c_2	k	λ_1	λ_2	λ_3	λ_4	ω_1	ω_2	α	β	δ
$x_{i,t}^{(fd)} \downarrow$						Guerrila Warfare						
Private Deposits/GDP	−0.032 (2.38)	0.054 (4.48)	0.689 (1.06)	−0.001 (4.01)	0.422 (3.17)	−0.0002 (0.39)	−0.028 (4.05)	–	0.031 (3.19)	0.71 (1.89)	0.36 (3.07)	1.00 –
Savings Bank Deposits/GDP	–	0.059 (6.99)	−1.060 (1.22)	−0.001 (3.52)	0.237 (3.87)	−0.0010 (1.08)	−0.026 (2.69)	–	0.038 (2.82)	0.73 (5.15)	0.38 (2.82)	0.80 –
							Strikes					
Private Deposits/GDP	–	0.063 (5.69)	1.121 (0.80)	−0.002 (2.67)	0.180 (0.44)	−0.0010 (0.36)	−0.055 (2.50)	–	0.017 (3.83)	0.41 (2.83)	0.60 (3.83)	1.10 –
Savings Bank Deposits/GDP	−0.009 (15.4)	–	0.893 (1.00)	−0.001 (1.76)	0.375 (2.52)	−0.0010 (1.17)	−0.048 (4.28)	0.015 (3.50)	0.074 (1.90)	0.84 (5.46)	0.08 (1.19)	1.00 –

Note: This table reports parameter estimates for the following model:

$y_t = c + c_1 D_{1t} + c_2 D_{2t} + k h_t + \lambda_1 x_{it}^{(pi)} + \lambda_2 x_{it}^{(fd)} + \lambda_3 x_{uk,t} + \lambda_4 x_{to,t} + \varepsilon_t,$

$h_t^{\frac{\delta}{2}} = \omega + \omega_1 D_{1t} + \omega_2 D_{2t} + \alpha h_{t-1}^{\frac{\delta}{2}} \mid e_{t-1} \mid^{\delta} + \beta h_{t-1}^{\frac{\delta}{2}}.$

$x_{it}^{(pi)}$ denotes an informal political instability (either guerilla warfare or strikes) variable.

$x_{it}^{(fd)}$ denotes a financial development (either private deposits/GDP or savings bank deposits/GDP) variable.

$x_{uk,t-1}$ is UK interest rate, and $x_{to,t-1}$ is trade openness.

D_{1t}, D_{2t} are (intercept) dummies defined as D_{1t}, $D_{2t} = 1$ in the periods 1922-2000 and 1964-2000 respectively, and D_{1t}, $D_{2t} = 0$ otherwise.

The numbers in parentheses are absolute t statistics.

Table 8: Indirect Effect of Constitutional Changes/Legislative Elections, UK Interest Rate, Trade Openness, and Public Deficit on Economic Growth. Dummies and (P)ARCH estimates

	c_1	c_2	k	ω_1	ω_2	α	β	δ	ϕ_1	ϕ_2	ϕ_3	ϕ_4	γ
Constitutional Changes	–	–	5.219	–	0.031	0.241	0.548	1.00	−0.003	0.005	−0.076	0.018	0.095
			(3.67)		(3.37)	(1.90)	(4.30)	–	(3.49)	(1.89)	(3.07)	(1.36)	(3.43) $_{l=7}$
Legislative Elections	−0.013	–	2.448	−0.002	0.044	0.261	0.558	1.00	−0.003	−0.001	−0.107	0.314	0.026
	(18.59)		(1.24)	(0.76)	(1.36)	(0.49)	(15.50)	–	(5.02)	(0.21)	(2.46)	(2.75)	(0.30) $_{l=7}$

Note: This table reports parameter estimates (interest) for the following model: $y_t = c + c_1 D_{1t} + c_2 D_{2t} + k h_t + \varepsilon_t$,

$h_t^{\frac{\delta}{2}} = \omega + \omega_1 D_{1t} + \omega_2 D_{2t} + \alpha h_{t-1}^{\frac{\delta}{2}} \mid e_{t-1} \mid^{\delta} + \beta h_{t-1}^{\frac{\delta}{2}} + \phi_1 x_{it}^{(pi)} + \phi_2 x_{uk,t} + \phi_3 x_{to,t} + \phi_4 x_{pd,t} + \gamma y_{t-l}$,

where $x_{it}^{(pi)}$ indicates a formal political instability variable (either constitutional changes or legislative elections),

$x_{uk,t}$ is UK interest rate, $x_{to,t}$ is trade openess, and $x_{pd,t}$ is public deficit.

D_{1t}, D_{2t} are (intercept) dummies defined as D_{1t}, $D_{2t} = 1$ in the periods 1922-2000 and 1964-2000 respectively, and D_{1t}, $D_{2t} = 0$ otherwise.

The numbers in parentheses are absolute t statistics.

