The political economy of seigniorage[*]

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Abstract

While most economists agree that seigniorage is one way governments finance deficits, there is less agreement about the political, institutional and economic reasons for relying on it. This paper investigates the main political and institutional determinants of seigniorage using panel data on about 100 countries, for the period 1960-1999. Estimates show that greater political instability leads to higher seigniorage, especially in developing, less democratic and socially-polarized countries, with high inflation, low access to domestic and external debt financing and with higher turnover of central bank presidents. One important policy implication of this study is the need to develop institutions conducive to greater political stability as a means to reduce the reliance on seigniorage financing of public deficits.

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1. Introduction

The purpose of this paper is to identify the main determinants of cross-country and cross-time differences in seigniorage – real revenues a government acquires by using newly issued money to buy goods and non-money assets. This is a challenge not yet satisfactorily confronted by the economics profession for four reasons. First, several political and institutional variables used as explanatory variables in earlier studies were relatively poorer measures of political instability and of the institutional environment than those available in new datasets such as the Cross National Time Series Data Archive (CNTS), Database of Political Institutions (DPI), the Polity IV Database, State Failure Task Force (SFTF) database, and the Freedom House ratings. Second, our analysis is based on a richer and wider dataset, covering more countries and years than those used in previous studies, and includes a larger variety of alternative model specifications. Third, although Aisen and Veiga (forthcoming) study the determinants of inflation using a similar dataset, one should not expect that variables affecting inflation should affect seigniorage in the exact same way, since the latter might be consistent with two different levels of the former in the presence of a well-defined Laffer curve. According to Easterly et al. (1995), studying inflation is different to studying seigniorage, especially for developing and high inflation countries. Furthermore, changes in inflation may also result from supply-side shocks, such as fluctuations in oil prices, that do not directly affect seigniorage. Fourth, our models are able to identify the circumstances, under which, the relationship between political instability and seigniorage is stronger, a central topic of our research and virtually absent from previous empirical studies on the determinants of seigniorage.

Relying upon the theoretical literature and using a dataset covering around 100 countries for the period 1960-1999, we estimate panel data models to investigate the main economic, political and institutional determinants of seigniorage. After controlling for the countries' economic structure and for several other variables that may affect seigniorage, we find that greater political instability leads to higher seigniorage levels, confirming previous results by Cukierman, et al. (1992) and Click (1998).

This paper's major contribution to the literature is the identification of the circumstances under which the above-referred relationship is stronger. That is, we find that political instability has stronger effects on seigniorage levels in higher inflation than in moderate and low inflation countries, and also in developing than in industrial nations. In addition, this relationship is also stronger in countries with (i) higher social polarization; (ii) a tradition of high political instability;[1] (iii) higher central bank president turnover (lower *de facto* central bank independence); (iv) lower indexes of economic freedom; (v) more authoritarian regimes; (vi) higher domestic debt levels as a percentage of GDP; (vii) lower access to international financing (expressed in poorer creditworthiness ratings); and, (viii) lower openness to international trade. It is also worth mentioning that, besides its effects on the relationship between political instability and seigniorage, social polarization is by itself a major determinant of seigniorage. Empirical results show quite clearly that higher degrees of social polarization (lower ethnic homogeneity) are associated with higher levels of seigniorage.

The paper is structured as follows. A survey of the empirical and theoretical literature on the relationship between seigniorage, political instability and institutions is presented in section 2. The dataset and the empirical models are described in section 3. Section 4 presents the empirical results, and section 5 concludes the paper.

[1]Expressed in a high number of state failure events in the last 15 years, such as revolutionary wars, ethnic wars, regime crises, and genocides/politicides.

2. The political economy of seigniorage

Most economists acknowledge that differences on the way countries conduct their fiscal policies are behind the variability of the seigniorage levels they sustain.[2] But this explanation leads to a much deeper and fundamental question, which is why countries differ on the way they conduct fiscal policies (see Woo, 2003). In particular, governments that are able to finance their expenditures through taxes or debt do not need to rely on seigniorage revenues. Several studies have explored the idea that structural features of a particular economy help determine its “taxable capacity”. Chelliah, et al. (1975), for example, provide evidence that countries with larger per capita non–export income, more open to trade and with larger mining but smaller agricultural sectors have, on average, a higher “taxable capacity” or ease of collection. This result leads to the conclusion that the countries’ ability to tax is technologically constrained by their stage of development and by the structure of their economies (e.g. size of the agricultural sector in GDP), and as tax collecting costs are high and tax evasion pervasive, countries might use seigniorage more frequently. But what if governments, independently of their countries’ economic structures, find it optimal to finance expenditures using seigniorage rather than levying other taxes (e.g. taxes on output)? The Theory of Optimal Taxation (see Phelps 1973; Végh 1989; and Aizenman 1992) rationalizes government behavior in many countries showing that it might be optimal for governments to rely on seigniorage if other taxes are highly distortionary. According to this theory, governments optimally equate the marginal cost of the inflation tax with that of output taxes, therefore minimizing the distortions to the economy when choosing the optimal combination of taxes to finance their expenditures. Edwards and Tabellini (1991) and Cukierman, et al. (1992) fail to find evidence that this theory applies to developing countries. Click (1998) estimates a model using 90 countries, from 1971-90, and find that only 40 percent of the

[2] See Catão and Torrones (2005) for an empirical analysis on the relationship between fiscal deficits and inflation and Fischer et al. (2002) for a survey on modern hyper- and high inflations that includes results showing a positive relationship between fiscal deficits and seigniorage.

cross-country variation in seigniorage can be explained with the Theory of Optimal Taxation. The empirical failure of this theory to fully explain the cross-country differences in the use of seigniorage revenues motivated the use of theoretical and empirical models focusing on the role played by political and institutional variables.

Cukierman, et al. (1992) develop a theoretical model whereby political instability and ideological polarization determine the equilibrium efficiency of the tax system and the resulting combination of tax revenues and seigniorage governments use. Using a probit model to determine the likelihood of an incumbent government to remain in power, they show evidence that higher political instability and ideological polarization lead to higher seigniorage. In the empirical analysis of section 4, we employ alternative and more direct measures of political instability, such as variables that count the exact number of cabinet changes, executive changes or government crises taking place in a particular year. Moreover, whereas they use a dummy variable for democratic regimes as a proxy for ideological polarization, we use the Polity Scale (ranged between -10 and +10) to measure the degree of democracy in different countries, and an ethnic homogeneity index as a proxy for the degree of social polarization. [3]

In line with Cukierman, et al. (1992), we conjecture that economies with weaker institutions might be unable to build efficient tax systems leading them to use more frequently seigniorage as a source of revenue. In the next sections, in addition to the effects of political instability on seigniorage, we also estimate the effects of institutions such as democracy and economic freedom. Besides structural variables accounting for the taxing capacity of the economy and political and institutional variables affecting the use of seigniorage financing of fiscal deficits, we also consider, in line with Click (1998), variables that measure the ability of governments to finance transitory expenditures with domestic or external debt. To the extent

[3] An additional shortcoming of the analysis in Cukierman et al. (1992) is the use of a cross-sectional dataset using averages from 1971 to 1982 for only 79 countries, while we use a panel dataset covering around 100 countries for the period 1960-99.

that a government is able to finance its expenditure through debt, there is less need to rely on seigniorage.

