

## Political Instability, Institutions, and Economic Growth\*

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### **Abstract**

Recent research has shown that institutions contribute significantly to long-run economic growth. Paradoxically, a separate line of research has produced mixed results concerning the effect of political instability on economic growth. How can it be that political institutions matter, but that during periods of political instability there is no systematic effect on growth? We attempt to resolve this paradox by modeling an institutional equilibrium as a coordination game whose payoffs are related to the value of the nexus of contracts governed by the prevailing institutions. The stability of this equilibrium in the face of political instability depends on the extent to which formal political institutions govern the underlying nexus of contracts. If formal political institutions matter, then political instability should cause a large decline in the value of contracts and a change in the institutional equilibrium is more probable. If informal institutions play a greater role, then political instability should have less impact on the value of trades and the opportunity cost of institutional change is correspondingly higher. We test this theory using a System-GMM panel estimator approach and panel data on political instability, institutions, and economic growth.

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## **I. Introduction**

Among politicians, and the economists who “whisper in their ears”, there is a belief that democratic institutions are good for growth. Unfortunately, while this idea may have very good theoretical and moral support, the empirical evidence for democratic institutions as a catalyst for growth is ambiguous at best. In a recent study, among a number of points made, Dani Rodrik and Romain Wacziarg find that among 24 countries that experienced a democratic transition, half found their average growth rate fell in the following ten years (and about a third experienced negative growth). The heterogeneity in countries’ growth experiences implies that something is missing from our analyses. We propose that this missing element is a more nuanced understanding of what institutions are and how institutional change occurs. The focus of most studies on formal political institutions ignores the full range of both formal and informal institutions that operate in most countries and their importance for determining whether political instability positively or negatively impacts growth. For both theoretical and empirical reasons this focus is entirely understandable. However, we believe it is at least possible to identify those circumstances in which a focus on formal institutions is more appropriate and those in which it is not.

Several components are necessary for a study of this type. First, there needs to be a theoretical framework describing an “institutional equilibrium” that includes both formal and informal institutions. This theory must also yield hypotheses that can be tested using available data. We propose that an institutional equilibrium should be thought of as governing the writing and enforcement of a “nexus of contracts.” Some of these contracts depend on formal and others on informal institutions. The stability of the institutional equilibrium stems from the value of the contracts it governs. The reason people do not often change the way property rights are defined

and enforced is because of the potential losses to those who benefit from them. Thinking of institutions in this way allows us to formulate hypotheses concerning how the changing value of the nexus of contracts impacts institutional change and ultimately the effect of political instability on growth.

In this paper, we hypothesize that periods of extreme political instability tend to reduce the value of contracts enforced by formal institutions more than they reduce the value of contracts enforced by informal institutions. As such, countries in which trade is structured predominantly through informal institutions should experience less of a reduction in output during these political shocks. In those countries in which contracts lose value during periods of political change, we hypothesize that institutional change is more likely to occur (creating the potential for a change in growth regime). In effect, we interpret political instability as providing a natural experiment to study the stability of institutional equilibria across countries at different times. By looking at many of these events we hope to say something more general about those countries which respond to political instability and those which do not.

In Section II below we describe in more detail our theoretical hypothesis. In Section III we describe our data, including our measures of political instability and our proxies for the degree of formal institutions in a country. In Section IV we use data on 134 instances of political instability across 69 countries between 1870 and 2000 to perform a simple “Before and After” examination of the effect of political instability on growth, while in Section V we use a System GMM approach to empirically examine whether or not countries that rely more on formal institutions are more responsive to political instability than countries that rely more on informal institutions. Section VI concludes.

## II. Institutional Equilibrium as a Nexus of Contracts

We take as our starting point that a country's "institutional equilibrium" plays a significant role in determining its rate of economic growth.<sup>1</sup> We also believe that the stability of the institutional equilibrium in the face of political instability depends on the type of institutions involved. In what follows we will: (1) define what we mean by formal and informal institutions; (2) define an institutional equilibrium; and (3) construct some hypotheses about the relationship between an institutional equilibrium and political instability.

Any trade that has value also has associated with it positive transaction costs. Transaction costs are all of the costs associated with engaging in trade that are not explicitly captured by price. Search costs, negotiation costs, and enforcement costs are all components of transaction costs.<sup>2</sup> Institutions exist to lower the transaction costs associated with trade.<sup>3</sup> Furthermore, these institutions may be either formal or informal. Formal institutions are usually defined as "explicit," or, "written down". Informal institutions are the implicit rules we obey when engaging in trade. As an illustration, consider institutions which govern land transactions. In particular, let's compare the institutions which governed U.S. land transactions during the nineteenth century with those in present day Peru.

After the American Revolution, U.S. lawmakers were confronted with the problem of how to govern land in their newly acquired territories. More than governing existing holdings, however, the government needed to develop institutions that would structure how the potentially vast public domain would be allocated to farmers, industrialists, and homeowners.<sup>4</sup> After

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<sup>1</sup> See for example, Hall and Jones (1998), Edison (2003), Engerman and Sokoloff (2003), Rodrik et al (2002), or Acemoglu et al (2004).

<sup>2</sup> See North and Thomas (1973), p. 93, or Furubotn and Richter (2000), ch. 2.

<sup>3</sup> North (1990), p. 61.

<sup>4</sup> This would, indeed, become a significant issue. The Louisiana Purchase in 1803 about doubled the size of the country and tripled the public domain. By 1850 the Federal Government would hold 1.2 billion acres in trust for the American people.

independence, disputes between the states over competing land claims delayed adoption of a set of formal institutions. However, after New York and Virginia ceded their claims to the Federal Government, the Land Ordinance of 1785 and the Northwest Ordinance of 1787 were adopted.

The Land Ordinance of 1785 laid out the precise rules by which public domain lands would be settled. It allowed for the scientific delineation of the lands, prohibited the Federal Government from taxing the land after it was ceded, and allowed for the creation of states after sufficient settlement. The Northwest Ordinance established that property rights in land would be fee simple. Thus, landowners were explicitly guaranteed perpetual possession, freedom of alienation, right of will, direct inheritance (in case of now will), and right of waste.

The Land Ordinance and the Northwest Ordinance were formal institutions that also happened to be highly conducive to economic growth. Perhaps the clearest example of this comes from the history of how the public domain was allocated during the nineteenth century. As more territories were acquired, huge amounts of land had to be transferred into the private sector. In 1836 more than 3 million acres were sold to Illinois alone. During the 1850's the government sold almost 50 million acres. The distribution of the returns from the sales of these lands was certainly not equitable. The government often set limits on minimum parcel size rather than minimum price which, when combined with preemption, led to speculators buying-up huge tracts of land and then reselling them at higher prices to smaller farmers.<sup>5</sup> However, it is difficult to deny that the land eventually did end up in the hands of those who valued it most, farmers.<sup>6</sup> In effect, formal government institutions led to secure property rights and lowered

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<sup>5</sup> For an overview of this process see Hughes and Cain (2003), pg. 94-100, Atack and Passell (1994), ch.9. For the specific argument that government policy led to speculation and inefficient allocation see Gates (1936).

<sup>6</sup> Fogel and Rutner (1972) address this question as does Swierenga (1966). Fogel and Rutner find, for example, that after the Civil War, the average time a speculator held a plot of land before selling was 32 months.

transaction costs enough so that the Coase Theorem held. The initial distribution of land didn't matter, it was eventually traded to those with the highest valuations.

The U.S. is a good example of a state in which formal institutions led to lower transaction costs which, in turn, led to economic growth. Where formal institutions fail to lower transaction costs (or actually raise them) individuals conspire to create informal institutions to facilitate trade. An example of this process is outlined by Hernando de Soto in present day Peru.<sup>7</sup> De Soto and his colleagues quantified the transaction costs of using the formal legal system in Peru by opening a garment workshop on the outskirts of Lima. This 1 employee business took 289 days and \$1,231 (or 31 times the average monthly wage) to acquire the proper paperwork to open.<sup>8</sup> Similarly, de Soto and his team observed that it took six years and eleven months to obtain legal authorization to build a house on state-owned land.<sup>9</sup> Acquiring the legal title alone required 728 steps.

As a result of the high transaction costs of using formal institutions in Peru, individuals have created informal ways to trade land. One way this is done is by forming legal agricultural cooperatives that buy large tracts of land, but then illegally convert that land into smaller parcels to sell to independent farmers. The property rights over these smaller holdings derives not from the central government, but from the informal arrangement with the cooperative. As a result of arrangements like these, de Soto claims that only 30% of homes in Peru have a legitimate legal title.<sup>10</sup> This, in turn, translates into huge amounts of "dead capital." It is impossible to borrow on the capital represented by your house if your deed is not recognized by the bank.

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<sup>7</sup> De Soto (2000).

<sup>8</sup> Ibid., p. 19.

<sup>9</sup> Ibid., p. 20. Fogel's and Rutner's 32 months for the 19<sup>th</sup> century U.S. doesn't look so bad after all...

<sup>10</sup> Ibid., p. 252.

These examples from the U.S. and Peru illustrate two points. First, societies erect formal and informal institutions in order to facilitate trade in the presence of transaction costs. Second, not all institutions are created equal. The formal laws governing land transactions in the U.S. allow individuals to borrow on their homes. In Peru, since property rights are not explicit, this is often impossible. In the Peruvian case, informal institutions are superior to existing formal institutions. By no means, however, do they represent the best possible institutional equilibrium. How do we explain how rational individuals arrive at an institutional equilibrium that is suboptimal, like that in Peru? What are the conditions that would cause a society to move from one equilibrium to another?

