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Political Instability and Economic Growth at Different Stages of Economic Development: historical evidence from Greece

Sotiris K. Papaioannou

LSE The London School of Economics and Political Science

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ABSTRACT

This study explores the relationship between political instability and growth within the perspective of Greece's modern history. The narrative approach is used to identify major events of political unrest which took place in the period from 1833 onwards. Econometric estimates show that political instability exerts an adverse effect on economic growth. Likewise, poor economic performance increases the likelihood of political risk. Their relationship is not uniform across time but strengthens only after the second half of the 20th century. The impact of political instability is conditional on the stage of economic development with the most harmful effect observed in the phase of rapid industrialization. When distinguishing between permanent and temporary effects of political instability, a strongly negative effect is observed on the growth rate of potential output and a weakly negative impact on the cyclical component of GDP. Political instability is unfavorably affected by the growth rate of potential output.

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[1] Centre of Planning and Economic Research and University of the Peloponnese. Email: sopa@kepe.gr

1. Introduction

The idea that political instability affects growth is well documented in the economics' literature (Alesina et al., 1996). Most of the existing empirical research explores the influence of political instability within a cross country setting and offers evidence in favor of a strongly negative effect on growth. Incidents of political violence such as civil wars, coups and mass demonstrations exert an adverse influence on economic activity.

A variety of indicators have been proposed to model the influence of political instability. Composite indices encompassing information on the number of assassinations, protests and coups were created by Venieris and Gupta (1983; 1986) and Gupta (1990). Alesina et al. (1996) classified political instability in two distinct categories: the first emphasizes on the propensity of government change which can be constitutional or unconstitutional, while the second is related to events of political violence and social unrest. Alesina and Perotti (1996) measured sociopolitical instability only with indices that capture violent events including information on the number of politically motivated assassinations, the number of people killed in incidents of domestic mass violence, the number of successful and unsuccessful coups and on whether a country is democratic or not. Klomp and de Haan (2009) distinguished four areas of political instability. The first is called aggression and is correlated with guerrilla, revolutions and internal conflict. The second is called protest and relates to strikes, riots and anti-government demonstrations. The third is regime instability and is associated with coups, regime durability and constitutional changes while the fourth is called government instability and is correlated with polarization and political cohesion. Jong-A-Pin (2009) also identified four major areas of political instability. These are: politically motivated violence, mass civil protest, instability within the political regime and instability of the political regime.[1]

Given that continuous time series indicators of political instability are scant, the existing research compares economic performance based on cross country observations. However, the time period under examination is usually short and does not allow us to distinguish whether the effects of political instability change over time. It also remains unclear to what extent political risk affects long run performance or impacts temporarily on short term fluctuations. Importantly, the impact of political risk on economic growth is heterogeneous and therefore the estimated slope coefficients of cross-country

[1] Other measures of political risk are derived from respondents' perceptions on various dimensions of political stability (see the Business Environment Risk Intelligence or the International Country Risk Guide). However, these indicators are often viewed as subjective given that the respondents' answers usually align with the economic conjecture.

studies should be interpreted as mean effects which could vary systematically between countries at different stages of economic development.

Unlike most studies using cross country indices, I use historical data to create a unique time series indicator of political instability that extends over 183 years (1833-2016) to study its co-evolution with economic growth of a single country. The narrative approach is used to identify major events of political instability that took place in Greece's modern history from 1833 onwards, soon after its liberation from the Ottoman Empire. The history of Greece is rich in episodes of political unrest which have been manifested in coups (successful or unsuccessful), civil war and mass revolutions that need to be captured in order to investigate their effects on economic performance. This definition of political instability (coups, civil war and mass demonstrations) is closest to the idea of Barro (1991) of using political risk as a measure for the protection of property rights. Appendix A1 narrates in detail all major events of economic, political and social instability that dominated Greece's history after the liberation from the Ottoman Empire in 1830 (for a detailed coverage of all major events in the modern history of Greece see Koliopoulos and Veremis, 2009).[2]

The use of time series data allows us to answer questions that have not been raised so far. First, I ask if political instability and economic growth are mutually determined. Though this issue has already been explored, the evidence provided so far is mixed (see Londregan and Poole, 1990; Alesina et al., 1996; Campos and Nugent, 2002) and the use of long time series data will help us uncover the nature of this relationship within a single-country setting.

Second, while a theoretic and empirical link has been established between political instability and growth in cross country studies (see Table 1 for a brief review of the existing empirical research), little is known if this relationship holds at different stages of economic development. The deleterious effect of political instability is more likely to take place in industrialized countries at late stages of development. Investment spending in capital intensive sectors and countries raises the importance of political instability as a facilitator of the uninterrupted and efficient provision of property rights. By contrast, its damaging effect could not be decisive in underdeveloped agrarian economies as the importance of investment for growth is negligible for such countries. A major feature widely shared by less developed agrarian economies is the large share of the population that is living in villages and works in the home production sector. Self-consumption of the household production is high, especially in rural areas, while the

[2] Despite its turbulent political life, the country managed to remarkably raise its living standards and move from the laggards of Europe to the club of the richest countries of the world. At the same time Greece became a liberal democracy with powerful institutions that protect citizens' human rights.

potential home production surplus is exchanged through barter, rather than the market system. In this case, the existence of an efficient system of property rights is not crucial as a high proportion of daily exchanges takes place informally. The present paper is a first study that systematically tries to establish a convincing relationship between political instability and economic growth at different stages of economic development. Greece is a representative case of a medium-high income industrialized country that shared all features of an agrarian home production economy, soon after its liberation from the Ottoman Empire in 1830.

Third, I ask if the effects of political instability on growth are temporary or last over the long run. While prior literature has documented a robust relationship between political instability and economic growth little is known about the mechanisms through which these effects take place. I therefore distinguish between permanent effects of political instability on potential output and temporary influences on cyclical gross domestic product (GDP). Last but not least, the effect of political instability on growth is evaluated against the influence of indicators that capture other shocks related to economic default, war and dictatorship.

I test these hypotheses by estimating a structural two-equation econometric model in which the endogenous variables are output per capita growth and political instability. Three stage least squares econometric estimates verify the adverse effect of political instability on economic performance and point to a negative impact of growth on political unrest. This relationship is not uniform but changes over time. Political instability and growth were not significantly associated until the second half of the 20th century. The empirical analysis suggests that the effect of political instability is conditional on the level of economic development with the most harmful impact taking place at the stage of rapid industrialization of the Greek economy in the second half of the 20th century. To raise the reliability of the obtained estimates, I provide difference in differences econometric evidence which show that the harmful impact of the revolutionary events of 1848 was more pronounced in high income countries of continental Europe. Political unrest exerts a strongly negative effect on potential GDP growth and a weakly negative impact on cyclical output. Likewise, political instability is unfavorably affected by potential output growth.

The rest of the paper is organized as follows: section 2 discusses the link between political instability and economic growth within the context of Greek history. Section 3 describes the econometric specification. Section 4 presents the empirical results. In Section 5 I provide the conclusion.

2. Political instability and economic performance within the historical perspective of Greece

Greece, soon after its liberation from the Ottoman Empire in 1830, became a recognized state under the name 'Kingdom of Greece'. The new state included only a small part of its present territory, the regions of Peloponnese, Cyclades and a part of Central Greece. Greece's economy at that time was underdeveloped and heavily dependent on rural activities. The industrial sector of the Greek economy grew very slowly (Petmezas, 2006). The reasons for this were mainly political instability, insecurity in the countryside, bad international relations with the main forces of Europe and the neighboring countries, international unreliability and lack of basic infrastructure. The Kingdom of Greece was characterized by a large number of small farmers and a noteworthy equal distribution of land (Petmezas, 2003).

Limited tax capacity, heavy regulation, lack of efficient provision of property rights, low participation in international trade and inefficient fiscal and monetary policies were the dominant features of economic policy. Hatzis (2019) notes that the nineteenth century was a period of a slow modernization of the country's economic structure and institutions. During this period and up to 1922 the political priority of political forces was dominated by the irredentist idea of the enlargement of the Greek state to include all lands, under Ottoman rule, inhabited by large Greek-speaking populations. This entailed the build of a relatively large, yet inefficient, administration and an active policy of nationalist expansion that ultimately put an excessive burden upon the Greek economy and undermined its financial stability. Military competition promoted by the idea of enlargement could have an effect on the late modernization of the Greek economy. Petmezas (2006) notes that a large part of the foreign debt contracted at that time was directed to and uselessly spent in military oriented objectives. Changes in monetary and fiscal policy and sudden swifts in exchange rate regimes were frequent and caused by military needs (Lazaretou, 2014). The public finances of that period were very bad and there was always a need for external borrowing. It is noteworthy that by 1893 the newly formed Greek state had already been bankrupt three times.

A minority of political parties argued that modernization of the Greek economy should first take place, however this policy did not become dominant until the end of the Asia Minor catastrophe in 1922. During the 19th and the first half of the 20th century Greece was a rural economy (with an agricultural share in GDP higher than 50%), dominated by undercapitalized small family farms, absence of technology, low productivity and exports of labour intensive products of arboriculture (Petmezas, 2006). One should add the poor transport and public infrastructure until the last two decades of the 19th

century. Most of this era is characterized by tumultuous political life and periods of authoritarian regimes. National wars, major disagreements between political groups, national schism between the elected government and the King, successful and unsuccessful coups and civil war are major events that contributed to prolonged political instability that lasted until the end of the civil war in 1949 (see Appendix A1) and is largely responsible for the Greek states' weakness to build an efficient institutional framework that protects investors' rights.[3]

Besley and Persson (2009) emphasize on the ability of the state to provide an effective mechanism that protects property stating that provision of this public good is not exogenously given but largely determined by the state's capacity. This ability is in turn shaped by social and political conditions. Governments which operate in an unstable political environment lack the incentive to undertake actions that protect property rights as they fully internalize the political cost of the reform but not the benefits (Svenssson, 1998; Keefer and Knack, 2002). In addition, short horizons of governments make it more likely to prefer expropriation over growth and weaken political incentive to support growth enhancing economic policies.[4,5] Likewise, countries with poor economic performance are prone to political unrest as they are often confronted with social discontent. Besley and Persson (2011) make the case that poor economic performance, political instability and weak enforcement of property rights are all symptoms of a fragile state. Politically unstable countries are unable to effectively provide high quality public goods that facilitate growth but at the same time, low income countries and ineffective states are more likely to incubate incidents of political violence.