Table 9: The short- and long-run Growth effects of Guerrila Warfare/Strikes, Private Deposits/ Savings Bank Deposits, UK Interest Rate, and Trade Openness with Dummies

	μ_1	μ_2	θ_1	θ_2	θ_3	θ_4	φ	ζ_1	ζ_2	ζ_3	ζ_4	ω_1	ω_2	δ
$x_{it}^{(fd)} \downarrow$							Guerrila Warfare							
Private Deposits/GDP	–	0.050 (4.67)	−0.0012 (7.73) $l=0$	−0.112 (4.30) $l=2$	−0.005 (19.57) $l=0$	−0.005 (2.22) $l=0$	−0.485 (9.96)	−0.0012 (3.65)	0.2348 (1.51)	−0.0034 (3.05)	−0.0084 (1.40)	−0.125 (2.64)	0.056 (4.26)	0.80 –
Savings Bank Deposits/GDP	–	0.050 (8.73)	−0.0003 (5.16) $l=3$	−0.236 (3.03) $l=3$	−0.003 (12.12) $l=0$	−0.023 (9.90) $l=0$	−0.481 (10.10)	−0.0009 (2.84)	0.1708 (2.21)	−0.0039 (5.54)	−0.0108 (1.43)	–	0.042 (3.08)	0.80 –
							Strikes							
Private Deposits/GDP	–	0.042 (5.13)	−0.0006 (3.06) $l=3$	−0.923 (6.11) $l=3$	−0.003 (3.82) $l=3$	−0.038 (6.86) $l=0$	−0.410 (8.80)	−0.0010 (2.23)	0.3205 (1.57)	−0.0039 (4.95)	−0.0059 (0.67)	–	0.033 (4.10)	0.90 –
Savings Bank Deposits/GDP	–	0.050 (3.37)	−0.0007 (4.51) $l=0$	−0.299 (4.38) $l=1$	−0.003 (5.17) $l=3$	−0.031 (4.89) $l=2$	−0.689 (8.78)	−0.0006 (1.95)	0.3779 (3.47)	−0.0038 (5.08)	−0.0092 (1.19)	–	0.047 (4.08)	1.00 –

Note: This table reports parameter estimates (of interest) for the following model:

$\Delta y_t = \mu + \mu_1 D_{1t} + \mu_2 D_{2t} + \theta_1 \Delta x_{i,t-l}^{(pi)} + \theta_2 \Delta x_{i,t-l}^{(fd)} + \theta_3 \Delta x_{uk,t-l} + \theta_4 \Delta x_{to,t-l} + \varphi(y_{t-1} - c - \zeta_1 x_{i,t-1}^{(pi)} - \zeta_2 x_{i,t-1}^{(fd)} - \zeta_3 x_{uk,t-1} - \zeta_4 x_{to,t-1}) + u_t,$

$h_t^{\frac{\delta}{2}} = \omega + \omega_1 D_{1t} + \omega_2 D_{2t} + \alpha \left|u_{t-1}\right|^{\delta} + \beta h_{t-1}^{\frac{\delta}{2}}$. The four θ's (l is the order of the lag) and the four ζ's capture the short- and long-run effects respectively.

φ indicates the speed of adjustment to the long-run relationship.

$x_{i,t-1}^{(fd)}$ denotes a financial development (either private deposits/GDP or savings bank deposits/GDP) variable.

$x_{i,t-1}^{(pi)}$denotes an informal political instability (either guerilla warfare or strikes) variable.

$x_{uk,t-1}$ is UK interest rate, $x_{to,t-1}$ is trade openness and $x_{pd,t-1}$ is public deficit.

D_{1t}, D_{2t} are (intercept) dummies defined as D_{1t}, $D_{2t} = 1$ in the periods 1922-2000 and 1964-2000 respectively, and D_{1t}, $D_{2t} = 0$ otherwise.

The numbers in parentheses are absolute t statistics.

6 Conclusions and Future Research

Using a PARCH framework and data for Argentina from approximately 1890 to 2000 we ask the following questions: What is the relationship between, on the one hand, financial development (domestic and international), inflation, trade openness and political instability and, on the other hand, economic growth and (predicted) growth volatility? Are these effects fundamentally and systematically different? Does the intensity and the direction (the sign) of these effects vary over time, in general and, in particular, do they vary with respect to short- versus long-run considerations? We find that the main explanatory factors, solely in terms of their direct effects on economic growth in Argentina, turn out to be financial development and informal political instability. Further, we find robust evidence that both formal political instability and trade openness affect growth indirectly via its volatility. No other variables in our basic set exhibit such robust estimates of their indirect effects. From investigating whether dynamic considerations affect our conclusions, we find important differences in terms of short and long-run behavior of our key variables, more specifically, while the effect of political instability (negative) is similar in the long- and short-run, that of financial development is negative in the short- and positive in the long-run whereas trade openness has only a positive long-run impact.

These findings are interest in themselves but they also matter because they raise a number of new questions that we believe may be useful in motivating future research. Here we highlight two suggestions. Regarding the role of finance in the process of economic development, our finding reinforces a large body of previous research in that we also show a strong, positive impact of financial development on growth in the long-run. We find that different forms of political instability affect growth through different channels over different time windows, making up for a strong and rather resilient effect that seem really too powerful vis-à-vis the benefits brought to the table by financial development. We can not forget however that Argentina is unique: no other country in the world since the Industrial Revolution went from riches to rags. Put it differently, Argentina is an outlier and further research could try to replicate our analysis using the historical experience of other countries (ideally in a panel setting). That is, to study the relationship between financial development and economic growth in a panel of developing countries would strengthen what we know. Yet, the data requirements are very heavy indeed, with most developing countries lacking historical data even on key figures, such as per capita GDP, going back to the beginning or middle of the XIXth century. This, of course, does not make this task less important.

The second suggestion refers to a possible methodological improvement, namely the application of the bivariate GARCH model to the problem at hand (albeit the relatively small number of observations). The joint estimation of the political instability-financial development-growth system in a panel of countries would clearly represent progress and is something we feel future research should try to address.

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