A convenient way to think of this problem is in terms of game theory. Transaction costs arise largely because of prisoners' dilemma problems. The reason it is costly for someone in Peru to purchase a legitimate lease on a small farm is because it is in the interests of a bureaucrat to raise the cost of doing so in order to benefit himself. In this case, the informal solution is for individuals to form collectives and negotiate land contracts outside the legal system. This is, of course, not the only possible solution to this particular prisoner's dilemma problem. Another option would be for individuals to act to reform (overthrow) the existing formal laws, or, to use some other informal allocation mechanism (perhaps based on trust within religious groups).<sup>11</sup>

The main point is that once a cooperative solution to the Prisoner's Dilemma problem has emerged, it is then in the interests of all players to continue to cooperate according to that solution, *even if it is not the best solution to the Prisoner's Dilemma problem from their point of view*. The reason for this is because engaging in institutional change would reduce the value of existing contracts that are defined and enforced through the current institutional equilibrium.

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<sup>11</sup> For example, see Grief (1989) or Richman (2006).

Figure 1: A Coordination Game

		Player A	
		Formal	Informal
Player B	Formal	3,3	1,1
	Informal	1,1	3,2

Consider the game portrayed in Figure 1. There are two organizations, or players: A and B. Each player chooses whether to support formal or informal institutions.<sup>12</sup> Player A's decision to support formal or informal institutions depends on B's decision because if they do not agree on the institutional framework, then many valuable trades will not take place. The two Nash Equilibria for this game are  $\{Formal, Formal\}$  and  $\{Informal, Informal\}$ .<sup>13</sup> These two equilibria do not possess the same welfare properties.  $\{Formal, Formal\}$  is Pareto Optimal to  $\{Informal, Informal\}$ . This need not be the specific case, but in general, it will be the case that some institutional equilibria are more growth enhancing than others.

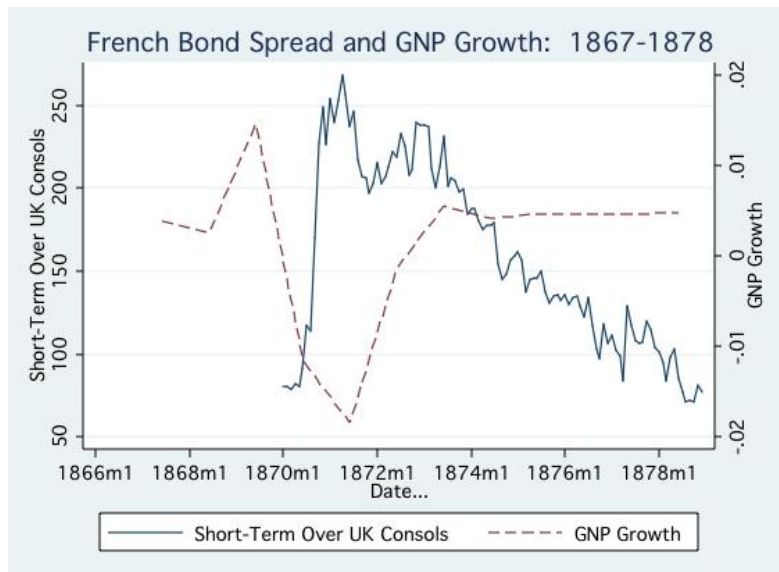
What role does political instability play in causing players A and B to change their strategies? By most definitions, political instability corresponds to a period during which the enforcement of formal institutions is highly uncertain. The most obvious examples of this come from capital markets. Consider Figure 2, which shows the yield spread between short-term bonds in France and Britain between 1870 and 1885.

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<sup>12</sup> The choice need not be "formal or informal," it could be between any number of different types of institutions, but this set-up will facilitate our point and also be consistent with a choice set that has more than two dimensions.

<sup>13</sup> We adopt the convention of writing the equilibrium choice as  $\{Player A's\ choice, Player B's\ choice\}$ .

Figure 2: French-UK Bond Spread and French Growth 1867-1878



This period is interesting because it includes the Franco-Prussian War, the Paris Commune, and the political transformation of France from a Monarchy under Napoleon III to a Republic. The fact that many of the institutions which were enforced by the Monarchy were thrown into question as a result of the political instability is reflected by the fact that the risk premium on government debt rose so high. The interest rate on French government bonds rose 56 basis points between August 1870 and September 1870, the month Napoleon III was captured by the Prussians at Sedan. In the subsequent months, during which the socialist Paris Commune seized control of the capital and there was debate about the new form of government, the interest rate rose another 80 basis points. This political uncertainty also reduced the value of the “nexus of contracts” which were enforced through formal institutions. At precisely the time political uncertainty was at its worst, 1870 and 1871, per capita growth of GNP went from positive to negative.

Political instability does not impact all types of institutions in the same way. In general, formal institutions are more adversely affected by political instability than informal institutions.

In the game above, political instability would lower the payoffs associated with coordinating on  $\{Formal, Formal\}$ , but not on  $\{Informal, Informal\}$ . If society started out in the equilibrium  $\{Informal, Informal\}$ , political instability would reduce the expected net benefit to B of switching strategies and increase the stability of the institutional equilibrium. Political instability reinforces the use of informal institutions in this society and should have no noticeable effect on the value of trades, since trades take place outside of the context of formal institutions anyway. What if the society began in the equilibrium  $\{Formal, Formal\}$ ? Then the result of the instability would make B more likely to switch his strategy to  $\{Informal, Informal\}$ , because the opportunity cost of doing so has decreased.

We do not argue, as this simple model may imply, that societies will ineluctably evolve towards informal institutions. In reality, there are many potential sets of institutions, both formal and informal on which society may coordinate. Our point is simply that countries that rely more on informal institutions to structure their transactions will be less likely to respond to political shocks. This is true because the opportunity cost of engaging in institutional change depends, in large part, on the value of “nexus of contracts” enforced by existing institutions. If political instability does not affect contracts defined and enforced by informal institutions, then organizations will be less likely to expend resources to change the institutional equilibrium.

This theoretical framework implies the following hypotheses:

- (1) Not all periods of political instability will result in a significant decrease in the value of trades.
- (2) Countries that experience a decrease in the value of trade *during* the period of political instability will be *more* likely to exhibit a change in their long-run growth regime.
- (3) Political instability should impact countries that rely on formal institutions more than countries which rely on informal institutions.

There are two *caveats* which accompany these hypotheses. First, our claims concern institutional stability. We make no claims of knowing why political instability occurs in the first place. Second, there is no claim here for a “Political Coase Theorem.” In other words, just because institutional change may be more likely in certain contexts does not necessarily mean that society will coordinate on a new equilibrium which is Pareto Superior to the old one.

In what follows we examine propositions (1) and (2) using a simple “Before and After” framework, and then in section IV adopt a panel approach to empirically test proposition (3).

### **III. Data**

Clearly, given the nature of this paper’s focus, identifying episodes of political instability is fundamental. Therefore a key dataset is the Polity IV dataset from the University of Maryland’s Center for International Development and Conflict Management. Covering 1800-2003, this dataset has annual coded information on regime and authority characteristics for a wide range of countries (all independent states).<sup>14</sup> While measuring political regimes and authority characteristics is a difficult task across countries, and even more so over time, the Polity database series is highly regarded and well suited for questions such as ours.

The Polity IV data set contains a large number of political variables. The variable of interest for our purpose is the “Polity” variable which indicates the degree of autocracy or democracy in a country for a given year.<sup>15</sup> Within the Polity variable there are three standardized codes for special political circumstances where a polity no longer operates properly. The first code, “-88”, indicates a transition period, the idea being that new polities may be preceded by a *transition period* determined by the executive or legislature. This is a period where

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<sup>14</sup> Further detail on the Polity IV dataset can be found at <http://www.cidcm.umd.edu/inscr/polity>.

<sup>15</sup> The components of the Polity variable measure the type of formal political institutions enjoyed by the country. -10 indicates high autocracy while +10 indicates high democracy. For a detailed list of these components see the Polity IV code manual.

new institutions are planned, legally constituted, and established. The second code, “-77”, indicates an *interregnum* period where the central political authority essentially collapses. Finally, “-66” indicates a period of *interruption*, where a country is occupied by a foreign power (but where the polity reestablishes itself once war has come to an end).

As an illustration of these standardized codes consider Uganda’s recent history. In 1966 Uganda’s leader, Milton Obote, was implicated (along with Idi Amin) in a gold smuggling plot. In order to avoid prosecution, Obote used his executive powers to suspend the constitution and have parliament arrested. After being cleared by the judiciary of wrong-doing, Obote launched a coup against the ceremonial president Edward Mutesa II, thus becoming the sole leader of the country. The years 1966-1967 are coded as -88 in the polity dataset. In contrast to Obote’s “legal” removal of Mutesa, Idi Amin’s forced exile in 1979 by invading Tanzanian forces is coded as -66. Finally, the years 1985-1986 when, first Obote, and then his successor Tito Okello, were “illegally” deposed are coded as -77.