Only after WWW II and the subsequent civil war, Greece's economy finally entered the stage of rapid industrialization. The economic structure was transformed with the decisive decline of the share of agriculture (Petmezas, 2006). Alogoskoufis et al. (1995)

[3] Sources of political instability might be ideological, political, social, economic, ethno-linguistic or religious. They manifest themselves when groups of organized people face financial hardship or do not find representation within the existing institutional setting.

[4] Under political unrest, the protection of property rights lacks intertemporal reliability and distorts incentives to engage in long term productive investments (Fielding 2003). On the contrary, in periods of political stability, the risk is lower and firms face an undisturbed time-horizon that allows them to undertake costly investments. Collier (1999) argues that political instability and the threat of civil war affect the composition of physical capital formation and lower investment in non-traded capital goods. As physical capital formation is partly irreversible, rational behavior calls for withholding investment until much of the uncertainty disappears. Political stability also impacts on growth through the channel of trade as it enables an asset's mobility. It also increases financial transactions by raising the possibility of using an asset as collateral.

[5] Formal links between political instability and economic outcomes can be found in Svensson (1998) and Devereux and Wen (1998).

argue that after the end of the civil war in 1949 the political regime was characterized by commitment and coordination mechanisms that led to high investment and growth by guaranteeing property rights in the constitution and the law. This period is characterized by a relatively higher degree of political instability which helped to facilitate a climate of business trust. Greece enjoyed one of the strongest, almost uninterrupted growth rates on a global level with rapid industrialization rates (Hatzis, 2019). Partial liberalization of the economy and integration to the globalized economic system led Greece to a middle-income status.

However, this era is not completely free of episodes of political unrest. The period 1965-66 is characterized by prolonged political instability which had been triggered by a major disagreement between the prime minister and the king of Greece. During July of 1965 large mass demonstrations took place in the center of Athens against monarch. This period of political instability weakened the ability of the Greek political system to govern the country and finally led to the imposition of a seven-year military dictatorship during 1967-1974. The period from 1974 onwards is characterized by the complete and uninterrupted restoration of democracy and political rights. At the same time, however, a period of political violence started with the advent of the terrorist organization of '17th November'. Its actions included bombings, arms' seizures robberies and politically motivated assassinations that caused death of twenty three people, among them Greek and foreign politicians, diplomats, military, police officers, businessmen and citizens. Soon after the outbreak of the economic crisis, during December of 2008, large mass demonstrations burst in the center of Athens after killing of a 15-year old student by an armed police officer. Shortly after, a prolonged period of mass demonstrations took place during 2010-12 against inclusion of the country to the economic adjustment programmes and supervision by the Troika (International Monetary Fund, European Commission, European Central Bank).

3. Econometric specification

3.1 Model and explanatory variables

In order to investigate the effect of political instability on growth, I use a time series dataset that extends over the period 1833-2016. I first provide a short discussion of the single equation approach. Though its major drawback is that it does not take into consideration the reverse association between growth and instability, I use it primarily to facilitate comparison with the simultaneous equation methodology which is later employed to address the issue of endogeneity bias. The following growth specification is considered:

$$Y_t = a + \beta INS_{t-1} + \gamma X_{t-1} + \delta D_{t-1} + u_t \quad (1)$$

with *Y* being the growth rate of output per capita and *X* a vector of regressors lagged by one period. Data for the variable of real GDP per capita growth are provided from the Maddison Project Database and are expressed in 2011 international dollars. The Maddison Project Database is amongst the most widely used sources of historical income data providing information on real GDP growth over the very long run. Pre-1950 real GDP data are usually based on benchmark estimates derived either from historical national accounts or from historical studies. For more details on the construction of the real GDP per capita series see Bolt et al. (2018).

INS is a dummy variable associated with political instability. One kind is related to executive or government uncertainty and usually involves regular or irregular government changes, frequent elections, ministerial changes etc. Another category entails more radical incidents (coups, civil war and mass demonstrations), is related to regime instability and emphasizes on phenomena of social unrest. This definition is closest to my idea of political instability as it often involves substantial changes in the protection of property rights, retreat of the rule of law and violent reversion of the existing economic legislation which are more likely to exert a lasting influence on long term economic growth.

I treat political instability as the probability of a political change that does not take place through the usual channel of elections and I follow the narrative approach to identify all major events of political turmoil in Greece. Then a dummy variable is created which receives ones for the years during which incidents of successful or unsuccessful coups d'état, mass revolutions and civil war took place and zero otherwise. Other incidents of political violence such as strikes, riots or political assassinations are not included as many of them are misreported or not reported. Table 2 summarizes all identified incidents of political instability along with current, previous and next year's GDP growth rates. Most events were accompanied by a subsequent fall in the rate of GDP per capita growth, compared to previous or current period's economic growth. However, we observe that during the period of the civil war (1946-1949) and especially during 1946-47, Greece witnessed remarkable growth rates. This can be explained by convergence dynamics, as the economy started to grow from a low income level and after a five year- period of significant income losses (average GDP growth was equal to -17.2% during the period of WWW II, 1940-45).

A drawback of using a single dummy variable is that it is difficult to interpret its influence unambiguously given that other events that take place within the same period could exert an independent impact on economic performance. Therefore, I consider vector *D* which includes dummy variables associated with other major events against

which the impact of political instability is gauged. These events are war, dictatorship and economic default. The first distinguishes all years during which Greece was involved in a war. The second is associated with economic instability and receives one for the year of the global economic crash (1929) and for all years during which the Greek government declared default. Finally, I employ a dummy variable which receives ones for the periods during which Greece was ruled by a dictatorship.

I also consider government uncertainty which is related to regular government changes. In doing so, I create a dummy variable which dates all years during which parliamentary elections took place. Political uncertainty regarding re-election might be harmful for growth. In periods before the elections politicians engage in myopic behavior and are not interested in long term policies. Governments usually postpone unpopular decisions and avoid bearing the political cost. Examples of this kind of behavior are the delay of structural reforms or excess public spending.

My choice of variables included in vector X is guided by economic theory. I therefore include the once lagged variable of output per capita to control for convergence effects. As I estimate a time series econometric specification, I include a time trend in the regression and also consider the lagged growth rate of output per capita to account for persistence in the dependent variable. In the absence of any reported data on physical capital formation, I include in the specification the variable of bank savings (% GDP) to model the influence of private investment.[6] I also consider the growth rate of the population (Maddison Project Database, Bolt et al., 2018) to control for the influence of major territorial expansions that took place in the period between 1833 and 1922. Given that the Great Britain was significantly linked to the Greek economy and was a dominant economic nation for much of the period under investigation I include the growth rate of English GDP to account for the impact of growth spillovers. I also consider the influence of macroeconomic instability and public finances and include in my specification the variables of inflation and public debt (% of GDP).[7] The econometric specification also includes the impact of political institutions

[6] The time coverage of this variable ranges between 1842 and 1939 and between 1960 and 2015. No observations are available for the period of war between 1940 and 1949 (WWWII and civil war). Bank deposits between 1950 and 1960 do not enter in this variable as observations of this period are not compatible with the rest of the time series. Observations for bank deposits between 1842 and 1939 are from Lazaretou (2014). From 1960 onwards I use the ratio of bank deposits to GDP (Worldbank, 2017).

[7] For the 1834-1938 period inflation is approximated by the growth rate of the GDP deflator which is based on a composite price index comprising of ten major products from agriculture, livestock, forestry and mining (Kostelenos et al., 2007). For the period from 1949 onwards this variable is the yearly change of the consumer price index. The consumer price index for the period 1949-1959 has been obtained from the Bank of Greece (1992). From 1960 onwards I use the yearly price change of the consumer price index of ELSTAT (2018). The debt to GDP variable is from IMF's (2015) historical debt to GDP database and is available for the period 1884-2015. Missing observations are from periods 1914-1927, 1940-1951, 1957, 1976-1978.

and therefore I include the Polity IV index of democracy which measures the degree of political freedom in a country (Marshall et al., 2018). It contains information on the extent of democracy and ranges from strongly autocratic (-10) to strongly democratic (10). Its impact on growth is still ambiguous with Gerring et al. (2005) stating that its growth effect is null of negative. Recently, Acemoglu et al. (2019) have challenged this view by showing that democracy causes growth across a wide panel of countries. In the absence of any officially reported data on the educational level of the population, an obvious disadvantage of the econometric specification is the lack of any control variable related to the stock of human capital.