Our main contribution to the literature is that our models not only identify the main political and economic determinants of seigniorage, but also reveal under which circumstances the effects of political instability on seigniorage are stronger. Our results indicate that the causal effect of political instability on seigniorage is stronger in developing and high inflation countries. In addition, it is also stronger in socially polarized, less democratic, traditionally unstable, and highly indebted countries. Finally, political instability have greater effects on seigniorage in countries that have lower *de facto* central bank independence, lower economic freedom, lower creditworthiness ratings and lower openness to international trade. In our view, and to the best of our knowledge, there is no comprehensive study in the literature fully analyzing the relationship between political instability and seigniorage. As it will become clear in the following sections, this paper is an attempt to contribute in this direction.

3. Data and the empirical model

The dataset is composed of annual data on political, institutional and economic variables for the years 1960 to 1999. Although we collected data for 178 countries, missing values for several variables reduce the number of countries in our estimations to around 100. The sources of political and institutional data are: the *Cross National Time Series Data Archive* (CNTS); the *Polity IV* dataset;[4] Gwartney and Lawson (2002);[5] the *Database of Political Institutions* (DPI 3.0);[6] the *State Failure Task Force* dataset (SFTF);[7] and the

[4] Available on the Internet (http://www.cidcm.umd.edu/inscr/polity/index.htm).

[5] Available on the Internet (http://www.freetheworld.com/release.html).

[6] On this database, see Beck et al. (2001). Available on the Internet though Philip Keefer's page in the World Bank's site (http://www.worldbank.org/research/bios/pkeefer.htm).

[7] Available on the Internet (http://www.cidcm.umd.edu/inscr/stfail/sfdata.htm).

Freedom House ratings.[8] Economic data was collected from the World Bank's *World Development Indicators* (WDI) and *Global Development Network Growth Database* (GDN),[9] the International Monetary Fund's *International Financial Statistics* (IFS), the *Penn World Tables* (PWT 6.1),[10] *Euromoney* creditworthiness ratings,[11] Cukierman and Webb (1995),[12] Dollar and Kraay (2002),[13] and Levi-Yeyati and Sturzenegger (2003).[14]

To investigate the main political, institutional and economic determinants of seigniorage levels across countries and time, we estimate panel data models, controlling for countries' fixed effects. Seigniorage is defined in two alternative ways: (1) the change in reserve money (line 14a of IFS-IMF) as a percentage of nominal GDP (line 99b in IFS-IMF); (2) the change in reserve money (line 14a of IFS-IMF) as a percentage of government revenues (line 81 in IFS-IMF). Table 1 shows the number of observations, means and standard deviations of these seigniorage measures for all countries for which data is available.[15]

-- Insert Table 1 about here --

We hypothesize that seigniorage levels depend on the following explanatory variables:

- A set of variables representing political instability, polarization and institutions:

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[8] Available on the Internet (http://www.freedomhouse.org/ratings/).

[9] Available on the Internet (http://www.worldbank.org/research/growth/GDNdata.htm).

[10] Available on the Internet (http://pwt.econ.upenn.edu/php_site/pwt_index.php).

[11] The data on the *Euromoney* creditworthiness index, raging from 0 to 100, from 1982 to 1999, was kindly provided by Reid Click..

[12] Underlying data available on the Internet (http://www.tau.ac.il/~alexcuk/pdf/WebbPoltime2.xls).

[13] Underlying data available on the Internet (http://siteresources.worldbank.org/INTRES/Resources/469232-1107449512766/648083-1108140788422/Growth_is_good_for_the_poor_data.zip)

[14] Underlying data available on the Internet (http://www.utdt.edu/~fsturzen/base_2002.xls).

[15] There is data on *ΔRM/GDP* for 144 countries and on *ΔRM/GR* for 122 countries. These are the seigniorage measures most commonly used in the literature. We performed all estimations for both measures but, to make our results more easily comparable to those of Cukierman et al. (1992), we report in most tables those obtained when using the change in reserve money as a percentage of government revenues. Two additional ways of measuring seigniorage, used by Cukierman et al. (1992), are the product of reserve money by the inflation rate divided by either GDP or government revenues. These authors have shown that these two additional alternative measures of seigniorage provide similar results for a cross-section of countries. Another alternative, used by Click (1998), is the change in the monetary base as a percentage of government spending.

- *Cabinet Changes* (CNTS), a proxy for political instability, counts the number of times in a year in which a new premier is named and/or 50% of the cabinet posts are occupied by new ministers. A positive coefficient is expected, as greater instability should lead to greater reliance on seigniorage revenues;
- *Ethnic Homogeneity Index* (SFTF): for each year, it is the value of that index in the beginning of the respective decade. According to Woo (2003) higher social polarization, which can be proxied by ethnic heterogeneity, leads to higher polarization of preferences for different types of government spending and to public deficits. Thus, a negative coefficient is expected;
- *Polity Scale* (Polity IV): from strongly autocratic (-10) to strongly democratic (10). Although the economic theory is not conclusive, we anticipate that democracy is associated with lower reliance on seigniorage (negative coefficient);

* A set of economic structural variables that reflect characteristics of the countries that may affect their capacity to control inflation:
  - *Agriculture (% GDP)*: share of the value added of agriculture in GDP (WDI, WB). According to Chelliah, et. al (1975), a positive coefficient is expected;
  - *Trade (% GDP)*: openness to trade (WDI, WB). Since it is associated with larger revenues of import duties, we expect that countries more open to trade rely less on seigniorage revenues (a negative coefficient is expected);
  - *Real GDP per capita* (PWT 6.1). Richer countries have more efficient tax systems and, thus, have a lesser need for seigniorage (negative coefficient expected);
* Variables accounting for economic performance and external shocks:
  - *% Change in Terms of Trade* (WDI, WB). Favorable evolution of terms of trade provides greater tax revenues (negative coefficient expected);

- *Growth of real GDP per capita* (PWT 6.1). Larger growth rates are associated with increasing tax revenues, reducing the need for seigniorage (negative coefficient);

- Variables accounting for fixed effects of countries and time:
    - Country dummy variables;
    - Dummy variables for each decade: 1960s, 1970s, 1980s and 1990s.

Table 2 presents the descriptive statistics for the above-described dependent and independent variables and for additional/alternative explanatory variables that appear in the tables shown in the paper.