It is the codes for these three political circumstances that we use as our primary indicator of episodes of extreme political instability, and which allow us to consider the relationship between political instability, institutional change, and economic growth. We would expect that it is during uncertain times such as these that we might see the value of contracts decline, and the opportunity cost of engaging in institutional change decline, as laid out by our earlier theoretical discussion. This instability measure is denoted “PI1” in this paper. In order to examine the sensitivity of our results to our choice of political instability, we also employ two other political instability proxies. Our second proxy is based on when there is a change in our polity variable score by 3 or more (and is denoted PI2), while our third proxy is based on a change in the polity score of 5 or more (and is denoted PI3).

Due to the well known difficulty of measuring institutions generally, and formality of institutions specifically, we consider three different proxies for formal institutions. One is based on tax revenue relative to GDP, where higher measured tax revenue relative to GDP indicates a higher degree of formal institutions. We also consider Clague et al. (1999)'s contract-intensive money, which is a widely used institutional measure (again we consider higher use of contract intensive money as an indicator of a more formalized institutional equilibrium), and infrastructure quality measures from Calderon and Serven (2004), where countries with higher infrastructure quality are taken as having a more formal institutional equilibrium.

Beyond our political instability and institutional proxies, the dataset for this study consists of our dependent variable, economic growth, which is measured as the growth of real GDP per capita, and standard control variables which include lagged initial real per capita GDP and average years of schooling as well as the black market premium, investment, trade openness, and inflation.<sup>16</sup>

#### **IV. A “Before and After” Examination of the Effect of Political Instability on Long-Run Economic Growth**

Recall there are a number of testable implications we consider. These are that: (1) not all periods of political instability result in a reduction in the value of trade (i.e. growth of real GDP per capita); and (2) countries that experience a decrease in the value of trade during the period of instability should be more likely to exhibit a change in their long-run growth regime. As well, a caveat raised is that the change in growth regime for countries which experienced a decrease in trade is not necessarily for the better. Our approach to get at these points is a basic “Before and After Test” which examines the growth characteristics of countries which experienced periods of

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<sup>16</sup> See the appendix for data sources.

extreme political instability (as measured by our Polity variable scores of  $-66,-77,-88$ ).<sup>17</sup> More specifically for a given episode of political instability we measure the average annual growth rate of real per capita GDP during the period of political instability, as well as the average annual growth rate of real per capita GDP five and ten years following the instability relative to the same length of time prior to the instability.<sup>18</sup>

Using this approach we are able to determine which countries experienced a reduction in the value of trade during the political instability (as proxied by negative real GDP growth) as well as examine whether countries experienced increased or reduced growth in the years after the political instability relative to the years prior to the political instability<sup>19</sup>.

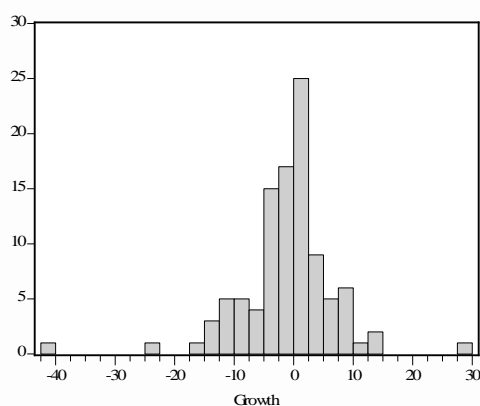
First, let's consider what we find in terms of growth using the entire sample of countries.

Table 1: Full Sample Statistics

Average Growth During Political Instability	10 Year Average Growth Difference	5 Year Average Growth Difference
-1.1 (8.0)	0.46 (3.8)	1.4 (4.8)

*Parenthesis indicate standard deviation*

Figure 3: Average Growth During Period of Instability (Entire Sample)



<sup>17</sup> Rodrik and Wacziarg (2005) employ a similar approach.

<sup>18</sup> Our before and after approach is based on percentage change in real per capita GDP.

<sup>19</sup> Table 1-4 in the appendix provide an extensive summary of these before and after results.

Figure 4: Change in 10 Year Average Growth (Entire Sample)

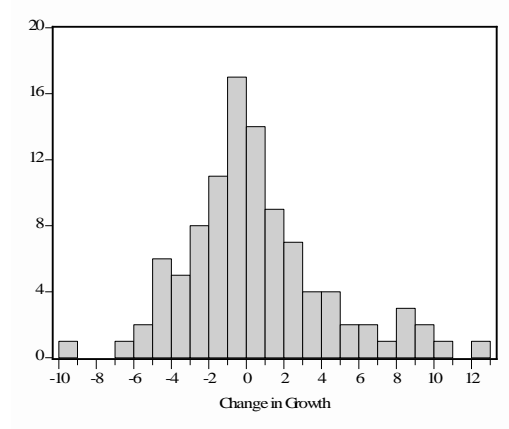
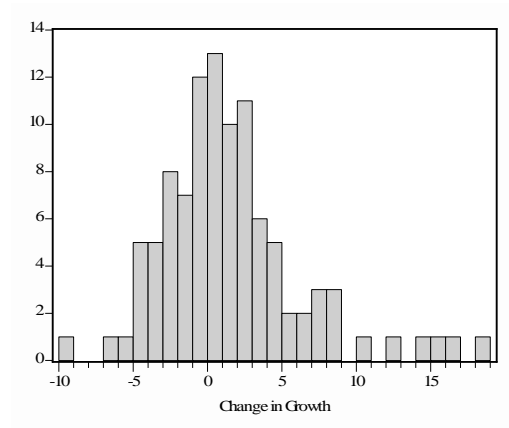


Figure 5: Change in 5 Year Average Growth (Entire Sample)



From the sample statistics and plots detailed in figures 3-5, a number of points emerge. First is that, on average, during periods of political instability countries tend to experience low growth.<sup>20</sup> This is evident in Table 1 which indicates an average annual growth rate of  $-1.1$  percent during episodes of political instability. However, in Figure 3 it is also evident that the experience of countries differs widely.

Another point concerns the relative change in growth experienced by these countries. In Table 1, when comparing the average growth rate for the five years following the instability relative to the five years prior to the instability, countries grow  $1.4\%$  faster annually in the five

<sup>20</sup> This is in line with results seen in the literature (see Alesina and Perotti, 1996).

years after the instability relative to their experience for the five years leading up to the political instability, while the 10 year difference indicates a 0.46% average annual increase.<sup>21</sup> Again, examining the plots in Figures 4 and 5, we see the experiences vary widely.

Having considered what the entire sample tells us, we see these results are in line with a number of papers in the literature. However, we also see the experiences differ dramatically across countries with respect to growth during the instability as well as the change in growth after the instability. Importantly, this has shed some light on our first testable implication, which is that periods of political instability will not necessarily always result in a decrease in the value of trades. Figure 3 certainly makes that point.<sup>22</sup>

With that, let's consider dividing the sample based on the growth experiences of countries during periods of political instability. This will allow us to consider testable implication two as well as our caveat.

Table 2: Comparing Across Samples

	Average Growth During Political Instability	Difference in 10 Year Average Growth	Difference in 5 Year Average Growth
Negative Growth Sample	-6.2 (7.0)	1.2 (4.5)	2.3 (5.4)
Positive Growth Sample	4.3 (4.9)	-0.4 (2.7)	0.5 (2.8)

Table 2 indicates that on average, countries which experienced negative average growth during their period of political instability went on to experience increased long run growth relative to their pre-instability rates of growth as well as relative to the countries which had experienced positive growth during their episode of political instability. Figures 6 and 7 also

<sup>21</sup> The finding that political instability does not have a large effect on growth in the long run is seen in papers such as Levine and Renelt (1992), Campos and Nugent (2000), Haber et al (2003). Our result appears in line with this earlier research.

<sup>22</sup> The appendix contains statistical tests of the results found in this section.

confirm this as the sample which experienced negative growth during their period of instability has many more cases than the positive growth instability group of large increases in their growth relative to their pre-instability periods.<sup>23</sup> This of course is what we would expect given our theory that during periods where the value of trade is reduced, institutional change may be brought about with a resulting relative increase in long-run economic growth occurring.

Figure 6: Change in 10 Year Average Growth (Negative Growth Instability Sample)

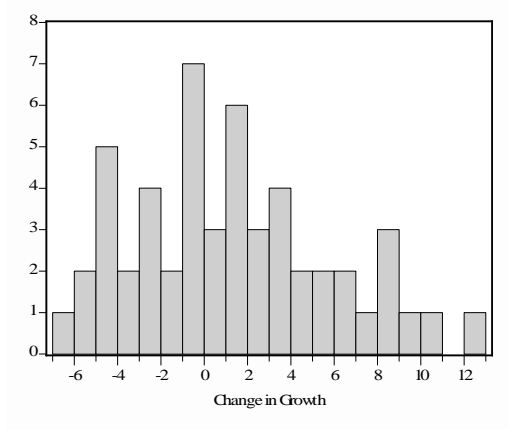
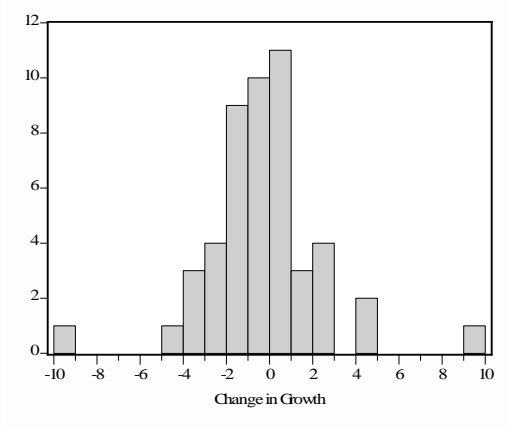


Figure 7: Change in 10 Year Average Growth (Positive Growth Instability Sample)



As well concerning our caveat that in the case of countries which experienced a reduction in the value of trade, it was not necessarily the case that they would expect a subsequent increase in their long-run rates of growth, in Figure 6, a number of countries which experienced negative

<sup>23</sup> For sake of space, 5 year results can be found in Figures 8 and 9 in the appendix.

growth during their period of instability went on to experience reduced rather than increased long run economic growth rates.