I also consider the following probit model:

$$INS_t = a + \beta INS_{t-1} + \gamma ECON_{t-1} + \delta POL_{t-1} + \theta D_{t-1} + e_t \quad (2)$$

INS is a dummy variable that models political instability and receives ones in the occurrence of a coup, mass demonstration and civil war. ECON is a set of economic variables that determine political instability. I consider the influence of the level and the growth rate of GDP per capita. I also control for the effect of macroeconomic instability and include the variable of inflation. POL is the Polity IV index of democracy which is expected to exert an adverse influence on political instability. Democratic regimes tend to experience less instability than undemocratic regimes because they allow people to participate in the political process. By allowing participation, internal conflicts are resolved through the process of voting. In undemocratic regimes, social discontent does not find representation through the elections and therefore is more likely to take place through violent events. *D* is a vector which encompasses four dummy variables associated with the incidence of war, dictatorship, default and elections.

Table 3 provides brief descriptive statistics and of all variables that are used in the econometric analysis. It also provides frequencies of dummy variables that enter in the regressions. We should note that specific economic variables receive extreme values in certain historical periods. For instance, the minimum value of GDP per capita growth was -51.36% in 1913 which was the second year of the Balkan wars. Its maximum value was 52.21% in 1918 which coincides with the end of the WWW I. Similarly, the lowest value of the inflation rate (-99.88%) was observed in 1954, one year after the drastic devaluation of the national currency, while its maximum value (72.57%) was observed in 1923, when Greece received in its territory more than one million refugees from Asia Minor. The debt to GDP variable came close or even exceeded 200% in the decade after

the default of 1893.[8] For robustness purposes the empirical analysis that follows will skip outlier observations (Table 7). The correlation matrix of Table 4 illustrates that no significant problem of multicollinearity exists between explanatory variables that enter as regressors in Equations 1 and 2.

3.2 Identification

If the residuals of equations (1) and (2) are not correlated, then OLS estimates will deliver consistent estimates. This assumption is rather unrealistic given that the error term of the growth equation is plausibly associated with political instability. Besides, a significant correlation with growth does not necessarily imply a causal effect. Poor economic performance increases the probability of a major political event or a government change after increased public discontent. In modern democracies, such a change manifests itself through the election of a new government. However, in turbulent periods or in countries which are politically and institutionally underdeveloped, political instability may be manifested through violent events such as coups, demonstrations or even civil war. Gupta (1990), Londregran and Poole (1990) and Alesina et al. (1996) argued that poor growth performance could be the source of political instability.

In this case, the estimation of a structural econometric specification is the modeling choice that should be followed (Alesina and Peroti, 1996). I consider the following system of two equations:

$$Y = a_1 + \beta_1 X_1 + \gamma_1 X_{11} + \delta_1 INS + e_t \quad (3)$$

$$INS = a_2 + \beta X_2 + \gamma_2 X_{22} + \delta_2 Y + u_t \quad (4)$$

The dependent variable of equation (3) is the growth rate of output per capita *Y*. In equation (4) the dependent variable is political instability *INS*. X_{11} is a vector of variables that determine economic growth (Y). It includes lagged GDP per capita (in log) and lagged GDP per capita growth, political instability, the dummy variables of war, default, elections and dictatorship and the economic variables of inflation, debt (% of GDP) and deposits (% of GDP). X_{22} is a set of variables that determine political instability. It includes GDP per capita (in log) and GDP per capita growth, lagged political instability, inflation and the dummy variables of war, default, elections and dictatorship

[8] Figures A1 to A3 in the Appendix demonstrate the time evolution of the variables of GDP per capita growth, inflation and debt to GDP.

One important issue in estimating the above empirical model is the correct identification of the two equations. One or more of the regressors in one of the two equations must not enter as independent variable in the remaining equation. This means that at least one of the regressors in equation (3) affects only GDP per capita growth. Similarly, one of the regressors in equation (4) should affect only political instability. Therefore, vector X_1 includes the growth rate of English GDP and the trend of time as exogenous covariates that affect only growth while X_2 encompasses the polity IV index of democracy as an exogenous variable that identifies political instability. Coefficients δ_1 and δ_2 estimate the causal effect between growth and political instability. The estimation is carried out via the three-stage least squares econometric methodology to account for correlation in the disturbances of equations (3-4).

4. Econometric estimates

4.1 Stationarity

Given the long-time length of the dataset, the examination of time series properties of the main variables of interest is necessary. I perform unit root tests for the economic variables of output per capita, inflation and debt to GDP by using the augmented Dickey-Fuller test.

I first test if the variables are stationary in the logarithmic levels. The null hypothesis of the augmented Dickey-Fuller test is that the variable under examination is non-stationary. Unit root tests of Table 5 indicate that the variables of GDP per capita, inflation and debt to GDP are non-stationary in their logarithmic levels, as their associated tests are lower than their 5% critical values. When considering the first differences of variables, the null hypothesis of non-stationarity is rejected suggesting that output per capita, inflation and debt to GDP are stationary in their first differences.

4.2 Initial estimates

Initial OLS econometric estimates of equation (1) are based on time series observations ranging from 1833 to 2016 (Table 6). All estimates of columns 1-4 point to a negative and statistically significant impact of political instability on economic growth which ranges from -0.044 to -0.062. The long run effect of political instability is measured by its coefficient estimate divided by (1-α) where α is the coefficient of the lagged dependent variable. Relying on estimates of column 1, this is equal to *-0.054 / (1+0.399) = -0.038*.

Concerning the rest of covariates included in Table 6, lagged GDP per capita enters the regression with a significantly negative coefficient estimate confirming that economic

growth of Greece has followed a successful convergence process. The coefficient of the time trend variable is significantly positive, suggesting that Greece's economic performance improves over time. Likewise, spillover effects as approximated by the growth rate of English GDP, exert a favorable impact on growth of the Greek economy. We also observe a weakly positive impact of the dummy variable of dictatorship on GDP per capita growth in half of the regressions reported in Table 6. However, after a careful inspection of income growth rates throughout the whole period under examination, we verify that the impact of dictatorship on economic growth is negligible as average GDP per capita growth during dictatorships was 1.34% while in the rest of the period was equal to 1.36%. Durbin Watson values are close to 2 across all reported regressions ensuring that the residuals are not autocorrelated.

In Table 7 I report some additional robustness checks. First, I re-estimate equation (1) by skipping outlier observations with a standardized residual higher than 1.96 or lower than -1.96 (column 1). I also check the sensitivity of estimates to the set of covariates included in the analysis. Including a fairly large set of explanatory variables limits degrees of freedom whereas coefficients could be unstable in the presence of co-linearity. For this reason, I choose to exclude from the analysis some controls which could be side effects of political instability, such as the occurrence of war, dictatorship, economic crisis, elections (column 2). Results of columns 1-2 illustrate that the impact of political instability remains strongly negative. Its coefficient estimate rises considerably when excluding from the regression the occurrence of other shocks related to war, dictatorship, economic crisis and elections (column 2). Finally, to assess if the dynamic specification can affect the interpretation of the results, I transform equation (1) to an error correction model. As can be seen by the results of column 3 the qualitative and quantitative effect of political instability is essentially the same to those obtained by estimates of Table 6. The error correction term is negative and close to -1 indicating that any short run disequilibrium is fully dissipated before by the next time period.

Table 8 reports probit econometric estimates of Equation 2. I first consider a set of baseline regressors that model the effect of GDP per capita, GDP per capita growth and democracy on political instability (column 1). Then I include an extended array of shocks that could trigger events of political instability (column 2). Such incidents include the occurrence of default, war, elections and dictatorship. I also consider the variable of inflation to control for the impact of macroeconomic imbalances. Overall, coefficient estimates of the variable of GDP per capita growth lack statistical significance. The once lagged variable of GDP per capita enters the regression with a significantly positive coefficient estimate only in estimates of column 2. The polity IV index of democracy is negatively associated with the dependent variable signifying that democratic institutions could lower the risk of political instability. Similarly, previous year's political

instability and the incidence of a war are positively associated with the likelihood of political instability (column 2).

4.3 Simultaneous equation estimates

To identify the causal effect of political instability on economic growth and vice-versa, I proceed with the estimation of a structural econometric model that considers the possibility of their endogenous association. Table 9 provides generalized least squares estimates of the system of equations 3 and 4. The dependent variable of equation 3 is the growth rate of GDP per capita with political instability entering as an explanatory covariate. In Equation 4, the dummy variable capturing incidents of political instability is the dependent variable with the growth rate of GDP per capita entering as a regressor. As identifying variables in equation 3 I consider the growth rate of English GDP and the trend of time as both of them were found to exert a significant influence on the variable of economic growth (Tables 6-7). Likewise, the polity index of democracy is the identifying variable in equation 4 as estimates of Table 8 point to a negative association with the likelihood of political unrest. Given a legacy of empirical results showing that the income effect of democratic political institutions is weak (Glaeser et al., 2004; Persson and Tabellini, 2009), the polity index of democracy is not included as regressor in equation 3.

Estimates of Table 9 (column 1-3) confirm that political instability exerts a significantly negative effect on growth. Its estimated influence is higher in magnitude compared to initial OLS estimates. Similarly, estimates of the bottom part of Table 9 demonstrate that poor growth performance increases the probability of political instability. Estimates of column 2 consider the growth influence of private deposits whose estimated influence on economic activity is not statistically significant. In column 3, I include a restricted set of controls to model the association between economic growth and political instability. All estimates point to a negative effect of GDP per capita growth and establish a mutually negative feedback relationship with political instability. We also notice that war is negatively correlated with political instability and exerts a reasonably negative influence on economic growth.

This evidence is in line with Asteriou and Siriopoulos (2000) showing that socio-political instability, as measured by a composite index comprising of politically motivated assassinations, terrorist activities, strikes, elections and the extent of democracy, exerted a negative impact on stock market performance and economic growth of Greece during 1960-95. Along the same lines, Asteriou and Price (2001) created a composite index comprising of terrorist events, strikes, elections government changes and war to show that political instability affected negatively economic growth and positively growth uncertainty of the UK during 1961-97.