-- Insert Table 2 about here --

The empirical model for seigniorage levels can be summarized as follows:

$$S_{it} = \alpha PI_{i,t-1} + \beta SP_{it} + \delta PS_{it} + \mathbf{Eco}_{it}^{'}\boldsymbol{\varphi} + \mathbf{EcP}_{it}^{'}\boldsymbol{\gamma} + \nu_i + \varepsilon_{it} \quad , \; i = 1,\ldots,N \quad t = 1,\ldots,T_i \qquad (1)$$

Where S is seigniorage, PI is a proxy for political instability, SP is a proxy for social polarization, PS is the *Polity Scale*, **Eco** is a vector of economic structural variables, **EcP** is a vector of variables accounting for economic performance and external shocks, ν_i is the fixed effect of country i, and ε_{it} is the error term.

The proxy for political instability ($PI_{i,t-1}$) is lagged one period for two reasons. First, political instability may translate into higher seigniorage only after some time. Furthermore, if a cabinet change occurs in the end of one year, it is very likely to lead to higher seigniorage only in the following year. Second, since from Aisen and Veiga (forthcoming) higher seigniorage leads to higher inflation, which may affect political instability, using the contemporaneous value of political instability could create simultaneity/endogeneity problems. Taking the first lag avoids these problems, as current seigniorage does not affect past political instability. Since current seigniorage can affect current economic growth, *Growth of GDP per capita* is also lagged one period.[16]

4. Empirical Results

The first objective of our empirical analysis is to identify the main political, institutional and economic determinants of seigniorage levels across countries and time. Then, after finding strong support for our hypothesis that greater political instability leads to higher seigniorage, we try to determine under which circumstances or country characteristics this relationship is stronger. Finally, we perform a sensitivity analysis that checks whether or not the main results hold for alternative proxies of political instability, when an alternative definition of seigniorage is used, when the sample only includes developing countries, and when our main proxy for political instability (*Cabinet Changes*) is defined in a different way.

a) Main determinants of seigniorage levels

The estimation results of the model described in the previous section, using a fixed effects specification,[17] are shown in Table 3. The dependent variable is the change in reserve money as a percentage of government revenues, and all explanatory variables described in the previous section were included in the estimation reported in column 1. Results confirm the hypothesis that greater political instability leads to higher seigniorage levels, and show that the effects are sizeable: an additional cabinet change increases seigniorage as a percentage of government revenues by 4.46 percentage points. Higher values of the *Ethnic Homogeneity Index* (lower social polarization) are associated with lower use of seigniorage, which is

[16] The contemporaneous values are used for the remaining explanatory variables, since they are taken as exogenous. It is also worth noting that seigniorage is not persistent (its first lag is never statistically significant when included as an explanatory variable) and that the error term of equation (1), ε_{it}, is not serially correlated.

[17] Hausmann tests indicate that the fixed effects specification is preferable to a random effects model, and the joint statistical significance of the country dummies implies that a fixed effects model is preferable to a simple pooled OLS model. These results are available from the authors upon request.

consistent with the findings of Cukierman, et al. (1992) [18] and Woo (2003). Democracy does not seem to affect seigniorage, as the *Polity Scale* is not statistically significant.[19] Regarding the economic variables, only *Agriculture (%GDP)* and *Real GDP per capita* are statistically significant. [20]

--- Insert Table 3 about here ---

Since *Trade (%GDP), %Change in Terms of Trade* and *Growth of Real GDP per capita (-1)* are not statistically significant in the first column, they are excluded from the model of column 2, which is our reference model.[21] The only change in results is that the *Polity Scale* becomes marginally statistically significant, with a positive sign, indicating that democracies may be associated with higher seigniorage.

Results regarding political instability conform to our expectations and are consistent with those found by Aisen and Veiga (forthcoming) for inflation levels, and with those of Cukierman, et. al (1992) using cross sectional data. Those concerning economic variables are consistent with the findings of previous studies, such as Chelliah, et. al (1975), Edwards and Tabellini (1991), and Click (1998), indicating that larger agricultural sectors and lower GDP per capita levels are associated with greater reliance on seigniorage revenues.

The results of robustness tests based on the model of column 2 are shown in the following columns. Those reported in column 3 indicate that higher economic freedom is associated with lower reliance on seigniorage. A higher *Index of Economic Freedom*[22] is

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[18] Although Cukierman, et al. (1992) refer to ideological polarization, the crucial factor in their model is the polarization of preferences for different types of government spending, which can also result from social polarization. Furthermore, higher social polarization is generally associated with higher ideological polarization.

[19] This is not surprising, as Aisen and Veiga (forthcoming) found that democracy marginally affects inflation and the effect is very small.

[20] The results for the dummy variables for the 1970s, 1980s, and 1990s are not shown in order to save space. They are all statistically significant and have positive signs. Results are virtually identical when using annual dummies. The same is true when a time trend and time trend squared are included in the estimations instead of the time dummies.

[21] They are never statistically significant when included in the models of the following columns of Table 3 or in those of the following Tables. Wald tests allow for the exclusion of these variables from the model.

[22] Gwartney and Lawson's (2002) data on the *Index of Economic Freedom* starts in 1970 and has a 5-year frequency. In order to avoid missing values, straight line interpolation was used to generate annual data. Since

associated with smaller governments, stronger legal structure and security of property rights, access to sound money, greater freedom to exchange with foreigners, and more flexible regulations of credit, labor, and business. Since these are characteristics of more advanced economies with lesser need of seigniorage financing, the negative coefficient found conforms to our expectations. Revolutionary wars in the country and civil/ethnic conflicts in Border States (columns 4 and 5, respectively) lead to higher reliance on seigniorage. This result is intuitive, since these occurrences are associated with larger military spending, which may be at least partially seigniorage-financed. In the model of column 6, *Agriculture (%GDP)* was replaced by *Urban Population (% of total).* The negative coefficient conforms to the idea that greater urbanization ratios are associated with greater ease to collect taxes and, thus, with lower seigniorage (see Edwards and Tabellini, 1991). The model of column 7 indicates that fixed exchange rates[23] lead to lower seigniorage levels. A possible explanation is that fixed exchange rates constrain monetary policy to the defense of the fixed parity and, thus, make the collection of seigniorage revenues harder. Finally, the results of column 8 confirm Click's (1998) result that seigniorage will be higher when the international creditworthiness of the country is lower. That is, when external borrowing is less available (or costlier), the government has to rely more heavily on seigniorage revenues.[24]

Access to Sound Money is affected by seigniorage, we avoided eventual endogeneity problems by using a transformed index that excludes that area (Area III).

[23] The result reported in column 7 is for the 5-way classification system of *de facto* exchange rate regimes of Levy-Yeyati and Sturzenegger (2003). Results are the same when their 3-way classification system is used instead. Since their data starts only in 1974, the inclusion of this variable originates a large number of missing values. That is why it was not included in the models of the previous columns. When included, it is always statistically significant, with a negative sign.