As a whole these findings lend support to our theory and its testable implications. For further evidence, section V below provides the results of our System-GMM model which examines the political instability-institutions-economic growth linkage.

## V. Empirical Approach and Results

### *Empirical Approach*

The use of panel data has become widespread in the growth literature due to limitations of cross-country growth regressions highlighted in work such as Levine and Renelt (1992). As has been raised in numerous studies, averaging data over long periods of time wastes valuable information in terms of dynamics, while cross-section models are also known to suffer from omitted variable bias due to heterogeneity as well as significant problems with endogeneity. In keeping with the recent literature, we use a dynamic panel approach based on Blundell and Bond (1998) to assess the relationship between political instability, institutions, and economic growth.<sup>24</sup>

Consider first the following standard model:

$$y_{i,t} - y_{i,t-1} = \alpha + \beta y_{i,t-1} + \gamma' X_{i,t} + \eta_i + \varepsilon_{i,t} \quad (1)$$

where for country  $i$  ( $i=1 \dots N$ ) at time  $t$  ( $t=1 \dots T$ ),  $y$  is the logarithm of real GDP per capita,  $X$  is the set of explanatory variables including our institutions and political instability measures,  $\eta$  is an unobserved country specific fixed-effect, and  $\varepsilon$  is the error term. We can restate (1) as

$$y_{i,t} = \alpha + \beta^* y_{i,t-1} + \gamma' X_{i,t} + \eta_i + \varepsilon_{i,t} \quad (2)$$

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<sup>24</sup> Hoeffler (2002) provides an excellent explanation of this approach for the interested reader.

where  $\beta^* = (\beta + 1)$ . A potential problem exists in (1) and accordingly (2) in that the lagged dependent variable  $y_{i,t-1}$  (as well as other regressors) may be correlated with the country fixed effect  $\eta_i$ . A standard approach to handle this problem is to difference this equation

$$(y_{i,t} - y_{i,t-1}) = \beta^* (y_{i,t-1} - y_{i,t-2}) + \gamma (X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (3)$$

which eliminates the country fixed-effect. This however introduces a new bias as  $(y_{i,t-1} - y_{i,t-2})$  and  $(\varepsilon_{i,t} - \varepsilon_{i,t-1})$  are now correlated. Thus we need valid instruments for  $(y_{i,t-1} - y_{i,t-2})$ . Assuming the error term is not serially correlated

$$E(\varepsilon_{i,t}, \varepsilon_{i,s}) = 0 \text{ for } s \neq t$$

and the initial conditions satisfy

$$E(y_{i,t} \varepsilon_{i,t}) = 0 \text{ for } t \geq 2$$

Arellano and Bond (1991) propose using GMM estimation using values of  $y_{it}$  lagged two periods or more as instruments. This is the case as  $y_{i,t-2}$  and earlier are generally correlated with  $(y_{i,t-1} - y_{i,t-2})$  but uncorrelated with  $(\varepsilon_{i,t} - \varepsilon_{i,t-1})$ .

In terms of our explanatory variables  $X$ , in the case where they are strictly exogenous,

$$E(X_{i,t}, \varepsilon_{i,s}) = 0 \text{ for all } s, t$$

all level values of  $X$  regardless of time period are useful instruments for the difference equation.

The use of  $X$  in first differences is also appropriate. In the case where the regressors in  $X$  are weakly exogenous

$$E(X_{i,t}, \varepsilon_{i,s}) \neq 0 \text{ for all } s < t$$

$$E(X_{i,t}, \varepsilon_{i,s}) = 0 \text{ for all } s \geq t$$

we can use the  $X$  in levels lagged one period or more as instruments in our difference equation

(3). Similarly for the case where our explanatory variables are endogenous

$$E(X_{i,t}, \varepsilon_{i,s}) \neq 0 \text{ for all } s \leq t$$

$$E(X_{i,t}, \varepsilon_{i,s}) = 0 \text{ for all } s > t$$

we can use the  $X$  in levels lagged two periods or more as instruments.

However, a problem with the Arellano and Bond estimator is that lagged levels often prove to be poor instruments for first differences for series which follow close to a random walk.<sup>25</sup> As a result, we follow the estimator methodology developed by Arellano and Bover (1995) and Blundell and Bond (1998) which combines the regression in differences with a regression in levels in order to estimate a system.

The difference equation in this system is as detailed in (3), where appropriately lagged levels of  $y_{i,t}$  and  $X_{i,t}$  are used as instruments, while the other equation is a levels equation as detailed in (2)

$$y_{i,t} = \alpha + \beta^* y_{i,t-1} + \gamma X_{i,t} + \eta_i + \varepsilon_{i,t}$$

where lagged differences are used as instruments for predetermined and endogenous variables in the levels regression. The use of lagged differences as instruments in the levels regression requires

$$E(\Delta X_{it} \eta_i) = 0$$

$$E(\Delta y_{i2} \eta_i) = 0.$$

In the case where  $X_{it}$  is strictly exogenous or predetermined,  $\Delta X_{it}$  can be used as an instrument, while  $\Delta X_{it-1}$  is used in the case of  $X_{it}$  being endogenous. In order to test the validity of our instruments, we employ the Arellano-Bond test for autocorrelation as well as the Hansen test of over-identifying restrictions.

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<sup>25</sup> See Blundell and Bond (1998).

## *Results*

Our results are based on 5 year-average panel data from 1960-2000. Our empirical model follows Beck and Levine (2004). The dependent variable is growth of real GDP per capita, while our control variables include education (average years of schooling), initial real GDP per capita, openness (trade/GDP), inflation, investment, and a black-market premium. Our measures of political instability are again based on the polity variables in the Polity IV database. Our measures of formal institutions include government tax revenue divided by GDP, contract-intensive money, and infrastructure quality.<sup>26</sup> Finally, in order to capture the institutional equilibrium-political instability link, we interact our political instability measure with our formal institutions proxy. The System GMM results based on our primary political instability measure, PI1, are seen in Table 3 to Table 6, while the results based on the PI3 measure are found in Tables 7 -10 in the appendix.

It is important to note the construction of the interaction term. Recall our institutional measure is based on a 5-year average while the instability measure is a 1-0 dummy based on whether there was an episode of political instability during the 5 year period. Therefore an interaction is based on the average institutional measure for the 5-year period and the 1-0 dummy. However our story concerns the institutional equilibrium up to the instability event and how that determines the impact of political instability on institutional change. One could imagine however that should the institutional equilibrium change as a result of the instability, the 5-year average used in the interaction will give a false sense of the institutional equilibrium at the time

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<sup>26</sup> At this point only results for contract intensive money and tax ratio institutional proxies are available. Also for the sake of space only the results for our primary instability indicator (PI1) based on codes -66,-77,-88 indicating the polity is no longer functioning properly, and an alternative (PI3) based on a polity score change of 5 are reported.

of political instability.<sup>27</sup> As a result of this concern, for each institutional measure and political instability measure we consider: (1) a standard interaction using the average institutional proxy during the 5 year period interacted with the political instability dummy of that period (as seen in tables 3 and 5); and (2) an interaction based on the previous period's average institutional proxy and the current period political instability dummy (as seen in tables 4 and 6).

Let's first consider the institutional proxy based on the tax ratio and the political instability measure PII. Table 3 again is based on a standard interaction while Table 4 has the interaction based on the lagged institutional measure (and current political instability dummy).

Table 3: Political Instability (PI1), Institutions (tax ratio) and Growth

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.041 (0.173)	0.017 (0.579)	0.081** (0.016)	0.173*** (0.000)	0.049 (0.120)	0.169*** (0.000)
Initial GDP per Capita <sup>a</sup>	-0.002 (0.398)	-0.000 (0.903)	-0.005 (0.159)	-0.013*** (0.000)	-0.005 (0.181)	-0.012*** (0.000)
Average Years of Schooling <sup>a</sup>	0.008** (0.039)	0.008* (0.074)	0.011*** (0.007)	0.006** (0.038)	0.011** (0.011)	0.007** (0.020)
Trade Openness <sup>a</sup>		0.020*** (0.003)				-0.000 (0.878)
Inflation			-0.027*** (0.000)			-0.018*** (0.001)
Investment <sup>a</sup>				0.025*** (0.000)		0.028*** (0.000)
Black Market Premium <sup>b</sup>					-0.011*** (0.002)	-0.003 (0.157)
Formal Institutions <sup>a</sup>	0.011** (0.037)	0.001 (0.815)	0.007 (0.140)	0.003 (0.534)	0.007 (0.179)	-0.002 (0.645)
Political Instability	-0.037*** (0.009)	-0.041*** (0.010)	-0.046*** (0.008)	-0.042*** (0.008)	-0.039*** (0.002)	-0.037*** (0.002)
Interaction	-0.015** (0.045)	-0.017** (0.038)	-0.021** (0.036)	-0.017** (0.042)	-0.017** (0.013)	-0.014** (0.025)
AB test for AR(1) in first diff (p-values)	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR(2) in first diff (p-values)	0.959	0.910	0.702	0.758	0.294	0.502
Hansen Test (p-values)	0.769	0.969	0.993	0.970	0.999	1.000

p-values in parentheses; \*, \*\*, \*\*\* indicate significance at the 10%, 5%, and 1% level.