Next, I follow the approach of Asteriou and Siriopoulos (2000) to create an index that comprises of various components of socio-political instability. In doing so, I use principal component analysis to combine the dummy variables of political instability, war, default, elections and dictatorship into a single index is time variant. A drawback of this approach is that this composite index does not include components such as terrorism activities and strikes due to the very long time series of this study. Estimates of column 4 confirm the mutually negative inter-relationship between the composite index of socio-political instability and economic growth. Importantly, the polity IV index of democracy exerts a strongly negative effect on instability signifying the role of the democratic constitution in mitigating phenomena of political unrest.

In column 5, I re-estimate equations 3-4 by assuming that the growth rate of England was determining economic growth of Greece over a shorter time period. Given that Britain's economic dominance declined significantly from WWW II onwards, I create a multiplicative term between the growth rate of England and a dummy variable that receives ones during 1833-1940 and zero otherwise. Econometric estimates do not change drastically when this multiplicative term enters the regression instead of the initial variable of English GDP per capita growth (column 5).

4.4 Structural breaks and the role of the stage of development

Given the long time period under investigation, the effect of political instability on growth could drastically change at a point in time. A Wald test based on the regression of GDP per capita growth on a time trend shows that in the year of 1955 a structural break took place (Table 10). Also, Figure 1 illustrates a CUSUSM parameter stability test based on the squared recursive residuals of the growth regression of Table 9. Parameter instability is statistically established when the weighted cumulative recursive residuals stray outside their confidence intervals. This is exactly what Figure 1 illustrates for a sub-period that starts in the middle of the sample.

With this in mind, I proceed with the estimation of equations (3-4) across two different sub-periods. I use 1955 as my threshold point and perform regressions before and after this year. Estimates of Table 11 suggest that the nature of the relationship between political instability and growth is not uniform over time. As illustrated by estimates of column 1 political instability did not exert any significant influence on growth in the period before 1955. By contrast, in the post-1955 period, political stability emerges as a key factor in boosting economic growth.[9] We also confirm that GDP per capita growth caused a negative effect on political instability in the post-1955 period. Concerning the

[9] In the absence of any events of war or default, their impact is not reported in estimates of the post-1955 period.

rest of covariates included in Table 11, inflation exerts a negative effect on growth in the post-1955 period, while lagged GDP per capita and war affected economic growth in a negative way during 1833-1955.

One possible explanation for the uneven effect of political instability relates to the multiple stages of development that the Greek economy has gone through the last 200 years. Throughout the whole 19th and during the first half of the 20th century, Greece was characterized by the undercapitalized structure of its production. If political instability matters more for countries which are capital intensive, then we should expect that rural-labor intensive economies should be less vulnerable by incidents of political disorder. Likewise, the period after the first half of the 20th century coincides with the rapid take-off and industrialization of the Greek economy. A successful transition of the Greek economy to a high growth regime required an environment free of political risks that would ensure the uninterrupted undertaking of private investments.

I test this possibility by performing regressions at different stages of economic development as measured by a) the economic gap of Greece vis-a-vis the Great Britain which was the dominant nation for much of the period under investigation and b) by the percent of population living in rural areas. The economic gap is measured by the distance (relative ratio) of GDP per capita between the two countries. As regards the percent of rural population, I use yearly estimates of the share of population living in areas with population lower than 2.000 (Dertilis 1993). These observations range from 1833 to 1933. I preferred to use this measure since population statistics are available on a yearly basis already from 1828 (while occupational statistics are not) allowing us to avoid extrapolation back to 1833. This series is complemented with official census statistics of the percent of rural population that is available on a ten-year basis from 1920 onwards (ELSTAT, 2020). Missing observations have been recovered with the use of interpolation techniques. Table 12 shows the evolution of the development stage of the Greek economy as measured by its economic gap vis-a-vis the Great Britain and by the share of its rural population.

Estimates of Table 13 report the effect of political instability conditional on the economic gap vis-à-vis the Great Britain. Regressions are performed across different quartiles of its distribution with the economic gap itself also included interchangeably as an explanatory variable. The strongest effect of political instability is observed across quartiles with the lowest economic distance vis-à-vis the Great Britain. Likewise, estimates of Table 14 illustrate that the most harmful effect takes places at the quartiles with the lowest share of rural population fitting our theoretical priors that the effect of political instability is stronger at late stages of economic development.

4.5 The effect of political instability in high income European countries

Estimates of Tables 13-14 are informative for the presence of a non-linear relationship between political instability and growth which is conditional on the stage of economic development. However, OLS estimates usually suffer from serious endogeneity bias and therefore cannot be used to establish causality.

To validate the causal nature of the effect of political instability on growth and add generality on its conditional influence on the level of economic development, I follow a counterfactual approach to compare its effects within a sample of twelve European countries (Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Sweden, Switzerland and UK). I use the table of revolutionary events of Aidt and Jensen (2014) and consider the revolutions of 1848 as an exogenous event that could have an impact on economic growth. Aidt and Jensen (2014) identify Austria, France, Germany and Italy as the countries that were more heavily influenced by the revolutions of that time. I therefore use them as my treatment group to see if the effect of revolutions was more severe against that of the remaining eight countries that form the control group.

I ask the following two questions: (i) what would be the rate of economic growth of European countries had they not been affected by the revolutionary events of 1848? and (ii) was GDP per capita growth more influenced in countries that were more wealthy? My sample extends over the period 1838-1859. I compare growth performance between treated and control countries before and after 1848 with the following difference in differences specification:

$$growth_{it} = a_0 + \theta Q_{it} + \gamma\, I(t > s) + \delta Q_{it} * I(t > s) + \beta X + d_t + \varepsilon_{it} \quad (5)$$

growth is the outcome variable of GDP per capita growth, while *i* indexes countries at time *t*. Q_{it} is a dummy variable receiving ones for countries that were influenced from the revolutions of 1848 (Austria, France, Germany and Italy) and zero otherwise, $I(t > s)$ is an indicator function equal to one for the post-1848 period (1848-1859) and $Q_{it} * I(t > s)$ is an interaction term between Q_{it} and $I(t > s)$. The parameter δ represents the effect of revolutionary events on growth which is estimated by the difference in differences estimator. Vector *X* includes as explanatory covariates those of the logarithm of GDP per capita (log), population growth (both obtained from the Maddison Project Database), the polity IV index of democracy and the inflation rate (Reinhart et al., 2018). Finally, ε_{it} is an error term.

Difference in differences comparisons of economic growth are presented in Table 15, along with the associated standard errors. The upper panel shows that the average growth difference between control and treated countries was statistically insignificant before the revolutions of 1848 (column 1). The lower panel illustrates that growth differences in the post-revolutionary period were negative and statistically significant indicating that economic performance of countries that were affected by revolutions witnessed a significant drop. The overall effect of revolutions on growth is estimated by the difference in differences estimate which is significantly negative suggesting that economic growth would have been higher had European countries not been affected by the revolutionary events of 1848. Relying on estimates of column 1, GDP per capita growth would have been higher by 7.9% in the absence of revolutions. Difference in differences estimates of column 2 remain practically unchanged when considering in the regression two additional dummy variables that indicate the occurrence of a war (Aidt and Jensen, 2014) or the event of a severe economic crisis (Reinhart et al. 2018).

To reduce the risk of selection bias, I use propensity score matching on a number of economic, social and political characteristics that are likely to predict the occurrence of a revolution. The goal is to approximate randomization of treatment by estimating the probability of the revolutions of 1848 given a vector of structural factors that could determine their occurrence. I use as predicting variables GDP per capita (log), inflation, population growth and democracy. Difference in differences comparisons between treated and control countries remain negative but lose their significance (column 3) suggesting that the growth effect of revolution is uncertain and could be shaped by structural characteristics.

To see if the growth influence of revolutions was conditional on the level of economic development, I compare the economic performance of the most rich countries that were affected by revolutions against that of the rest ones. According to the Historical Statistics of the World Economy, GDP per capita in 1820 was higher in Austria and France (compared to that of Germany and Italy) and therefore these two countries form my second treatment group that is used to investigate if the stage of economic development matters for the growth influence of political instability. Regressions of columns 4-6 are performed in the same way as those in columns 1-3 and suggest that the economic activity of more developed countries was more severely hit by the revolutions of 1848.

4.6 Permanent and temporary effects

One of the goals of this study is to see if the effects of political instability on growth are temporary or last over the long run. The productivity impact of investments in physical

capital and technology equipment takes time to materialize and therefore potential output and aggregate supply should be adversely influenced in politically unstable countries that cannot effectively protect property rights. Likewise, cyclical output could be heavily influenced by precautionary saving, lower current consumption and a possible downturn in trade and exports in highly unstable countries. To distinguish between temporary effects on output fluctuations and permanent influences on potential GDP, we must first isolate the cyclical component from the estimated trend of GDP per capita. The economics' literature proposes a variety of methods to separate long-term trends from cyclical fluctuations. I use the Hodrick-Prescott (HP) filter to detrend the GDP per capita series with a smoothing parameter λ=100 for annual data. The HP filter is not without criticism; however, its simple estimation and implementation makes it still widely acceptable in the business cycle literature. The estimated trend can be interpreted as the potential output and the cyclical component as the output gap.

Table 16 reports coefficient estimates of political instability with trend GDP per capita growth (column 1) and output gap (column 2) entering as dependent variables. Consistent with its influence on labor supply, population growth enters as an explanatory variable in estimates of column 1. Regression results confirm that political instability affects growth of potential output in an unfavorable way. Similarly, the likelihood of political instability lowers as the growth rate of trend GDP per capita increases. Estimates of column 2 are in favor of a weakly negative effect of instability on the cyclical component of GDP. Output fluctuations do not exert any significant influence on the likelihood of political instability. Estimates of table 16 are in line with Campos et al. (2012) showing that informal political instability (as measured by politically motivated assassinations, guerilla warfare and strikes) exerted a negative long run and short run effect of growth of Argentina during 1896-2000.