[24] A series of additional robustness tests, whose results are not shown here, were also performed. First, the Freedom House ratings of *Political Rights* and *Civil Liberties* were used instead of the *Polity Scale*. None was statistically significant. The same result was obtained when using indicators of *Executive Constraints* (CNTS) and of *Checks and Balances* (DPI). Second, indicators of *Ideological Polarization* (DPI), *Ideological Orientation* (DPI) and *Religious Homogeneity* (SFTF) were added to the reference model, but were not statistically significant. Third, we also found that trading partners GDP growth (GDN), external debt (WDI), domestic debt (IFS), currency inside banks (IFS), *de jure* central bank independence (CW), U.S. Treasury Bill rates (IFS), real effective exchange rates (WDI), current account balance (IFS), government revenues as a percentage of GDP (IFS), and dollarization ratios (share of dollar deposits) do not affect seigniorage in a statistically significant way. All results not shown in the paper are available from the authors upon request. Although the indicator of *Ideological Polarization* taken from the DPI was not statistically significant, we should

b) Circumstances under which the effects of political instability on seigniorage are stronger

Although our results regarding the relationship between political instability and seigniorage are quite robust, it is possible that they are stronger in some circumstances or in countries with specific characteristics. Aisen and Veiga (forthcoming) found that political instability affect inflation levels especially in high inflation and developing countries, whereas that relationship was practically nonexistent in low inflation and industrialized countries. In order to check if the same happens with seigniorage, we performed estimations based in the model of column 2 of Table 3 in which *Cabinet Changes* was interacted with dummy variables accounting for annual inflation rates above and below 50% and for developing and industrial countries. Results, shown in columns 1 and 2 of Table 4, are consistent with those of Aisen and Veiga (forthcoming). That is, greater political instability, expressed in a higher number of cabinet changes, leads to higher seigniorage levels only in high inflation and developing countries.

--- Insert Table 4 about here ---

According to Woo (2003), social polarization, which can be proxied by income inequality and ethnic or religious heterogeneity/fractionalization, and the quality of institutions are important determinants of budget deficits. In highly polarized societies, the high heterogeneity of preferences may translate to political parties and interest groups lobbying for different types and amounts of government spending. Then, high polarization of interests may lead to higher seigniorage, in the presence of political instability.[25] The quality of institutions is also very important because more stringent and transparent budgetary procedures, independence of the central bank, and greater parliamentary influence in the

not interpret this result as a rejection of the model of Cukierman, et al. (1992) in which greater ideological polarization leads to higher seigniorage. Since this indicator only takes the values of 0, 1 or 2, it does not satisfactorily represent the wide differences in ideological polarization among countries. These may be better proxied by the indicators of social polarization used in this paper.

[25] In the model of Cukierman, et al. (1992), this high polarization of interests results in higher seigniorage.

budgetary process can reduce the government's ability to increase budget deficits and extract seigniorage revenues.

The hypothesis that the relationship between seigniorage and political instability is affected by social polarization is tested in columns 3 to 5 of Table 4, where *Cabinet Changes* was interacted with dummy variables for average Gini coefficients above and below 40,[26] for high and low ethnic homogeneity,[27] and for high and low religious homogeneity. Results clearly support the hypothesis that political instability has stronger effects on seigniorage in countries with large social polarization (high income inequality and low ethnic or religious homogeneity).

In column 6, we test the hypothesis that political instability will have greater effects on seigniorage in countries that have traditionally been more unstable. Two dummy variables were created using the variable *Upheaval* from the SFTF, [28] which indicates the sum of the maximum magnitude of events in the prior 15 years, including revolutionary wars, ethnic wars, regime crises, and genocides/politicides. Although both dummies are statistically significant, the magnitude of the coefficients implies that the number of cabinet changes in the previous year (our proxy for political instability) has greater impact on seigniorage in traditionally unstable countries.[29]

The hypothesis that institutions affect that relationship was tested in columns 1 to 3 of Table 5, where *Cabinet Changes* was interacted with dummy variables for high and low

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[26] The dummy *Gini>40* takes the value of one for countries whose average Gini coefficient is above 40, and equals zero for the remaining countries. *(Gini≤ 40) = 1 – (Gini>40).*

[27] The dummy *Low Ethnic Homogeneity* takes the value of one for countries whose respective index is equal to or lower than the 25th percentile, and equals zero for the remaining countries. *(High Ethnic Homogeneity = 1 – Low Ethnic Homogeneity).* The same procedure was adopted for the religious homogeneity dummies.

[28] *High Upheaval* equals one when the value of *Upheaval* is above 3, and equals zero otherwise. *Low Upheaval = 1- High Upheaval.*

[29] When *Cabinet Changes* is interacted with regional dummy variables, the positive effect of political instability on seigniorage is statistically significant only for Western Hemisphere (Latin American) and African countries. These results are not shown here, but are available upon request.

turnover rates of central bank presidents,[30] for high and low economic freedom,[31] and for *Polity Scale* below and above zero. The results of column 1 imply that greater political instability leads to higher seigniorage only when there is a high turnover rate of central bank presidents, that is, when the *de facto* independence of the central bank is low. When independence is high, seigniorage does not increase, as the government is no longer able to affect reserve money.[32] Political instability also seems to affect seigniorage only in countries that have a low *Index of Economic* Freedom (column 2). This implies that the establishment of sounder and freer economic institutions is a way to reduce the impact of political instability on seigniorage. More democratic institutions also seem to matter, as the results of column 3 indicate that political instability affects seigniorage less in democratic countries (*Polity Scale>0*) than in countries under authoritarian regimes (*Polity Scale≤ 0*).

--- Insert Table 5 about here ---

Click (1998) shows that when governments face greater constraints to issue domestic and/or external debt, they tend to resort more often to seigniorage revenues. We hypothesize that the effects of political instability on seigniorage levels also depend on the ratios of domestic debt to GDP and on the countries' creditworthiness. That is, when greater political instability leads to higher deficits, governments resort more often to seigniorage revenues to finance them when domestic or foreign borrowing is more difficult (or costlier). The results of columns 4 and 5 provide empirical support for the above-referred hypothesis, as a greater

[30] Cukierman and Webb (1995) use this turnover rate as an indicator of *de facto* central bank independence. The dummy *High Turnover* takes the value of one when the turnover rate is above the sample median of 0.20, and is zero otherwise. *Low turnover = 1 – High Turnover*.

[31] The dummy variable *High Economic Freedom* takes the value of one when the *Index of Economic Freedom* is greater than 5, and equals zero otherwise (*Low Economic Freedom = 1- High Economic Freedom*). Again, we used a transformed index that excludes Area III (Access to Sound Money).