<sup>a</sup> variable is included as log(variable); <sup>b</sup> variable is included as log(1+variable)

Time dummies are included in the regressions but are not reported

<sup>27</sup> For example, a country with a high degree of formal institutions which experiences political instability at the beginning of the 5 year period and as a result moves say to a more informal institutional equilibrium for much of the rest of the period would therefore give an average institutional formality measure that is much less than the actual institutional formality at the time of the instability. This of course is problematic.

Table 4: Political Instability (PI1), Institutions (tax ratio), and Growth

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.112*** (0.002)	0.082** (0.047)	0.111*** (0.002)	0.205*** (0.000)	0.073** (0.039)	0.174*** (0.000)
Initial GDP per Capita <sup>a</sup>	-0.008* (0.052)	-0.003 (0.410)	-0.009** (0.043)	-0.014*** (0.000)	-0.006 (0.113)	-0.012*** (0.000)
Average Years of Schooling <sup>a</sup>	0.011** (0.027)	0.010* (0.070)	0.014*** (0.006)	0.007* (0.054)	0.012** (0.021)	0.008** (0.023)
Trade Openness <sup>a</sup>		0.023*** (0.002)				0.000 (0.870)
Inflation			-0.028*** (0.000)			-0.018*** (0.001)
Investment <sup>a</sup>				0.024*** (0.000)		0.028*** (0.004)
Black Market Premium <sup>b</sup>					-0.012*** (0.003)	-0.003 (0.335)
Formal Institutions <sup>a</sup>	0.010* (0.094)	0.002 (0.761)	0.004 (0.514)	0.002 (0.727)	0.010 (0.115)	0.000 (0.934)
Lag Formal Institutions <sup>a</sup>	0.008 (0.202)	0.004 (0.585)	0.006 (0.370)	0.005 (0.432)	0.004 (0.570)	-0.002 (0.743)
Political Instability	-0.050* (0.063)	-0.051** (0.029)	-0.071*** (0.007)	-0.045* (0.067)	-0.061*** (0.004)	-0.042*** (0.010)
Interaction	-0.021 (0.139)	-0.022* (0.088)	-0.033** (0.018)	-0.018 (0.158)	-0.029** (0.015)	-0.016* (0.086)
AB test for AR(1) in first diff (p-values)	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR(2) in first diff (p-values)	0.803	0.862	0.320	0.987	0.886	0.865
Hansen Test (p-values)	0.885	0.978	0.984	0.950	0.999	1.000

p-values in parentheses; \*, \*\*, \*\*\* indicate significance at the 10%, 5%, and 1% level.

<sup>a</sup> variable is included as log(variable); <sup>b</sup> variable is included as log(1+variable)

Time dummies are included in the regressions but are not reported

In both Tables 3 and 4, the coefficients for our control variables generally appear as would be expected, while political instability is negative and statistically insignificant across the regression. One possible concern is that our measure of formal institutions (PI1) while positive is not statistically significant (with 1 exception in each table). However this is not necessarily a finding contradicting the importance of institutions. Recall we are trying to capture the degree of formality of institutions not necessarily good versus bad institutions. While the extent of tax revenue relative to GDP is likely a good proxy for the formality of the institutional equilibrium it does not necessarily also capture “good versus bad” institutions (in fact two countries may rely

largely on formal institutions but one relies on good formal institutions while the other largely bad formal institutions). Now importantly for our purposes, in Table 3 the interaction of political instability with formal institutions is negative and statistically significant in all our model specifications, and is negative and largely significant (though significance depends on the control variables) in Table 4. This negative and generally significant finding for the interaction term is consistent with our idea that political instability will have a greater negative impact on countries in which formal institutions play a greater role than for countries which are structured more by informal institutions.

Table5: Political Instability (PI1), Institutions (CIM) and Growth

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.103*** (0.001)	0.112*** (0.000)	0.115*** (0.000)	0.176*** (0.000)	0.070*** (0.005)	0.167*** (0.000)
Initial GDP per Capita <sup>a</sup>	-0.008** (0.020)	-0.007** (0.060)	-0.010*** (0.070)	-0.011*** (0.001)	-0.004 (0.129)	-0.010*** (0.001)
Average Years of Schooling <sup>a</sup>	0.010** (0.011)	0.010** (0.042)	0.129*** (0.004)	0.004 (0.334)	0.010*** (0.006)	0.005* (0.089)
Trade Openness <sup>a</sup>		0.018*** (0.009)				-0.002 (0.460)
Inflation			-0.024*** (0.000)			-0.022*** (0.000)
Investment <sup>a</sup>				0.020*** (0.006)		0.028*** (0.000)
Black Market Premium <sup>b</sup>					-0.007* (0.072)	-0.002 (0.002)
Formal Institutions <sup>a</sup>	0.039*** (0.001)	0.035*** (0.004)	0.038*** (0.000)	0.032*** (0.000)	0.027** (0.018)	0.020*** (0.005)
Political Instability	0.007 (0.598)	0.006 (0.636)	-0.010 (0.347)	0.000 (0.992)	-0.000 (0.986)	-0.023** (0.033)
Interaction	0.067 (0.120)	0.059 (0.191)	-0.003 (0.921)	0.034 (0.450)	0.040 (0.330)	-0.039 (0.174)
AB test for AR(1) in first diff (p-values)	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR(2) in first diff (p-values)	0.585	0.731	0.225	0.666	0.464	0.980
Hansen Test (p-values)	0.976	1.000	1.000	0.999	1.000	1.000

p-values in parentheses; \*, \*\*, \*\*\* indicate significance at the 10%, 5%, and 1% level.

<sup>a</sup> variable is included as log(variable); <sup>b</sup> variable is included as log(1+variable)

Time dummies are included in the regressions but are not reported

Tables 5 and 6 again consider our primary political instability measure (PI1), however this time uses contract intensive money (CIM) as the measure of formal institutions in the

economy. Again the signs of our control variables are generally in line with the literature. The results in however are much less favourable for our hypothesis. Overall our measure of formal institutions (contract intensive money) proves to be positive and statistically in all regressions in both tables. This is not surprising given that CIM is also an excellent and widely used proxy for “good” institutions. However the use of CIM rather than the tax ratio as our measure of formal institutions appears to reduce the significance of political instability relative to tables 3 and 4 and more importantly the interaction term.

Table 6: Political Instability (PII), Institutions (CIM) and Growth

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.060* (0.052)	0.033 (0.256)	0.053** (0.023)	0.120*** (0.000)	0.030 (0.322)	0.141*** (0.000)
Initial GDP per Capita <sup>a</sup>	-0.003 (0.324)	-0.001 (0.679)	-0.004 (0.129)	-0.007** (0.025)	-0.000 (0.989)	-0.009*** (0.004)
Average Years of Schooling <sup>a</sup>	0.009** (0.048)	0.008 (0.138)	0.012** (0.015)	0.004 (0.314)	0.007* (0.100)	0.007** (0.045)
Trade Openness <sup>a</sup>		0.020*** (0.006)				-0.004 (0.148)
Inflation			-0.024*** (0.000)			-0.023*** (0.000)
Investment <sup>a</sup>				0.018** (0.011)		0.027*** (0.000)
Black Market Premium <sup>b</sup>					-0.005 (0.174)	-0.000 (0.866)
Formal Institutions <sup>a</sup>	0.099*** (0.000)	0.084*** (0.000)	0.080*** (0.000)	0.084*** (0.000)	0.082*** (0.000)	0.058*** (0.004)
Lag Formal Institutions <sup>a</sup>	-0.061** (0.012)	-0.054** (0.031)	-0.053** (0.032)	-0.056** (0.013)	-0.050* (0.060)	0.046** (0.041)
Political Instability	-0.015 (0.298)	-0.020 (0.201)	-0.027** (0.021)	-0.014 (0.279)	-0.025 (0.162)	-0.028** (0.025)
Interaction	-0.021 (0.633)	-0.038 (0.400)	-0.066** (0.033)	-0.022 (0.574)	-0.042 (0.428)	-0.052* (0.097)
AB test for AR(1) in first diff (p-values)	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR(2) in first diff (p-values)	0.094	0.133	0.118	0.125	0.575	0.711
Hansen Test (p-values)	0.986	1.000	1.000	0.999	1.000	1.000

p-values in parentheses; \*, \*\*, \*\*\* indicate significance at the 10%, 5%, and 1% level.

<sup>a</sup> variable is included as log(variable); <sup>b</sup> variable is included as log(1+variable)

Time dummies are included in the regressions but are not reported

## **VI. Conclusion**

This study is premised on the idea that if institutions are important, then a deeper understanding of how institutional change comes about is essential. Where our paper attempts to contribute to this area is by considering one avenue which may bring about regime change – during episodes of extreme political instability (broadly defined). More specifically, we lay out a theory which links political instability, institutional change, and economic growth.

Using a before and after approach to compare the growth experiences of countries during episodes of political instability as well as changes in their growth regimes following the political instability, the data is suggestive of many of the ideas our theory lays out. More specifically, the results indicate that political instability does not necessarily entail negative growth during the period of instability, or even reduced growth over the long run following the period of instability. Splitting countries based on their growth experiences during the periods of political instability we see that the growth experiences in the years following the instability do seem to differ. We tie these results into how political instability may alter the institutional equilibrium, and more to the point, formal institutions.