5. Concluding remarks

The purpose of this study was to examine the relationship between economic growth and political instability. Unlike the existing literature providing so far evidence based on cross country data, I studied their association within the historical context of Greece's modern political life. The period after its liberation from the Ottoman Empire is rich in episodes of political violence and therefore their study could be useful in trying to explain the impact of political instability on economic performance of a single country.

I followed the narrative approach to incorporate within a unique time series indicator all major events of political instability that took place from 1833 onwards. Compared to previous findings, this paper provides evidence in favor of a negative impact of political instability on economic growth. Likewise, poor growth performance raises the likelihood of political instability. Their relationship is not uniform across time. A significantly

negative interrelationship emerges only in the second half of the 20th century. The econometric estimates suggest that the growth influence of political instability is determined by the stage of economic development. The most harmful effect takes place in the phase of rapid industrialization. This study also shows that political instability mainly impacts on the growth rate of potential output. A weakly negative effect is also exerted on the cyclical component of GDP. Likewise, higher potential GDP growth exerts a strongly negative effect on the likelihood of political instability.

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Appendix

Appendix A1: Incidents of economic, political and social instability in Greece's modern history

1831: Rebellion of the Greek Navy, armed movement of organized groups against the government and assassination of the first governor of Greece Ioannis Kapodistrias. 1843: Insurgency against the first king of Greece Otto in 1843 which led to the grant of the first constitution. In the same year, the first default after the establishment of the Greek state took place which led to the imposition of fiscal control.

1862: Eviction of the first King Otto after military uprising which led to his replacement by King George A' in 1864.

1893: Debt default of the Greek state.

1897: Military defeat after the Greco-Turkish War which led to the imposition of international control over the Greek finances and subsequent fiscal consolidation.

1909: Military coup against the government which resulted in the advent of the new Prime Minister Eleftherios Venizelos.
1912-13: Participation of Greece in the Balkan Wars which led to a considerable territorial and population enlargement.
1916: Major disagreement between the Prime Minister Eleftherios Venizelos and King Constantine I over the military involvement of Greece in the WWW I led to a significant conflict and a national schism. In 1916 with the support of the French army, Venizelos set up a provisional government in Thessaloniki against the royalist government in Athens. There was also an armed confrontation in the streets of Athens between the royal army and the French forces. A naval blockade by the allies of Entante finally forced King Constantine I to leave Athens (without abdication) in 1917 and leave his son Alexander as king of Greece. Greece entered the war by the side of the Entrant allies in 1917-18.
1920-1922: In reward for the military support during WWW I the allies offered Greece the territories of Western and Eastern Thrace by the Treaty of Sevres in 1920. The Greek army also landed in the territory of western Asia Minor with the objective to annex it to Greece after a referendum. However, King Constantine and the royal friendly government of that period which took office after the elections of 1920 attempted to invade in the inside of the ex Ottoman Empire resulting finally in a major military defeat and a pogrom against the Greek population in 1922. After the catastrophe a military

coup which was organized by antiroyalist army officers took place and forced King Constantine I to abdicate.
1923-1938: During this period a number of successful or unsuccessful military coups took place being the result of the political dispute between the liberal and the royalist party. We report the following: 1923: unsuccessful military coup against the government, 1925: successful military coup which led to the dictatorship by General Pagkalos lasting until 1926, 1926: Military coup against the dictator Pagkalos which led to his overthrow, 1933: unsuccessful military coup against the government, 1935: unsuccessful military coup against the government, 1936: Imposition of dictatorship under General Ioannis Metaxas, 1938: unsuccessful military coup against the government.

1932: The Greek government declared default as a consequence of the global economic crash of 1929.

1940-44: Greek-Italian war, invasion and occupation by German troops. During this period, the monetary and real sectors of the Greek economy collapsed.

1944: Soon after liberation by the German troops, mass demonstration of the communist party took place against the coalition government and the British forces leading to an armed conflict in the area of Athens in December of 1944. Political polarization of that period and mass persecutions of the communists led to the civil war of 1946-49 after the decision of the communist party to abstain from the first post WWWII national elections in1946 and the return of King George.

1951: military rebellion of a group of higher military officers in favor of the General of the Army Alexandros Papagos.

1953: Drastic devaluation of the national currency.

1965-66: Prolonged political instability after major disagreement of the prime minister with the king of Greece. During July of 1965 large mass demonstrations took place in the center of Athens against monarch. This period of political instability weakened the ability of the Greek political system to govern the country and finally led to the imposition of dictatorship after a military coup in 1967.

1967: Successful military coup after a period of political turmoil (1965-1967) which led to the dictatorship of 1967-1974.

1973: Military coup after the student uprisings of November 1973.

2008: Large mass demonstrations during December of 2008 in the center of Athens after killing of a 15-year old student by a police officer.

2010-12: Prolonged period of mass demonstrations against inclusion of the country to the economic adjustment programmes and supervision by the Troika (International Monetary Fund, European Commission, European Central Bank).

Appendix A2: Evolution of GDP per capita growth, inflation and debt (% of GDP)

Figure A1: GDP per capita growth (%, 1834-2016)

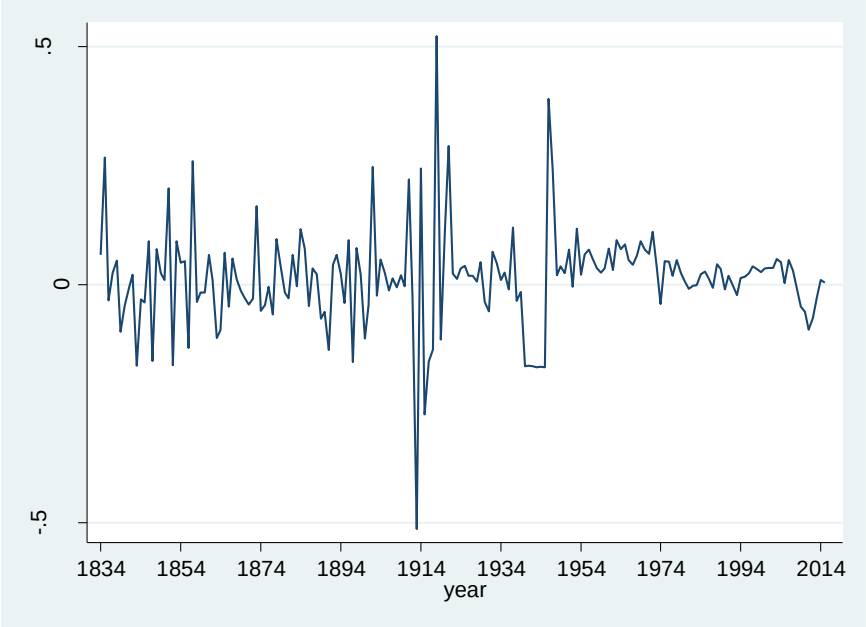


Figure A2: Inflation (%, 1834-2016)

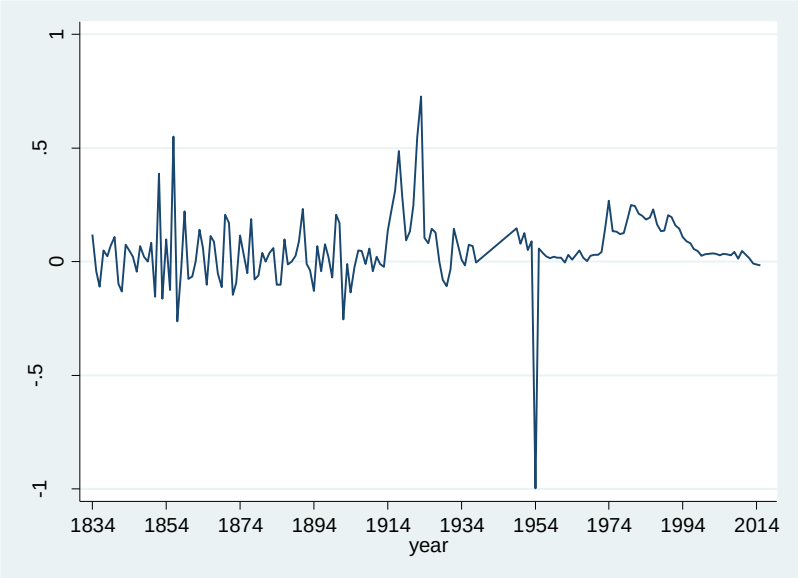
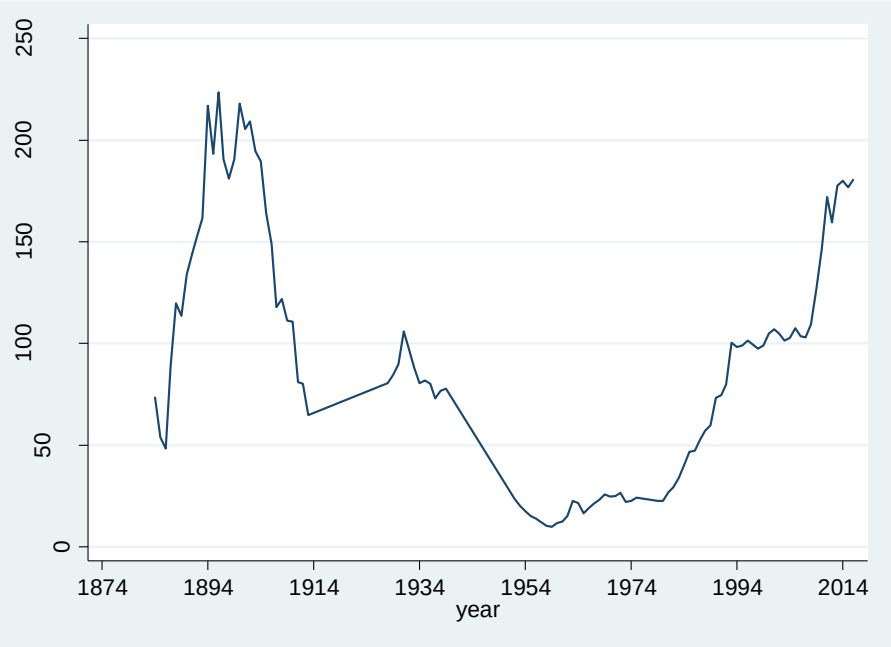