[32] It is worth noting that this result does not hold when the Cukierman and Webb (1995) legal index of Central Bank Independence is used instead of the turnover rate of presidents (that proxies *de facto* independence). This may happen because what really matters for the conduct of monetary policy is the *de facto* independence and not what is written in the central bank law.

number of *Cabinet Changes* is associated with higher seigniorage only in countries that have *High Domestic Debt* (column 4)[33] or *Low Creditworthiness* (column 5).[34]

Finally, we test the hypothesis that political instability will lead to greater seigniorage essentially in countries with lower trade openness ratios. Although we did not identify a direct relationship between openness and seigniorage in the estimations of Table 3, it is possible that openness to international trade affects the relationship between political instability and seigniorage. That is, in more open economies, the increase in government expenditures caused by political instability may be partially financed by higher taxes on trade, reducing the need to resort to seigniorage financing. Results shown in column 6 are consistent with this hypothesis.

c) Sensitivity analysis

Table 6 shows the results obtained when using two alternative proxies of political instability. These are defined as:

- *Government Crises* (CNTS): counts the number of rapidly developing situations in a year that threaten to bring the downfall of the present regime;
- *Executive changes* (CNTS): counts the number of times in a year that effective control of the executive power changes hands.

The results for these alternative proxies are similar to those obtained for *Cabinet Changes* (see column 2 of Table 3 and columns 1 and 2 of Table 4). Thus, our results are robust to the use of different proxies for political instability.

--- Insert Table 6 about here ---

[33] *High Domestic Debt* is a dummy variable that takes the value of one for the countries whose average ratio of domestic debt to GDP is above the countries' median ratio (13.28), and takes the value of zero otherwise. *Low Domestic Debt = 1 – High Domestic Debt.*

[34] *High Creditworthiness* is a dummy variable that equals one for the countries whose average *Euromoney's* creditworthiness rating is above 60 (the 75th percentile of the country averages), and equals zero otherwise. *Low Creditworthiness=1- High Creditworthiness.*

Columns 1 to 3 of Table 7 report results obtained for an alternative definition of seigniorage: Change in Reserve Money as a percentage of GDP. In the models of columns 4 and 5 the sample contains only developing countries, and seigniorage is defined as in the previous tables. Finally, in the models of columns 6 to 8, a three-year moving average of *Cabinet Changes* was used instead of its annual values, in order to better capture eventual persistent situations of political instability. In all cases, results are similar to those obtained in Tables 3 and 4, meaning that our conclusions regarding the effects of political, institutional and economic variables on seigniorage levels remain practically the same.

--- Insert Table 7 about here –

5. Conclusions

The main purpose of this paper was to identify the major determinants of the cross-country and cross-time variability of seigniorage. Using a dataset covering about 100 countries, from 1960-1999, and applying standard panel data techniques, we found that greater political instability and social polarization lead to higher seigniorage. These results are consistent with the findings of previous studies such as Cukierman, et al. (1992), Click (1998) and Woo (2003).

Our major contribution to the literature is that, in addition to the above-referred results, we succeeded to comprehensively determine the circumstances under which political instability has a greater impact on seigniorage, an important topic that received little attention in previous studies. Our results indicate that the effects of political instability on seigniorage are stronger in high-inflation, developing, socially polarized, and traditionally more unstable economies. Moreover, the same applies to countries with high turnover rates of central bank presidents (lower *de facto* central bank independence), with lower levels of economic freedom, that are less democratic, with higher domestic debt, with poorer creditworthiness ratings and with lower openness to international trade.

The results of this study have policy implications that greatly contribute to the policy debate in high inflation (seigniorage) and politically unstable economies. Our results show that countries adopting policies targeting greater political stability, lower income inequality, and institutional strengthening, such as new laws governing central bank independence, limit the negative effect of political instability on seigniorage improving their chances of successfully lowering their dependence on seigniorage revenues to finance their governments' deficits. After some time, they should benefit from lower inflation and, consequently, higher growth and economic prosperity.

References

Aisen, Ari and Francisco José Veiga (forthcoming). "Does Political Instability Lead to Higher Inflation? A panel data analysis." *Journal of Money, Credit and Banking.*

Aizenman, Joshua (1992). "Competitive Externalities and the Optimal Seignoriage." *Journal of Money, Credit and Banking* 24(1), 61-71.

Beck, Thorsten, George Clarke, Alberto Groff, Philip Keefer, and Patrick Walsh (2001). "New Tools in Comparative Political Economy: the Database of Political Institutions." *The World Bank Economic Review* 15(I), 165-176.

Catão, Luis A.V. and Marco E. Torrones (2005). "Fiscal Deficits and Inflation." *Journal of Monetary Economics* 52, 529-554.

Chelliah, Raja, Hessel Baas and Margaret Kelly (1975). "Tax Ratios and Tax Effort in Developing Countries 1969-1971." *IMF Staff Papers*, March, 22: 187-205.

Click, Reid. W. (1998). "Seigniorage in a Cross-Section of Countries." *Journal of Money, Credit and Banking* 30(2), 154-171.

Cukierman, Alex, Sebastian Edwards, and Guido Tabellini (1992). "Seignioriage and Political Instability." *American Economic Review* 82(3), 537-555.

Cukierman, Alex and S.B. Webb (1995). "Political Influence on the Central Bank: International Evidence." *The World Bank Economic Review* 9 (3), 397–423.

Dollar, David and Aart Kraay (2002). "Growth is Good for the Poor." *Journal of Economic Growth* 7, 195-225.

Easterly, William R., Paolo Mauro and Klaus Schmidt-Hebbel (1995), "Money Demand and Seigniorage-Maximizing Inflation." *Journal of Money, Credit and Banking* 27(2), 583-603.

Edwards, Sebastian and Guido Tabellini (1991). "Explaining Fiscal Policy and Inflation in Developing Countries." *Journal of International Money and Finance* 10, S16-S48.

Fischer, Stanley, Ratna Sahay and Carlos Végh (2002). Modern Hyper- and High Inflations." *Journal of Economic Literature* Vol.40, No. 3, 837-880.

Gwartney, James and Robert Lawson (2002). *Economic Freedom of the World - 2002 Annual Report.* Vancouver, B.C.: Fraser Institute.

Levy-Yeyati, Eduardo (2003) "To Float or to Fix: Evidence on the Impact of Exchange Rate Regimes on Growth." *American Economic Review* 93(4), 1173-1193.

Phelps, Edmund (1973). "Inflation in the Theory of Public Finance." *Swedish Journal of Economics 75*, 67-82.

Végh, Carlos (1989). "Government Spending and Inflationary Finance: A Public Finance Approach." *IMF Staff Papers* 36, 657-77.

Woo, Jaejoon (2003). "Economic, political, and institutional determinants of public deficits." *Journal of Public Economics* 87, 387-426.