Using System-GMM and panel data, our results for our hypothesis linking political instability and institutions with institutional change provides mixed evidence at this point that political instability may affect countries organized by formal institutions more significantly than it affects countries organized by informal institutions. Additional data and techniques will investigate this further in future drafts.

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## Appendix I

Table 1: Before and After Summary Table: Latin America\*

Country	Episode	Duration	Polity Score Before Instability	Polity Score After Instability	Regime Length Pre-Instability	Regime Length Post-Instability	Average Annual Growth During Instability	Change in 10 Year Average Growth Rate	Change in 5 Year Average Growth Rate
Argentina	-88	1946-1948	-8	-9	3	7	6.5	-0.2	-2.4
	-88	1955-1957	-9	-1	7	9	2.1	0.7	1.1
Bolivia	-88	1952-1956	-5	-3	16	8	-2.8	-4.7	-4.7
Brazil	-88	1930-1934	-3	-7	36	11	-1.2	-0.3	-0.2
	-88	1945-1946	-7	7	11	1	7.9	0.3	0.6
	-88	1964-1965	3	-9	1	8	-0.3	2.2	1.4
Chile	-88	1924-1925	3	-2	33	10	-0.1	0.2	1.5
Cuba	-88	1952-1955	3		18		-3.8	-3.55	-3.18
	-77	1959-1960							
	-88	1960-1961		-7		15			
Dom Rep	-88	1961-1963	-9		28		1.5	2.4	2
	-77	1963-1965							
	-88	1965-1966		-3		12			
El Salvador	-88	1948-1950	-8	-6	4	6	-10.6	-1.2	-2.3
	-88	1979-1984	-6	6	3	7	-5.5	-0.4	-3
Guatemala	-88	1985-1986	-6	3	1	10	-3.4	1.5	3.7
Haiti	-88	1986-1988	-9	-7	9	1	-2.1	-3.7	-2.2
Honduras	-88	1980-1982	-1	6	8	4	-1.6	-1.7	-4.5
Mexico	-77	1911-1917	-9	-1	30	3	0.7	-1.8	-0.1
Nicaragua	-66	1926-1928	-3	-3	17	8	13.5	-3.7	-3.7
	-77	1979-1981	-8	-5	43	3	-8.9	-5.3	-4
	-88	1919-1920	2	-9	33	11	14.2	-0.8	-2.4
Peru		1930-1933	-9	2	11	17	-10.7	-2.3	-1.5
		1978-1980	-7	7	1	10	0.4	-4	-3.8
	-88	1971-1973	8	-8	20	5	-3.6	0.9	2.1
Venezuela	-88	1935-1936	-9	-6	15	0	8.4	-0.9	4.8

\* Note: Where sample coverage makes comparing 10 year growth differences impossible, the results for the 5 year comparisons are included in the 10 year growth differences column. Also, where a number of events of political instability run together (or are within a few years of each other), the averages over those periods are used and included as a single event.

Table 2: Before and After Summary Table: Europe\*

Country	Episode	Duration	Polity Score Before Instability	Polity Score After Instability	Regime Length Pre-Instability	Regime Length Post-Instability	Average Annual Growth During Instability	Change in 10 Year Average Growth Rate	Change in 5 Year Average Growth Rate
Austria	-88	1918-1920	-4	8	51	12	-2.4	6.4	12.7
	-88	1933-1934	8		12		-3.2	10.5	18.6
	-77	1938-1945							
Belgium	-88	1945-1946		10		current			
	-66	1914-1915	7	7	1	4	-7	1.3	0.3
Bulgaria	-66	1939-1944	10	10	9	current	-4.2	4.5	4.1
	-88	1934-1935	-3	-10	15	8	-9.7	-6.5	1.2
Czech Rep	-77	1943-1944	-10		8				
	-88	1944-1946		-6		1			
	-77	1939-1945	7		20				
Denmark	-88	1947-1948		-7		20			
	-77	1968-1969	-7	-7	20	20	4.3	-1.2	0.3
	-88	1901-1915	-3	10	31	25	2.2	-0.1	-0.4
Finland	-66	1940-1945	10	10	25	current	-1	2.2	4.5
	-88	1930-1931	10	4	11	14	-1.9	-2.4	0.9
France	-88	1851-1852	6	-8	4	8	6.2	0.4	-0.3
	-88	1860-1863	-8	-6	8	6	0.8	-1.4	-1.4
	-88	1870-1877	-3	7	1	21	2.1	-0.8	1.3
	-88	1944-1946	-9	10	4	12	28	9	15.7
Germany	-88	1867-1871	-7	-4	5	7	1.4	-0.3	0.4
	-88	1918-1919	2	6	9	14	-13.3	5.7	8.3
	-66	1945-1949	-9	10	12	41	-12.6	3.5	7.5
Greece	-88	1989-1990	10	10	41	current	-3.8	-0.3	-0.9
	-77	1941-1944	-8	8	5	5	-15.8	8.8	14.7
Hungary	-88	1974-1975	-7	8	7	11	-3.9	-5.3	-4.7
	-66	1944-1945	-1		25				
	-88	1945-1948		-7		8			
Italy	-66	1956-1957	-7	-7	8	31	-5.3	-2.4	0.2
	-88	1989-1990	-2	10	1	current	-1.8	-0.1	-1.7
	-88	1922-1928	-1	-9	22	15	1.6	0.4	3.3
	-77	1943-1945	-9		15		1.5	4.4	6.2
Netherlands	-88	1945-1947		10		current			
	-66	1940-1945	10	10	22	present	-13	12	16.5
Norway	-66	1940-1945	10	10	42	current	-4.2	1.9	2.6
Portugal	-88	1910-1911	2	7	3	15	1.1	0.7	1
	-88	1926-1930	7	-9	15	44	2.1	-1.3	-2.1
	-88	1974-1976	-9	9	44	7	-3.9	-4.9	-4.1
Romania	-88	1989-1990	-8	5	13	6	-10.9	0.4	-0.6
Spain	-88	1868-1871	-6		9		2.5	-0.6	1.7
	-88	1874-1876		-1		3			
	-88	1930-1931	-6	7	4	7	-3.9	-4.8	-6.8
	-88	1975-1978	-7	9	37	4	2.6	-4	-5.2
Sweden	-88	1907-1917	-4	10	37	current	0.3	1.2	0
Yugoslavia	-88	1937-1939	-9		2				
	-77	1941-1944							

Country	Episode	Duration	Polity Score Before Instability	Polity Score After Instability	Regime Length Pre-Instability	Regime Length Post-Instability	Average Annual Growth During Instability	Change in 10 Year Average Growth Rate	Change in 5 Year Average Growth Rate
	-88	1951-1953	-7	-7	6	27			
Yugo (Bosnia)	-77	1992-1995	-5	-7	2	2	-5.4	8.8	8.8

\* Note: Where sample coverage makes comparing 10 year growth differences impossible, the results for the 5 year comparisons are included in the 10 year growth differences column. Also, where a number of events of political instability run together (or are within a few years of each other), the averages over those periods are used and included as a single event.

Table 3: Before and After Summary Table: Africa\*

Country	Episode	Duration	Polity Score Before Instability	Polity Score After Instability	Regime Length Pre-Instability	Regime Length Post-Instability	Average Annual Growth During Instability	Change in 10 Year Average Growth Rate	Change in 5 Year Average Growth Rate
Benin	-88	1963-1965	2	-7	3	4	3.5	0.7	0.4
	-88	1990-1991	-7	6	10	current	0.6	0.7	2.4
Burkina Faso	-88	1977-1978	-4	5	8	3	9.2	2.8	2.9
Burundi	-88	1965-1966	-3	-7	2	17	2	2.5	6.9
	-88	1992-1993	-7		5		-4.8	-4.8	-2.2
Chad	-77	1993-1996		-5		2			
	-88	1978-1979	-7		3		0.6	-0.5	-2.3
	-77	1979-1984							
Ethiopia	-88	1984-1985		-7		6			
	-88	1991-1992	-7	-4	6	4	6.6	-2.6	0.2
	-77	1974-1975	-9	-7	28	9	-1.1	-2.6	-0.9
	-77	1991-1993	-8		7		-0.8	-0.8	2.2
Gabon	-88	1993-1995		1		current			
	-88	1990-1991	-9	-4	22	current	3.4	1.2	4.9
Ghana	-88	1969-1970	-7	3	4	1	7.5	-3	-0.9
	-88	1978-1979	-7	6	7	3	6.7	-1.6	-4
	-88	1991-1992	-7	-1	9	4	1.1	2.7	0
Liberia	-77	1990-1996	-6		5		1.5	-4.5	-4.5
	-88	1996-1997		0		current			
Madagascar	-88	1991-1992	-6	9	17	4	-1.7	3	0.3
Mali	-88	1991-1992	-7	7	12	5	-3.1	1.1	-0.6
Niger	-88	1991-1992	-7	8	4	3	-9.1	4.6	1.8
Nigeria	-88	1978-1979	-7	7	13	4	3.3	-9.4	-9.5
Rwanda	-88	1993-1994	-7	-6	2	6	-42.1	7.1	7.1
Senegal	-88	1962-1963	-1	-7	3	11	1.3	-2.6	-1.3
Sierra Leone	-88	1968	-7	1	1	2	8.1	-1.7	-0.5
South Africa	-88	1992-1994	5	9	3	current	-0.4	2.2	2.2
Sudan	-88	1964-1965	-7		6		0.2	-0.9	2.1
	-88	1969-1971		-7		13			
	-88	1985-1986	-7	7	13	3	-9.9	-0.7	2
Togo	-88	1991-1993	-7	-2	13	9	-11.7	3	3
Uganda	-88	1966-1967	7	-6	3	2	2.7	-2.2	-0.9
	-66	1979-1980	-7	3	8	5	-9.3	1.8	3.1
	-77	1985-1986	3	-7	5	7	-1.3	6.1	2.4
Zimbabwe	-88	1979-1980	4	5	10	3	7	-1.8	3.6

\* Note: Where sample coverage makes comparing 10 year growth differences impossible, the results for the 5 year comparisons are included in the 10 year growth differences column. Also, where a number of events of political instability run together (or are within a few years of each other), the averages over those periods are used and included as a single event.