Figure A3: Debt to GDP (%, 1884-2016)



Tables & Figures

Table 1: Brief review of the empirical literature

Study	Finding	Sample
Stewart and Venieris (1985)	Sociopolitical instability impacts on growth through the channel of lower savings.	60 less developed countries during 1961-67
Venieris and Gupta (1986)	Negative impact of unequal income distribution and sociopolitical instability on savings.	49 non-communist countries at various years
Londregran and Poole (1990)	The likelihood of a government collapse increases with lower economic prosperity. No evidence in favor of a negative impact of coups on income growth.	121 countries during 1950-82
Ozler and Rodrik (1992)	The extent of political stability can magnify or dampen the influence of an external shock on private investment.	32 countries during 1975-85

Fosu (1992)	Political unrest is associated with inferior economic performance.	38 Sub-Saharan countries during 1975-90
Alesina et al. (1996)	Increased probability of government collapse impacts negatively on economic growth. Low economic performance increases the propensity of government change.	113 countries for the period 1950 through 1982
Alesina and Perotti (1996)	Income inequality increases the likelihood of sociopolitical instability which impacts negatively on investment.	71 developed and developing countries during 1960–85
Chen and Feng (1996)	Regime instability, polarization and government repression exert a negative impact on growth.	88 countries over the period 1974–90
Ades and Chua (1997)	Political instability of neighboring countries lowers economic growth through decreased trade flows and higher military spending.	118 countries over the period 1960-85
Gyimah-Brempong and Camacho (1998)	*Political unrest exerts an adverse effect on growth through lower human capital accumulation.*	18 Latin American countries over the period 1970-81
Asteriou and Siriopoulos (2000)	Socio-political instability as measured by a composite index comprised of politically motivated assassinations, terrorist activities, strikes, elections and the extent of democracy affects negatively stock market performance and economic growth.	Greece during 1960-95
Asteriou and Price (2001)	Political instability as measured by an index comprised of terrorist	United Kingdom during 1961-97

	activities, strikes, elections, government changes and the occurrence of a war exerts a negative effect on economic growth and a positive impact on growth uncertainty.	
Campos and Nugent (2002)	Absence of causal effect of political instability on growth except for the group of African countries.	98 developing countries during 1960-1995
Jong-A-Pin (2009)	Out of 25 different indicators, only the instability *of* the political regime exerts a robustly negative effect on growth.	90 countries over the period 1974–2003
Campos et al. (2012)	Informal political instability (politically motivated assassinations, guerilla warfare, strikes) exerts a negative long run and short run effect on growth. Formal instability (cabinet or constitutional changes) exerts an indirect adverse impact on growth through higher volatility.	Argentina during 1896-2000
Aisen and Veiga (2013)	Total factor productivity is the main channel through which political unrest impacts on growth.	169 countries during 1960-2004
Uddin et al. (2017)	Political instability negatively affects economic growth of low- and middle-income countries.	120 developing countries over the period of 1996–2014

Table 2: Incidents of political instability and growth rates of GDP per capita

Year	Event	Previous year's growth rate of GDP per capita	Current year's growth rate of GDP per capita	Next year's growth rate of GDP per capita
1843	Insurgency against King Otto	2.13%	-17.02%	-3.11%
1862	Eviction of King Otto after military uprising	6.23%	0.91%	-11.25%
1909	Military coup against the government (successful)	-0.51%	1.93%	-0.38%
1916	Major conflict between prime minister and the king	-27.32%	-16.21%	-13.61%
1922	Military coup against the government (successful)	29.18%	2.33%	1.24%
1923	Military coup against the government (unsuccessful)	2.33%	1.24%	3.42%
1925	Military coup against the government (successful)	3.41%	3.94%	1.85%
1926	Military coup against the government (successful)	3.94%	1.85%	1.84%
1933	Military coup against the government (unsuccessful)	6.98%	4.53%	0.97%

1935	Military coup against the government (unsuccessful)	0.97%	2.53%	-1.01%
1938	Military coup against the government (unsuccessful)	1.20%	-3.38%	-1.49%
1944	Mass demonstrations in the city of Athens and military conflict between the communists and the coalition government	-17.39%	-17.32%	-17.41%
1946	Civil war	-17.41%	39.10%	24.02%
1947	Civil war	39.10%	24.02%	2.01%
1948	Civil war	24.02%	2.01%	3.83%
1949	Civil war	2.01%	3.83%	2.45%
1951	Military rebellion of a group of higher military officers	2.44%	7.38%	-0.40%
1965-1966	Prolonged period of political instability after major disagreement of the prime minister with the king of Greece accompanied with large mass demonstrations against monarch. This period of political instability weakened the Greek political system and finally led to the imposition of	7.53%	6.84%	4.15%

	dictatorship after a military coup in 1967			
1967	Military coup (successful) and imposition of dictatorship	5.18%	4.16%	6.17%
1973	Military coup after the student uprisings of November 1973	1.10%	3.39%	-4.08%
2008	Mass demonstrations in the city of Athens in December of 2008 after killing of a 15-yar old student by a police officer	2.96%	-0.60%	-4.66%
2010-2012	Prolonged period of mass demonstrations against inclusion of the country to economic adjustment programmes and supervision by the Troika (International Monetary Fund, European Commission, European Central Bank)	-4.66%	-7.41%	-2.56%

Table 3: Summary statistics and frequencies of variables

Variable	Obs.	Mean	Standard Deviation	Min	Max
GDP per capita growth (%)	183	1.360	10.558	-51.365	52.216
GDP per capita (log)	184	8.516	0.890	7.400	10.300
Debt (% of GDP)	103	91.155	59.942	9.690	223.500
Inflation (%)	173	5.555	15.438	-99.885	72.578
Population growth (%)	186	0.773	0.590	-3.761	2.880
Growth rate of English GDP per capita (%)	186	1.275	2.952	-12.656	9.058
Polity index (from-10 to 10)	183	4.797	6.154	-8.000	10.000
Deposits (% of GDP)	154	17.995	28.523	0.000	100.200
	Obs.	Frequency (number of occurrences in period 1833-2016)			
Political instability (0,1)	187	25			
War (0,1)	187	14			
Default (0,1)	187	4			
Elections (0,1)	187	58			
Dictatorship (0,1)	187	16			

Table 4: Correlation matrix of variables

	GDP per capita growth	GDP per capita (log)	Time trend	Political instability	Polity index	War	Default	Elections	Dictatorship	Growth rate of English GDP per capita	Debt to GDP	Inflation	Population growth	Deposits to GDP
GDP per capita growth	1.00													
GDP per capita (log)	0.21	1.00												
Time trend	0.16	0.97	1.00											
Political instability	0.06	0.08	0.13	1.00										
Polity index	-0.23	-0.42	-0.46	-0.30	1.00									
War	-0.59	-0.21	-0.16	-0.07	0.12	1.00								

Default	0.10	-0.12	-0.10	-0.07	0.12	-0.05	1.00						
Elections	0.10	-0.07	-0.07	-0.06	0.23	0.00	0.00	1.00					
Dictatorship	0.16	0.33	0.33	0.23	-0.94	-0.09	-0.09	-0.21	1.00				
Growth rate of English GDP per capita	0.14	0.24	0.24	0.13	-0.21	0.00	-0.08	-0.04	0.12	1.00			
Debt to GDP	-0.12	-0.76	-0.77	-0.19	0.50	0.08	0.09	0.06	-0.35	-0.20	1.00		
Inflation	-0.24	0.58	0.54	-0.01	-0.04	-0.07	-0.08	-0.05	0.05	-0.02	-0.35	1.00	
Population growth	-0.10	-0.48	-0.47	0.13	0.24	-0.03	0.19	0.06	-0.21	-0.22	0.33	-0.24	1.00
Deposits to GDP	0.08	0.91	0.86	-0.08	-0.14	-0.15	-0.15	-0.04	0.09	0.21	-0.56	0.64	-0.54	1.00

Table 5: Augmented Dickey Fuller unit root tests

Variable	Test statistic	Critical value 5% (prob.)
Logarithms		
GDP per capita	-0.288	-2.877 (0.922)
Inflation	-2.519	-2.901 (0.115)
Debt to GDP	-1.739	-2.894 (0.408)
First differences		
GDP per capita	-14.239	-2.877 (0.000)
Inflation	-8.482	-2.901 (0.000)
Debt to GDP	-6.196	-2.894 (0.000)

Table 6: Growth effects of political instability in Greece:

OLS baseline estimates

Dependent variable: GDP per capita growth rate				
	(1)	(2)	(3)	(4)
Constant	0.933***	0.164***	1.256***	1.220***
	(0.268)	(0.057)	(0.431)	(0.407)
GDP per capita growth (lagged once)	-0.399*	-0.525**		-0.407
	(0.243)	(0.260)		(0.270)
GDP per capita (log, lagged once)	-0.130***		-0.190***	-0.173***
	(0.042)		(0.069)	(0.059)
Time trend	0.002***	-0.0002	0.003***	0.003***
	(0.0008)	(0.0002)	(0.001)	(0.001)
Political instability (lagged once)	-0.054***	-0.057***	-0.044***	-0.062***
	(0.016)	(0.017)	(0.013)	(0.016)
War (lagged once)	-0.223	-0.222	-0.134	-0.238
	(0.192)	(0.192)	(0.181)	(0.200)
Default (lagged once)	-0.008	0.015	-0.032	-0.020
	(0.025)	(0.029)	(0.025)	(0.028)
Elections (lagged once)	-0.019	-0.013	-0.027	-0.022
	(0.015)	(0.016)	(0.019)	(0.016)
Dictatorship (lagged once)	0.078	0.089*	0.169*	0.065
	(0.070)	(0.053)	(0.095)	(0.064)
Debt (% of GDP, lagged once)	-0.0003	-0.0001	-0.0003	-0.0004

	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Inflation (%, lagged once)	0.020	-0.016	0.063	-0.043
	(0.051)	(0.052)	(0.046)	(0.139)
Population growth (lagged once)	-2.229	-2.094	-1.922	-1.392
	(1.826)	(1.776)	(1.906)	(1.909)
Growth rate of English GDP per capita	0.646**	0.657**	0.474	0.758**
	(0.280)	(0.280)	(0.300)	(0.300)
Polity index (lagged once)	0.003	-0.008**	0.010	0.003
	(0.005)	(0.004)	(0.006)	(0.004)
Deposits (% of GDP, lagged once)				0.00001
				(0.0007)
Durbin Watson stat.	1.894	1.885	2.201	1.921
R-squared	0.337	0.287	0.264	0.357
Observations	101	101	101	94

† Robust standard errors are reported in parentheses. ***, ** and * denote significance at 5% and 10% levels, respectively.

Table 7: Growth effects of political instability in Greece: robustness checks

Dependent variable: GDP per capita growth rate			
	(1)	(2)	(3)
	OUTLIERS	RESTRICTED SET OF COVARIATES	ECM
Constant	0.502***	0.692***	-0.0002
	(0.161)[†]	(0.194)	(0.007)
Error correction term			-1.044***
			(0.073)
Political instability (lagged difference)			-0.051***
			(0.018)
GDP per capita growth (lagged once)	-0.053	-0.163	
	(0.100)	(0.124)	
GDP per capita (log, lagged once)	-0.068**	-0.097***	
	(0.027)	(0.033)	
Time trend	0.001**	0.001**	
	(0.0006)	(0.0009)	
Political instability (lagged once)	-0.039***	-0.047***	
	(0.010)	(0.013)	
War (lagged once)			
Default (lagged once)	-0.006		
	(0.020)		

Elections (lagged once)	0.00004		
	(0.009)		
Dictatorship (lagged once)	0.049		
	(0.043)		
Debt (% of GDP, lagged once)	-0.0003**	-0.0001	
	(0.0001)	(0.0002)	
Inflation (%, lagged once)	0.002	0.039	
	(0.025)	(0.046)	
Population growth (lagged once)	-1.599	-0.875	
	(1.138)	(2.641)	
Growth rate of English GDP per capita	0.509***	0.377	
	(0.192)	(0.319)	
Polity index (lagged once)	0.001	-0.002*	
	(0.003)	(0.001)	
R-squared	0.417	0.190	
Observations	95	101	183

[†] Robust standard errors are reported in parentheses. ***, ** and * denote significance at

1%, 5% and 10% levels, respectively. 1. The dummy of war was omitted from the regression

of the first column.

Table 8: Determinants of political instability (probit estimates)

Dependent variable: Political instability	(1)	(2)
Constant	-1.758	-4.322***
	(1.212)†	(1.640)
Political instability (lagged once)	0.901***	0.646*
	(0.295)	(0.355)
GDP per capita growth (lagged once)	0.956	0.445
	(1.477)	(1.666)
GDP per capita (log, lagged once)	0.070	0.377**
	(0.142)	(0.193)
Polity (lagged once)	-0.025	-0.067**
	(0.019)	(0.031)
Default (lagged once)		0.855
		(0.844)
War (lagged once)		1.048**
		(0.506)
Elections (lagged once)		0.043
		(0.294)
Dictatorship (lagged once)		-0.491
		(0.574)
Inflation (lagged once)		-0.170
		(0.677)
Pseudo R-squared	0.085	0.21

Observations	178	168

† Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10% levels, respectively.

Table 9: Instrumental variable estimates (three stage least squares)

	(1)	(2)	(3)	(4)	(5)
Dependent variable: GDP per capita growth					
Constant	0.218	-0.094	0.222	0.455**	0.211
	(0.249)†	(0.499)	(0.239)	(0.227)	(0266)
GDP per capita growth (lagged once)	0.023	-0.041	0.001	0.023	0.011
	(0.105)	(0.127)	(0.137)	(0.136)	(0.107)
GDP per capita (log, lagged once)	-0.026	0.017	-0.029	-0.065*	-0.025
	(0.035)	(0.066)	(0.036)	(0.035)	(0.037)
Time trend	0.0006	0.0002	0.0008	0.001*	0.0006
	(0.0006)	(0.0009)	(0.0007)	(0.0007)	(0.0006)
Political instability	-0.317***	-0.307*	-0.191*		-0.339**
	(0.122)	(0.168)	(0.107)		(0.137)
War	-0.280***	-0.283***			-0.280***
	(0.073)	(0.091)			(0.082)
Default	0.011	0.004			0.008
	(0.072)	(0.091)			(0.080)
Elections	0.007	0.006			0.006
	(0.026)	(0.033)			(0.029)
Dictatorship	0.074	0.068			0.078
	(0.046)	(0.059)			(0.051)
Principal component of political instability, war,				-0.019	

dictatorship, default and election				(0.008)**	
Growth rate of English GDP per capita	0.097	0.090	0.245	0.446	
	(0.239)	(0.236)	(0.333)	(0.336)	
Growth rate of English GDP per capita (1833-1940)					0.034
					(0.342)
Debt (% of GDP)	-0.0001	-0.0001	-0.0001	-0.0003**	-0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Inflation	-0.096	-0.371**	-0.082	-0.050	-0.102
	(0.094)	(0.183)	(0.078)	(0.061)	(0.104)
Deposits (% of GDP)		-0.0003			
		(0.0008)			
Root mean squared error	0.110	0.108	0.093	0.075	0.115
Dependent variable: Political instability					
Constant	0.009	-0.072	-0.217	0.228	-0.002
	(0.352)	(0.387)	(0.230)	(0.753)	(0.352)
Political instability (lagged once)	0.054	0.075	0.107		0.058
	(0.068)	(0.067)	(0.084)		(0.065)
Principal component of political instability, war, dictatorship, default and election (lagged once)				-0.003	
				(0.088)	
GDP per capita growth	-2.414***	-2.249***	-2.264***	-5.851***	-2.245***

	(0.254)	(0.290)	(0.310)	(0.907)	(0.243)
GDP per capita (log)	0.030	0.049	0.048	0.108	0.031
	(0.037)	(0.040)	(0.036)	(0.084)	(0.037)
War	-0.668***	-0.634***			-0.625***
	(0.191)	(0.196)			(0.190)
Dictatorship	-0.012	-0.118			-0.008
	(0.224)	(0.249)			(0.222)
Elections	0.013	0.008			0.010
	(0.065)	(0.069)			(0.065)
Default	0.033	0.010			0.026
	(0.183)	(0.186)			(0.183)
Inflation	-0.249	-0.811	-0.252	-0.290	-0.236
	(0.233)	(0.374)	(0.233)	(0.534)	(0.233)
Polity	-0.015	-0.020	-0.009*	-0.162***	-0.014
	(0.012)	(0.014)	(0.005)	(0.017)	(0.012)
Root mean squared error	0.326	0.325	0.341	0.716	0.322
Observations	102	94	102	102	102

† Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10% levels, respectively.