Table 1: Seigniorage across countries

	Obs	Mean	StDev
ALGERIA			
ΔRM/GDP	31	.033	.018
ANTIGUA AND BARBUDA			
ΔRM/GDP	22	.013	.035
ARGENTINA			
ΔRM/GDP	38	.060	.078
ΔRM/GR	18	1.203	1.287
ARMENIA			
ΔRM/GDP	5	.026	.026
AUSTRALIA			
ΔRM/GDP	39	.004	.007
ΔRM/GR	38	.022	.036
AUSTRIA			
ΔRM/GDP	38	.005	.002
ΔRM/GR	37	.020	.013
BAHAMAS			
ΔRM/GDP	23	.004	.004
ΔRM/GR	30	.022	.043
BAHRAIN			
ΔRM/GDP	24	.008	.022
ΔRM/GR	24	.031	.073
BANGLADESH			
ΔRM/GDP	25	.009	.008
BARBADOS			
ΔRM/GDP	32	.009	.014
ΔRM/GR	25	.035	.047
BELARUS			
ΔRM/GDP	4	.042	.014
ΔRM/GR	4	.134	.047
BELGIUM			
ΔRM/GDP	39	.005	.005
ΔRM/GR	36	.019	.022
BELIZE			
ΔRM/GDP	22	.010	.012
ΔRM/GR	19	.041	.052
BENIN			
ΔRM/GDP	36	.008	.018
BHUTAN			
ΔRM/GDP	15	.035	.053
ΔRM/GR	13	.184	.294
BOLIVIA			
ΔRM/GDP	39	.026	.031
ΔRM/GR	35	.481	1.076
BOTSWANA			
ΔRM/GDP	22	.005	.011
ΔRM/GR	20	.012	.030
BRAZIL			
ΔRM/GDP	39	.036	.027
ΔRM/GR	35	.247	.187
BULGARIA			
ΔRM/GDP	7	.068	.036
ΔRM/GR	7	.001	.0001
BURKINA FASO			
ΔRM/GDP	35	.010	.012
ΔRM/GR	26	.096	.109
BURUNDI			
ΔRM/GDP	34	.007	.010
CAMEROON			
ΔRM/GDP	35	.005	.008
ΔRM/GR	20	.021	.058
CANADA			
ΔRM/GDP	39	.003	.002
ΔRM/GR	35	.021	.013
CENTRAL AFRICAN REP.			
ΔRM/GDP	37	.011	.018
CHAD			
ΔRM/GDP	28	.010	.020
ΔRM/GR	17	.089	.232
CHILE			
ΔRM/GDP	39	.069	.077
ΔRM/GR	38	.283	.281
CHINA,P.R.: MAINLAND			
ΔRM/GDP	13	.063	.026
ΔRM/GR	13	.474	.250
CHINA,P.R.:HONG KONG			
ΔRM/GDP	8	.007	.005
COLOMBIA			
ΔRM/GDP	37	.019	.009
ΔRM/GR	5	.059	.094
CONGO, DEM. REP. OF			
ΔRM/GDP	29	.056	.141
ΔRM/GR	30	.813	1.983
CONGO, REPUBLIC OF			
ΔRM/GDP	38	.006	.012
COSTA RICA			
ΔRM/GDP	39	.026	.024
ΔRM/GR	29	.230	.189
COTE D IVOIRE			
ΔRM/GDP	36	.010	.013
CROATIA			
ΔRM/GR	5	.057	.043
CYPRUS			
ΔRM/GDP	39	.023	.026
ΔRM/GR	33	.127	.138
CZECH REPUBLIC			
ΔRM/GDP	5	.035	.036
ΔRM/GR	5	.114	.114
DENMARK			
ΔRM/GDP	39	.00	.012
ΔRM/GR	36	.015	.029
DOMINICA			
ΔRM/GDP	22	.015	.053
DOMINICAN REPUBLIC			
ΔRM/GDP	39	.015	.016
ΔRM/GR	39	.111	.127
ECUADOR			
ΔRM/GDP	39	.018	.010
ΔRM/GR	39	.147	.084
EGYPT			
ΔRM/GDP	39	.039	.031
ΔRM/GR	20	.129	.062
EL SALVADOR			
ΔRM/GDP	39	.013	.018
EQUATORIAL GUINEA			
ΔRM/GDP	12	.001	.059
ESTONIA			
ΔRM/GDP	7	.039	.034
ΔRM/GR	6	.159	.147
ETHIOPIA			
ΔRM/GDP	38	.013	.017
ΔRM/GR	33	.112	.124
FIJI			
ΔRM/GDP	35	.008	.015
ΔRM/GR	29	.039	.070
FINLAND			
ΔRM/GDP	39	.002	.002
ΔRM/GR	37	.008	.011
FRANCE			
ΔRM/GDP	39	.004	.004
ΔRM/GR	38	.017	.021
GABON			
ΔRM/GDP	37	.005	.010
GAMBIA			
ΔRM/GDP	30	.016	.029
ΔRM/GR	26	.083	.176
GERMANY			
ΔRM/GDP	39	.004	.002
ΔRM/GR	38	.019	.011
GHANA			
ΔRM/GDP	38	.024	.020
ΔRM/GR	34	.245	.272
GREECE			
ΔRM/GDP	39	.024	.013
ΔRM/GR	37	.120	.065
GRENADA			
ΔRM/GDP	26	.017	.027
ΔRM/GR	12	.087	.114
GUATEMALA			
ΔRM/GDP	39	.010	.011
ΔRM/GR	38	.117	.137
GUINEA-BISSAU			
ΔRM/GDP	10	.010	.007
ΔRM/GR	6	.436	.214
GUYANA			
ΔRM/GDP	38	.050	.095
ΔRM/GR	37	.139	.259
HAITI			
ΔRM/GDP	39	.015	.021
ΔRM/GR	32	.231	.359
HONDURAS			
ΔRM/GDP	39	.011	.012
ΔRM/GR	39	.074	.074
HUNGARY			
ΔRM/GDP	13	.025	.045
ΔRM/GR	13	.052	.088
ICELAND			
ΔRM/GDP	39	.019	.016
ΔRM/GR	31	.084	.073
INDIA			
ΔRM/GDP	38	.014	.006
ΔRM/GR	38	.132	.049
INDONESIA			
ΔRM/GDP	33	.016	.010
ΔRM/GR	29	.081	.056
IRAN			
ΔRM/GDP	34	.032	.026
ΔRM/GR	23	.199	.162
IRELAND			
ΔRM/GDP	39	.008	.014
ΔRM/GR	39	.028	.060
ISRAEL			
ΔRM/GDP	38	.086	.121
ΔRM/GR	38	.173	.208
ITALY			
ΔRM/GDP	36	.007	.003
ΔRM/GR	36	.040	.028
JAMAICA			
ΔRM/GDP	39	.021	.021
JAPAN			
ΔRM/GDP	39	.009	.006
ΔRM/GR	34	.084	.062
JORDAN			
ΔRM/GDP	39	.044	.043
ΔRM/GR	38	.225	.203
KAZAKHSTAN			
ΔRM/GR	5	.115	.161
KENYA			
ΔRM/GDP	32	.014	.014
ΔRM/GR	28	.061	.059
KOREA			
ΔRM/GDP	39	.014	.013
ΔRM/GR	39	.100	.099
KUWAIT			
ΔRM/GDP	35	.002	.019
ΔRM/GR	31	.005	.044
KYRGYZ REPUBLIC			
ΔRM/GDP	3	.015	.007
ΔRM/GR	3	.089	.045
LAO PEOPLE'S DEM.REP			
ΔRM/GDP	9	.014	.009
LATVIA			
ΔRM/GDP	5	.016	.012
ΔRM/GR	4	.048	.037