Table 4: Before and After Summary Table: Asia and Middle East\*

Country	Episode	Duration	Polity Score Before Instability	Polity Score After Instability	Regime Length Pre-Instability	Regime Length Post-Instability	Average Annual Growth During Instability	Change in 10 Year Average Growth Rate	Change in 5 Year Average Growth Rate
Afghanistan	-77	1978-1979	-7	-7	1	8	1.5	0	2.2
	-77	1992-1996	-8	-7	3	5	-2.6	5.2	5.2
Cambodia	-88	1970-1972	-9		15		1.4	0	0
	-77	1976-1976							
	-66	1979-1988							
	-88	1988-1993		1		4			
Iran	-88	1979-1981	-10	-6	24	16	-12.1	-4.3	0.2
Japan	-66	1945-1952	1	10	78	current	7.9	4.9	7.2
Kuwait	-66	1990-1991	-10	-9	4	1	-23.2	9.9	10.4
Laos	-77	1961-1973	-1		1		1	0.6	1.3
	-88	1973-1975		-7		current			
Nepal	-88	1957-1959	-7	2	7	2	4.4	-1.7	-1.7
Pakistan	-88	1969-1971	1		8		1.9	0.3	-0.9
	-77	1971-1971							
	-88	1972-1973		-8		4			
Philippines	-88	1986-1987	-6	8	2	5	1	1.6	4.2
Singapore	-66	1963-1965	7	-2	4	current	-4.7	8.1	8.9
S. Korea	-88	1960	-4	8	8	1	-1.3	1.3	1.1
	-88	1987-1988	-5	6	6	10	10.4	-1.3	-1.7
Thailand	-88	1968-1969	-7		9		4.9	-0.4	-2
	-88	1973-1974							
	-88	1977-1978		2		10			
Turkey	-88	1960-1961	4	9	6	4	-0.7	-0.1	5.5
Yemen	-88	1990-1993	-5	-2	2	10	-1.9	3.6	3.6

\* Note: Where sample coverage makes comparing 10 year growth differences impossible, the results for the 5 year comparisons are included in the 10 year growth differences column. Also, where a number of events of political instability run together (or are within a few years of each other), the averages over those periods are used and included as a single event.

**Change in 5 Year Annual Growth Rates**

Figure 8: Change in 5 Year Average Growth (Negative Growth Instability Sample)

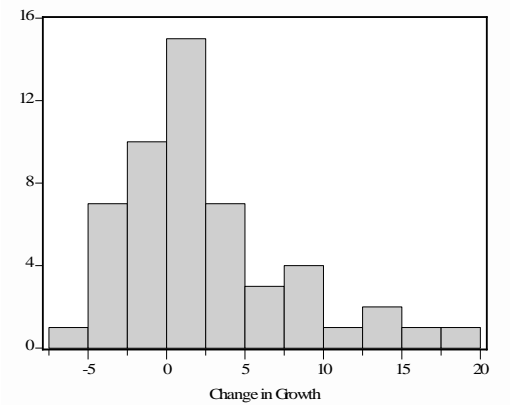
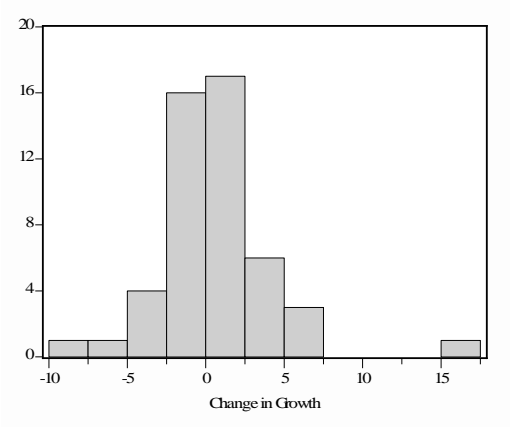


Figure 9: Change in 5 Year Average Growth (Positive Growth Instability Sample)



## Appendix II: Statistical Tests of the Before and After Results

*Testing the hypothesis that the Positive and Negative Group growth rates have identical variances and means during instability*

### Test 1

Ho = Variances are equal during instability

H1 = Variances differ during instability

Mean1 eq: -6.223 (variance=49.13) (se=0.9815)

Mean2 eq: 4.318 (variance=23.929) (se=0.7061)

Single sided probability that the two variances are equal (f- test): 0.00659  $\hat{e}$  Reject the null of equality

### Test 2

Ho = Means are equal during instability

H1 = Means differ during instability

Difference between means:

-10.5414 (sd=11.4451) (se=1.1971)

95% CI: -12.8878<diff<-8.1951 (Wald)

t-value of difference: -8.806; df-t: 91

probability: 0 (left tail pr: 1)

doublesided p-value: 0  $\hat{e}$  Reject Ho that the means are identical

*Testing the hypothesis that 10 year difference growth rates for Positive and Negative have identical variances and means*

### Test 3

Ho = variance of positive and variance of negative equal

H1 = variance of positive and variance of negative not equal

mean1 eq: 1.243 (variance=20.767) (se=0.6381)

mean2 eq: -0.363 (sd=2.74) (se=0.3955)

Single sided probability that the two variances are equal (f-test): 0.00026  $\hat{e}$  Reject Ho that the variances are identical

### Test 4

Ho = means of positive and negative samples are identical

H1 = means of positive and negative samples differ

difference between means:

1.6065 (sd=6.8306) (se=0.7434)

95% CI: 0.1496<diff<3.0635 (Wald)

t-value of difference: 2.161; df-t: 84

probability: 0.983012 (left tail pr: 0.01699)

doublesided p-value: 0.034  $\hat{e}$  Reject Ho that means of samples are identical

### Appendix III: Country Coverage for System GMM Estimation

Algeria	Gabon	New Zealand
Argentina	Gambia	Nicaragua
Australia	Ghana	Niger
Austria	Great Britain	Nigeria
Barbados	Greece	Norway
Belgium	Guatemala	Pakistan
Belize	Haiti	Panama
Bolivia	Honduras	Papua New Guinea
Botswana	Hungary	Paraguay
Brazil	Iceland	Peru
Burkina Faso	India	Philippines
Burundi	Indonesia	Portugal
Cameroon	Iran	Rwanda
Canada	Ireland	Senegal
C.A.R.	Israel	Sierra Leone
Chad	Italy	South Africa
Chile	Jamaica	Spain
Colombia	Japan	Sri Lanka
Congo	Jordan	Sweden
Costa Rica	Kenya	Switzerland
Cote d' Ivoire	Korea	Syria
Cyprus	Lesotho	Tanzania
Denmark	Luxembourg	Thailand
Dom.Republic	Madagascar	Togo
Ecuador	Malawi	Trinidad and Tobago
Egypt	Malaysia	Turkey
El Salvador	Mauritius	Uganda
Ethiopia	Mexico	Uruguay
Fiji	Morocco	USA
Finland	Nepal	Venezuela
France	Netherlands	Zaire
		Zimbabwe

Note: Actual country coverage varies slightly depending on institutional proxy.

## Appendix IV: Data

Variable	Measure	Source
growth	constructed as log difference of real GDP per capita ( <i>rgdpch</i> )	PWT 6.1
Initial GDP per capita	real GDP per capita at beginning of each 5 year period ( <i>rgdpch</i> )	PWT 6.1
schooling	average years of schooling in the total population 25+ ( <i>tyr</i> )	Barro and Lee (2000)
trade openness	sum of exports and imports to GDP ( <i>openc</i> )	PWT 6.1
inflation	constructed as log difference of CPI ( <i>fp.cpi.totl</i> )	World Development Indicators
investment	Investment share of real GDP ( <i>ki</i> )	PWT 6.1
black market premium	ratio of black market exchange rate and official exchange rate minus 1	Data underlying Beck, Levine and Loayza (2000) and Beck and Levine (2004). Original source is Pick's Currency Yearbook.
political instability 1	dummy variable constructed for polity code of -66, -77, or -88	Polity IV Database
political instability 2	dummy variable constructed for change of polity2 score of 3 or more.	Polity IV Database
political instability 3	dummy variable constructed for change of polity2 score of 5 or more.	Polity IV Database
tax ratio	ratio of tax revenue ( <i>s05f3/100</i> ) to GDP ( <i>s16f3</i> )	Cross National Time Series Database
CIM	contract intensive money: ratio of non-currency component of M2 to total M2.	IFS
infrastructure	TBA	Calderon and Serven (2004)