Table 10: Structural break analysis

Test	Year of break	Test statistic (supremum Wald test)	P value

Number of structural break in the GDP per capita series	1955	34.186	0.000

Figure 1: Cumulative sign of the squared recursive residuals

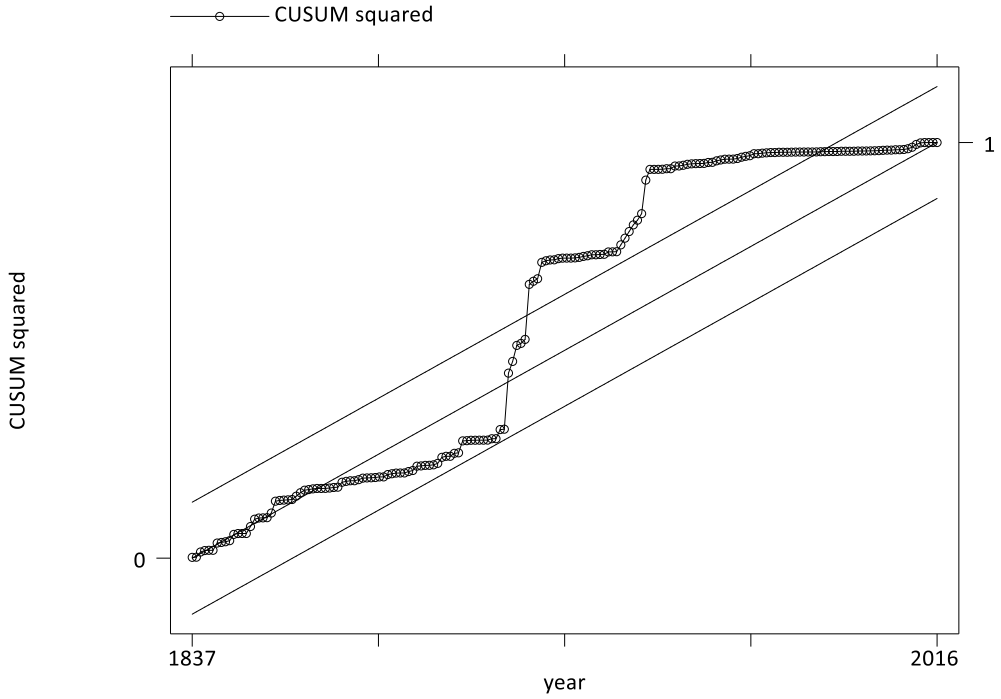


Table 11: Estimates before and after structural breaks

Dependent variable: GDP per capita growth		
	(before structural break of 1955)	(after structural break of 1955)
	(1)	(2)
Constant	3.432***	0.045
	(1.254)†	(0.152)
GDP per capita growth (lagged once)	0.200	0.115
	(0.175)	(0.095)
GDP per capita (log, lagged once)	-0.448***	0.013
	(0.161)	(0.045)
Time trend	0.002**	-0.0006
	(0.001)	(0.002)
Political instability	0.129	-0.088***
	(0.136)	(0.017)
War	-0.214***	
	(0.056)	
Default	0.082	
	(0.053)	
Elections	0.030	-0.012
	(0.027)	(0.008)
Dictatorship	0.081	0.013

	(0.060)	(0.012)
Growth rate of English GDP per capita	0.567	0.172
	(0.483)	(0.138)
Debt (% of GDP)	-0.0003	-0.0002
	(0.0003)	(0.0004)
Inflation	-0.074	-0.263***
	(0.085)	(0.089)
Root mean squared error	0.083	0.029
Dependent variable: Political instability		
Constant	-6.017***	0.260
	(1.838)	(1.297)
Political instability (lagged once)	-0.262*	0.103
	(0.144)	(0.108)
GDP per capita growth	0.339	-6.926***
	(0.434)	(1.156)
GDP per capita (log)	0.726***	0.070
	(0.212)	(0.153)
War	0.062	
	(0.182)	
Dictatorship	0.437	-0.674
	(0.515)	(0.422)
Elections	0.031	-0.124
	(0.082)	(0.079)
Default	- 0.260*	

	(0.155)	
Inflation	0.306	-0.877*
	(0.241)	(0.491)
Polity	0.027	-0.069
	(0.030)	(0.031)
Root mean squared error	0.261	0.290
Observations	44	57

† Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%,

5% and 10% levels, respectively.

Table 12: Stage of development of the Greek economy

Time period	Economic gap (GDP per capita of Great Britain / GDP per capita of Greece)	Share (%) of rural population
1833-39	1.60	79.25
1840-49	2.03	77.13
1850-59	2.02	74.39
1860-69	2.11	75.37
1870-79	2.45	74.19
1880-89	2.25	71.11
1890-99	2.65	69.15
1900-09	2.60	67.39
1910-19	3.25	64.86

1920-29	1.97	59.62
1930-39	1.90	56.31
1940-49	3.90	53.23
1950-59	2.54	49.00
1960-69	1.84	43.45
1970-79	1.27	36.41
1980-89	1.25	32.48
1990-99	1.35	30.31
2000-09	1.28	28.40
2010-16	1.55	27.23

Table 13: Growth effect of political instability at various stages of economic development in Greece

(economic gap with England)

Dependent variable: GDP per capita growth rate									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		1st quartile (low economic gap)		2nd quartile (low-medium economic gap)		3rd quartile (medium-high economic gap)		4th quartile (high economic gap)	
Political instability (lagged once)	-0.029**	-0.066**	-0.063**	-0.069***	-0.044	-0.097**	-0.075**	0.114	0.021
	(0.015)†	(0.030)	(0.026)	(0.021)	(0.039)	(0.046)	(0.036)	(0.146)	(0.118)
Economic gap with England (lagged once)	0.175**		0.332**		0.256		0.871**		-0.739*
	(0.071)		(0.142)		(0.374)		(0.414)		(0.389)
R-squared	0.409	0.754	0.794	0.772	0.787	0.706	0.840	0.410	0.495
Observations	101	40	40	22	22	19	19	32	32

† Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10% levels, respectively.

All regressions include as controls the variables of lagged GDP per capita growth, lagged GDP per capita (log), time trend, growth rate of English GDP, lagged polity

IV index, lagged inflation rate, lagged population growth, lagged debt to GDP and the lagged dummy variables of war, default, elections and dictatorship. Their coefficient

estimates are not reported to save space but are available upon request.

Table 14: Growth effect of political instability at various stages of economic development in Greece

(share of rural population)

Dependent variable: GDP per capita growth rate								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		1st quartile (low share of rural population)		2nd quartile (low-medium share of rural population)		3rd quartile (medium-high share of rural population)		4th quartile (high share of rural population)	
Political instability (lagged once)	-0.043***	-0.041*	-0.044*	-0.031	-0.033**	-0.102*	-0.115*	-0.078	-0.079
	(0.016)†	(0.025)	(0.025)	(0.022)	(0.016)	(0.058)	(0.068)	(0.055)	(0.056)

Agricultural population (lagged once)	-0.010		-0.014		-0.031**		0.134		0.001
	(0.009)		(0.010)		(0.013)		(0.212)		(0.030)
R-squared		0.739	0.749	0.724	0.799	0.751	0.758	0.371	0.371
Observations	101	43	43	28	28	30	30	44	44

† Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10% levels, respectively.

All regressions include as controls the variables of lagged GDP per capita growth, lagged GDP per capita (log), time trend, growth rate of English GDP, lagged polity

IV index, lagged inflation rate, lagged population growth, lagged debt to GDP and the lagged dummy variables of war, default, elections and dictatorship. Their coefficient

estimates are not reported to save space but are available upon request.

Table 15: Political instability and growth in Europe

Outcome variable: Growth rate of GDP per capita						
	Effect of revolution			*Effect of revolution in more developed countries*		
	(1)	(2)	(3)	(4)	(5)	(6)
Before revolution (1848)						
Control group	0.015	0.020	0.008	0.009	0.020	0.004
Treatment group	0.020	0.025	0.008	0.015	0.025	0.017
Difference (Treatment-Control)	0.005	0.005	0.000	0.005	0.005	0.013
	(0.008)†	(0.009)	(0.006)	(0.009)†	(0.009)	(0.012)
After revolution (1848)						
Control group	0.001	0.011	0.013	-0.004	0.011	0.011
Treatment group	-0.073	-0.061	-0.020	-0.077	-0.061	-0.067
Difference (Treatment-Control)	-0.074**	-0.072*	-0.033	-0.073**	-0.072*	-0.077*
	(0.037)	(0.040)	(0.026)	(0.037)	(0.040)	(0.043)
Difference in differences	-0.079**	-0.078*	-0.033	-0.078**	-0.078*	-0.090**
	(0.038)	(0.040)	(0.027)	(0.038)	(0.040)	(0.045)
R-square	0.05	0.07	0.02	0.05	0.07	0.13
Observations	154	145	147	154	145	40

† Clustered standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10% levels, respectively. All regressions include as explanatory covariates those of GDP per capita (log), inflation, population growth and the polity IV index of democracy. To raise the robustness of the obtained estimates, columns 2 and 5 also include two dummies which indicate the occurrence of an event of war or an event of economic crisis. Estimates of columns 3 and 6 are based on propensity score matching.

Table 16: Trend growth and output gap

Dependent variable	(Trend output per capita growth)	(Output gap)
Constant	0.159***	0.001
	(0.052)†	(0.011)
Trend GDP per capita (log, lagged once)	-0.022***	
	(0.007)	
Output gap (lagged once)		0.776***
		(0.164)
Political instability	-0.082**	-0.159*
	(0.024)	(0.087)
War	0.002	-0.192***
	(0.012)	(0.055)
Default	-0.00001	0.023
	(0.015)	(0.043)
Elections	0.002	0.014
	(0.004)	(0.015)
Dictatorship	0.039***	0.042
	(0.010)	(0.028)
Population growth	0.491	
	(0.360)	
Time trend	0.0005***	

	(0.0001)	
Growth rate of English GDP per capita	0.055	0.509*
	(0.070)	(0.295)
Debt (% of GDP)		0.00005
		(0.0001)
Root mean squared error	0.033	0.073
Dependent variable	(Political instability)	(Political instability)
Constant	-0.095	0.175
	(0.242)	(0.126)
Political instability (lagged once)	0.136**	0.284**
	(0.067)	(0.105)
Trend GDP per capita growth	-4.971***	
	(0.835)	
Trend GDP per capita (log)	0.022	
	(0.029)	
Output gap		1.272
		(0.950)
War	0.122	-0.027
	(0.128)	(0.187)
Dictatorship	0.413***	- 0.117
	(0.104)	(0.245)
Elections	0.020	-0.069
	(0.050)	(0.069)
Default	0.118	-0.044

	(0.153)	(0.185)
Inflation	0.121	0.267
	(0.137)	(0.220)
Polity	0.005	-0.009
	(0.004)	(0.013)
Root mean squared error	0.331	0.313
Observations	169	102

† Robust standard errors are reported in parentheses. ***, ** and * denote significance at 1%, 5% and 10% levels, respectively.

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