Table 1 (cont.): Seigniorage across countries

	Obs	Mean	StDev
LEBANON			
ΔRM/GR	4	.406	.224
LESOTHO			
ΔRM/GDP	18	.019	.024
ΔRM/GR	17	.050	.065
LIBYA			
ΔRM/GDP	33	.027	.033
LITHUANIA			
ΔRM/GDP	5	.020	.011
ΔRM/GR	5	.083	.048
LUXEMBOURG			
ΔRM/GDP	35	.003	.015
ΔRM/GR	21	.015	.053
MADAGASCAR			
ΔRM/GDP	36	.011	.013
ΔRM/GR	21	.112	.153
MALAWI			
ΔRM/GDP	33	.014	.023
MALAYSIA			
ΔRM/GDP	38	.018	.020
ΔRM/GR	39	.063	.142
MALDIVES			
ΔRM/GR	20	.248	.350
MALI			
ΔRM/GDP	36	.013	.018
MALTA			
ΔRM/GDP	38	.059	.091
ΔRM/GR	36	.157	.268
MAURITANIA			
ΔRM/GDP	31	.006	.029
ΔRM/GR	12	.034	.126
MAURITIUS			
ΔRM/GDP	39	.015	.028
ΔRM/GR	32	.090	.148
MEXICO			
ΔRM/GDP	39	.022	.024
ΔRM/GR	27	.235	.220
MOLDOVA			
ΔRM/GDP	6	.077	.075
MONGOLIA			
ΔRM/GDP	6	.039	.022
ΔRM/GR	5	.197	.118
MOROCCO			
ΔRM/GDP	39	.015	.009
ΔRM/GR	31	.071	.042
MOZAMBIQUE			
ΔRM/GDP	11	.074	.049
MYANMAR			
ΔRM/GDP	38	.028	.048
ΔRM/GR	33	.332	.516
NAMIBIA			
ΔRM/GDP	7	.006	.005
ΔRM/GR	3	.016	.023
NEPAL			
ΔRM/GDP	39	.014	.008
ΔRM/GR	37	.223	.149
NETHERLANDS			
ΔRM/GDP	39	.004	.003
ΔRM/GR	13	.004	.006
NETHERLANDS ANTILLES			
ΔRM/GR	23	.066	.178
NEW ZEALAND			
ΔRM/GDP	39	.001	.008
ΔRM/GR	37	.006	.029
NICARAGUA			
ΔRM/GDP	38	.058	.091
ΔRM/GR	39	.255	.370
NIGER			
ΔRM/GDP	36	.004	.010
NIGERIA			
ΔRM/GDP	35	.014	.016
ΔRM/GR	34	.136	.168
NORWAY			
ΔRM/GDP	39	.005	.005
ΔRM/GR	37	.020	.016
OMAN			
ΔRM/GDP	28	.009	.013
ΔRM/GR	27	.024	.033
PAKISTAN			
ΔRM/GDP	39	.019	.010
ΔRM/GR	39	.126	.069
PAPUA NEW GUINEA			
ΔRM/GDP	20	.005	.024
ΔRM/GR	20	.028	.126
PARAGUAY			
ΔRM/GDP	39	.018	.010
ΔRM/GR	34	.177	.094
PERU			
ΔRM/GDP	39	.034	.029
ΔRM/GR	38	.282	.300
PHILIPPINES			
ΔRM/GDP	39	.010	.007
ΔRM/GR	39	.074	.054
POLAND			
ΔRM/GDP	18	.050	.059
ΔRM/GR	9	.067	.088
PORTUGAL			
ΔRM/GDP	39	.014	.021
ΔRM/GR	27	.075	.142
QATAR			
ΔRM/GDP	31	.005	.006
ROMANIA			
ΔRM/GDP	19	.031	.035
ΔRM/GR	23	.076	.084
RUSSIA			
ΔRM/GR	4	.185	.077
RWANDA			
ΔRM/GDP	34	.006	.008
ΔRM/GR	20	.124	.120
SAUDI ARABIA			
ΔRM/GDP	35	.009	.015
SENEGAL			
ΔRM/GDP	36	.005	.014
SEYCHELLES			
ΔRM/GDP	27	.014	.037
ΔRM/GR	21	.040	.098
SIERRA LEONE			
ΔRM/GDP	35	.023	.026
ΔRM/GR	37	.268	.362
SINGAPORE			
ΔRM/GDP	35	.016	.012
ΔRM/GR	35	.066	.057
SLOVAK REPUBLIC			
ΔRM/GDP	5	.020	.022
SLOVENIA			
ΔRM/GDP	5	.010	.003
ΔRM/GR	6	.023	.007
SOUTH AFRICA			
ΔRM/GDP	39	.007	.015
ΔRM/GR	39	.027	.022
SPAIN			
ΔRM/GDP	39	.011	.004
ΔRM/GR	37	.078	.040
SRI LANKA			
ΔRM/GDP	39	.012	.009
ΔRM/GR	39	.063	.051
ST. KITTS AND NEVIS			
ΔRM/GDP	18	.016	.036
ΔRM/GR	10	.057	.051
ST. LUCIA			
ΔRM/GDP	22	.012	.014
ST. VINCENT & GRENS.			
ΔRM/GDP	22	.015	.034
ΔRM/GR	20	.049	.121
SUDAN			
ΔRM/GDP	38	.035	.031
ΔRM/GR	17	202.3	425.5
SURINAME			
ΔRM/GDP	31	.069	.074
SWAZILAND			
ΔRM/GDP	23	.016	.027
ΔRM/GR	24	.057	.105
SWEDEN			
ΔRM/GDP	39	.005	.011
ΔRM/GR	39	.015	.034
SWITZERLAND			
ΔRM/GDP	39	.009	.015
ΔRM/GR	39	.110	.172
SYRIAN ARAB REPUBLIC			
ΔRM/GDP	34	.050	.039
ΔRM/GR	21	.176	.106
TANZANIA			
ΔRM/GR	31	.135	.083
THAILAND			
ΔRM/GDP	39	.010	.004
ΔRM/GR	39	.068	.029
TOGO			
ΔRM/GDP	35	.011	.033
TONGA			
ΔRM/GDP	12	.012	.074
TRINIDAD AND TOBAGO			
ΔRM/GDP	38	.008	.016
ΔRM/GR	30	.023	.054
TUNISIA			
ΔRM/GDP	39	.010	.008
ΔRM/GR	25	.041	.026
TURKEY			
ΔRM/GDP	12	.031	.006
ΔRM/GR	29	.179	.052
UGANDA			
ΔRM/GDP	24	.018	.013
ΔRM/GR	22	.367	.395
UKRAINE			
ΔRM/GDP	5	.074	.072
UNITED ARAB EMIRATES			
ΔRM/GDP	23	.009	.013
ΔRM/GR	16	4.215	8.255
UNITED KINGDOM			
ΔRM/GDP	39	.004	.005
ΔRM/GR	36	.013	.015
UNITED STATES			
ΔRM/GDP	39	.003	.001
ΔRM/GR	36	.021	.009
URUGUAY			
ΔRM/GDP	39	.049	.029
ΔRM/GR	33	.267	.175
VANUATU			
ΔRM/GDP	14	.012	.017
VENEZUELA			
ΔRM/GDP	39	.015	.016
ΔRM/GR	38	.066	.071
YEMEN, REPUBLIC OF			
ΔRM/GDP	7	.050	.048
ΔRM/GR	8	.261	.298
ZAMBIA			
ΔRM/GDP	30	.019	.022
ΔRM/GR	29	.087	.105
ZIMBABWE			
ΔRM/GDP	21	.010	.007
ΔRM/GR	18	.042	.026