## Summary Statistics

Variable	Observations	Mean	Standard Dev.	Min	Max
Growth	751	0.0178	0.0303	-0.1151	0.1576
Initial GDP	749	6146	6135	321	34372
Education	660	4.5897	2.8293	0.042	12.179
Trade Openness	755	0.5949	0.3303	0.0874	2.424
Inflation	697	0.1403	0.2864	-0.0305	3.446
Investment	755	0.1575	0.0861	0.0102	0.4393
Black Market Premium	569	0.6144	5.1878	-0.0525	109.9
PI1	729	0.0836	0.2770	0	1
PI2	729	0.2318	0.4222	0	1
PI3	729	0.1934	0.3952	0	1
Tax Ratio	644	0.2153	0.1132	0.0211	0.800
CIM	703	0.7601	0.1581	0.2113	0.9841

## Appendix V: Additional Results

Table 7: Political Instability (PI3), Institutions (tax ratio) and Growth

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.082** (0.017)	0.005 (0.891)	0.093** (0.012)	0.190*** (0.000)	0.046 (0.172)	0.162*** (0.000)
Initial GDP per Capita <sup>a</sup>	-0.004 (0.285)	0.001 (0.747)	-0.006 (0.135)	-0.014*** (0.001)	-0.001 (0.686)	-0.012*** (0.001)
Average Years of Schooling <sup>a</sup>	0.008* (0.060)	0.005 (0.318)	0.010** (0.024)	0.006* (0.054)	0.008* (0.068)	0.007** (0.032)
Trade Openness <sup>a</sup>		0.024*** (0.001)				0.000 (0.934)
Inflation			-0.025*** (0.000)			-0.015*** (0.002)
Investment <sup>a</sup>				0.026*** (0.000)		0.027*** (0.000)
Black Market Premium <sup>b</sup>					-0.011*** (0.001)	-0.004 (0.115)
Formal Institutions <sup>a</sup>	0.011** (0.021)	-0.000 (0.899)	0.009 (0.107)	0.004 (0.325)	0.004 (0.404)	-0.001 (0.780)
Political Instability	-0.045*** (0.009)	-0.043** (0.020)	-0.032* (0.070)	-0.037** (0.025)	-0.011 (0.585)	-0.011 (0.823)
Interaction	-0.019*** (0.021)	-0.019** (0.031)	-0.013 (0.125)	-0.014* (0.071)	-0.001 (0.859)	-0.002 (0.823)
AB test for AR(1) in first diff (p-values)	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR(2) in first diff (p-values)	0.870	0.747	0.670	0.600	0.348	0.698
Hansen Test (p-values)	0.739	0.972	0.971	0.938	1.000	1.000

p-values in parentheses; \*, \*\*, \*\*\* indicate significance at the 10%, 5%, and 1% level.

<sup>a</sup> variable is included as log(variable); <sup>b</sup> variable is included as log(1+variable)

Time dummies are included in the regressions but are not reported

Table 8: Political Instability (PI3), Institutions (tax ratio), and Growth

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.125*** (0.001)	0.073** (0.067)	0.107*** (0.004)	0.228*** (0.000)	0.063* (0.073)	0.186*** (0.000)
Initial GDP per Capita <sup>a</sup>	-0.008* (0.051)	-0.003 (0.502)	-0.008* (0.058)	-0.16*** (0.000)	-0.006 (0.160)	-0.013*** (0.001)
Average Years of Schooling <sup>a</sup>	0.011** (0.036)	0.009 (0.109)	0.012** (0.014)	0.008** (0.047)	0.012** (0.033)	0.009** (0.027)
Trade Openness <sup>a</sup>		0.018*** (0.009)				0.002 (0.708)
Inflation			-0.024*** (0.000)			-0.015*** (0.006)
Investment <sup>a</sup>				0.027*** (0.000)		0.028*** (0.000)
Black Market Premium <sup>b</sup>					-0.012*** (0.007)	-0.003 (0.298)
Formal Institutions <sup>a</sup>	0.008 (0.135)	0.000 (0.886)	0.003 (0.563)	0.000 (0.881)	0.009 (0.176)	0.001 (0.809)
Lag Formal Institutions <sup>a</sup>	0.009 (0.207)	0.003 (0.644)	0.005 (0.498)	0.006 (0.426)	0.001 (0.863)	-0.002 (0.755)
Political Instability	-0.040** (0.044)	-0.040* (0.056)	-0.025 (0.248)	-0.037** (0.041)	-0.018 (0.486)	-0.020 (0.361)
Interaction	-0.017* (0.087)	-0.017* (0.088)	-0.009 (0.390)	-0.013 (0.131)	-0.005 (0.662)	-0.005 (0.611)
AB test for AR(1) in first diff (p-values)	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR(2) in first diff (p-values)	0.772	0.807	0.350	0.970	0.798	0.796
Hansen Test (p-values)	0.791	0.982	0.988	0.976	0.998	1.000

p-values in parentheses; \*, \*\*, \*\*\* indicate significance at the 10%, 5%, and 1% level.

<sup>a</sup> variable is included as log(variable); <sup>b</sup> variable is included as log(1+variable)

Time dummies are included in the regressions but are not reported here

Table 9: Political Instability (PI3), Institutions (CIM) and Growth

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.105*** (0.001)	0.093*** (0.002)	0.100*** (0.000)	0.174*** (0.000)	0.054** (0.029)	0.157*** (0.000)
Initial GDP per Capita <sup>a</sup>	-0.007** (0.044)	-0.004 (0.210)	-0.008** (0.017)	-0.011*** (0.005)	-0.002 (0.375)	-0.009*** (0.002)
Average Years of Schooling <sup>a</sup>	0.008** (0.011)	0.006* (0.092)	0.103*** (0.005)	0.001 (0.597)	0.009** (0.011)	0.006* (0.070)
Trade Openness <sup>a</sup>		0.015*** (0.004)				-0.002 (0.518)
Inflation			-0.026*** (0.000)			-0.019*** (0.000)
Investment <sup>a</sup>				0.021*** (0.004)		0.025*** (0.000)
Black Market Premium <sup>b</sup>					-0.008** (0.035)	-0.003 (0.206)
Formal Institutions <sup>a</sup>	0.038*** (0.000)	0.037*** (0.000)	0.036*** (0.000)	0.032*** (0.000)	0.019* (0.072)	0.014** (0.035)
Political Instability	-0.006 (0.449)	-0.004 (0.607)	-0.005 (0.459)	-0.007 (0.340)	-0.005 (0.507)	-0.006 (0.317)
Interaction	0.004 (0.847)	0.001 (0.931)	-0.004 (0.802)	-0.004 (0.826)	0.009 (0.640)	0.004 (0.692)
AB test for AR(1) in first diff (p-values)	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR(2) in first diff (p-values)	0.493	0.641	0.174	0.613	0.580	0.880
Hansen Test (p-values)	0.991	1.000	1.000	1.000	1.000	1.000

p-values in parentheses; \*, \*\*, \*\*\* indicate significance at the 10%, 5%, and 1% level.

<sup>a</sup> variable is included as log(variable); <sup>b</sup> variable is included as log(1+variable)

Time dummies are included in the regressions but are not reported here

Table 10: Political Instability (PI3), Institutions (CIM) and Growth

Regressors	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.054* (0.090)	0.044 (0.156)	0.065** (0.014)	0.126*** (0.001)	0.030 (0.311)	0.154*** (0.000)
Initial GDP per Capita <sup>a</sup>	-0.003 (0.463)	0.000 (0.934)	-0.004 (0.161)	-0.006* (0.075)	-0.000 (0.960)	-0.009*** (0.005)
Average Years of Schooling <sup>a</sup>	0.008* (0.071)	0.005 (0.255)	0.010** (0.025)	0.002 (0.520)	0.008* (0.093)	0.006 (0.101)
Trade Openness <sup>a</sup>		0.016*** (0.003)				-0.003 (0.273)
Inflation			-0.023*** (0.000)			-0.019*** (0.000)
Investment <sup>a</sup>				0.019** (0.013)		0.027*** (0.000)
Black Market Premium <sup>b</sup>					-0.006 (0.109)	-0.001 (0.453)
Formal Institutions <sup>a</sup>	0.099*** (0.000)	0.094*** (0.000)	0.087*** (0.000)	0.086*** (0.000)	0.078*** (0.001)	0.062*** (0.003)
Lag Formal Institutions <sup>a</sup>	-0.062*** (0.009)	-0.058** (0.012)	-0.055** (0.016)	-0.057** (0.008)	-0.051** (0.043)	-0.048** (0.032)
Political Instability	-0.003 (0.890)	-0.004 (0.593)	-0.008 (0.321)	-0.010 (0.275)	-0.002 (0.839)	-0.009 (0.229)
Interaction	-0.003 (0.890)	-0.009 (0.673)	-0.020 (0.288)	-0.016 (0.497)	0.015 (0.538)	-0.010 (0.588)
AB test for AR(1) in first diff (p-values)	0.000	0.000	0.000	0.000	0.000	0.000
AB test for AR(2) in first diff (p-values)	0.080	0.099	0.066	0.104	0.516	0.532
Hansen Test (p-values)	0.983	1.000	1.000	0.999	1.000	1.000

p-values in parentheses; \*, \*\*, \*\*\* indicate significance at the 10%, 5%, and 1% level.

<sup>a</sup> variable is included as log(variable); <sup>b</sup> variable is included as log(1+variable)

Time dummies are included in the regressions but are not reported here