RM: Reserve Money (IMF-IFS-14a)
GDP: Nominal GDP (IMF-IFS-99b)
GR: Government Revenues (IMF-IFS-81)

Table 2: Descriptive Statistics

Variables	Obs.	Mean	Std.Dev.	Min.	Max.	Source
Dependent:						
Δ Reserve Money (% Government Revenues)	3189	122.22	3355.86	-380.78	151882.8	IFS-IFM
Δ Reserve Money (%GDP)	4376	1.87	3.62	-29.40	65.53	IFS-IFM
Explanatory:						
Agriculture (% GDP)	4255	22.52	16.45	0.13	78.01	WDI-WB
Cabinet Changes	5667	.44	.60	0	5	CNTS
Change in Terms of Trade	3978	220801	1.5e+7	-6.3e+7	9.8e+8	WDI-WB
Civil/ethnic conflicts in border states	4957	.87	1.14	0	6	SFTF
Creditworthiness	1988	48.13	25.00	2.01	100	Euromoney
Domestic Debt (%GDP)	1163	200.57	2588.54	0.12	52345.17	IFS-IMF
Ethnic Homogeneity Index	4869	.58	.28	0	1	SFTF
Exchange Rate Regime	3345	4.06	1.28	1	5	LYS
Executive Changes	5701	.19	.46	0	4	CNTS
Gini Coefficient	693	37.49	10.64	16.63	74.33	DK
Govern. Revenues (%GDP)	2561	19.51	9.64	0	50.57	WDI-WB
Government Crises	5572	.17	.52	0	7	CNTS
Growth of Real GDPpc	4982	2.03	6.72	-41.91	77.69	PWT-6.1
Index of Economic Freedom	2958	5.52	1.10	2.75	8.99	GL
Inflation (Annual Rate)	4820	40.90	455.16	-36.74	23773.1	IFS-IFM
Polity Scale	5344	.08	7.62	-10	10	Polity IV
Real GDP per capita	5075	5936.76	6111.80	281.25	44008.5	PWT-6.1
Religious Homogen. Index	4670	.67	.26	0	1	SFTF
Revolutionary war	5431	.09	.29	0	1	SFTF
Trade (%GDP)	4815	70.06	46.37	0	439.59	WDI-WB
Turnover Rate Governors	1990	.24	.20	0	1.08	CW
Upheaval	6000	5.63	11.88	0	61.5	SFTF
Urban population (%total)	6688	43.90	24.25	1.75	100	WDI-WB

Notes:
IFS-IMF: International Financial Statistics - International Monetary Fund;
WDI-WB: World Development Indicators – World Bank;
CNTS: Cross-National Time Series database;
SFTF – State Failure Task Force database;
LYS: Levi-Yeyati and Sturzenegger (2003);
DK: Dollar and Kraay (2002);
PWT-6.1: Penn World Tables (Mark 6.1);
GL: Gwartney and Lawson (2002);
CW: based on Cukierman and Webb (1995).

Table 3: Results for Seigniorage

Seigniorage	1	2	3	4	5	6	7	8
Cabinet Changes (-1)	4.460 (2.76)***	4.214 (2.88)***	3.182 (1.65)*	3.998 (2.76)***	4.071 (2.80)***	4.444 (3.31)***	5.417 (2.40)**	4.330 (1.99)**
Ethnic Homogeneity Index	-23.419 (-1.82)*	-22.456 (-1.94)*	-85.006 (-4.28)***	-22.014 (-1.98)**	-23.339 (-2.10)**	-28.435 (-3.10)***	-167.36 (-3.23)***	-90.937 (-3.83)***
Polity Scale	.407 (1.54)	.403 (1.68)*	.471 (1.42)	.381 (1.62)	.423 (1.72)*	.513 (2.11)**	.403 (1.03)	-.256 (-.58)
Agriculture (% GDP)	1.737 (3.09)***	1.559 (3.69)***	2.209 (3.17)***	1.529 (3.77)***	1.570 (3.79)***		2.378 (3.62)***	.594 (2.20)**
Trade (%GDP)	-.006 (-.09)							
Real GDP per capita	-.001 (-4.06)***	-.001 (-4.59)***		-.001 (-3.49)***	-.001 (-2.20)**	-.002 (-6.38)***	.0002 (.55)	-.0002 (-.41)
% Change in Terms of Trade	.43e-07 (.67)							
Growth of Real GDP per capita (-1)	-.171 (-.83)							
Index of Economic Freedom			-4.238 (-2.26)**					
Revolutionary war				11.078 (1.78)*				
Civil/ethnic conflicts in border states					5.660 (2.14)**			
Urban population (% of total)						-.287 (-1.73)*		
Exchange Rate Regime							-2.419 (-2.95)***	
Creditworthiness								-.189 (-2.00)**
# Observations	1863	2063	1602	2052	2050	2509	1290	1071
# Countries	97	102	93	102	102	109	95	100
Adjusted R^2	.24	.24	.22	.25	.25	.19	.23	.40

Notes:
- Panel regressions with fixed effects. T-statistics based on heteroskedastic consistent standard errors are in parenthesis. Significance level at which the null hypothesis is rejected: ***, 1%; **, 5%, and *, 10%;
- Seigniorage, the dependent variable, was defined as the change in reserve money (IFS, line 14a) as a percentage of government revenues (IFS line 81);
- Models estimated with a constant and 3 decade dummies (1970s, 1980s, and 1990s). Their estimated coefficients are not shown in order to economize space.

Table 4: Interactions of Cabinet Changes

Seigniorage	1	2	3	4	5	6
[Cabinet changes * (Inflation ≥ 50%)] (-1)	23.430 (2.18)**					
[Cabinet changes * (Inflation < 50%)] (-1)	1.053 (1.09)					
[Cabinet changes * (Dev. Countries)] (-1)		5.500 (2.93)***				
[Cabinet changes * (Ind. Countries)] (-1)		-.284 (-.61)				
[Cabinet changes * (Gini > 40)] (-1)			4.575 (2.18)**			
[Cabinet changes * (Gini ≤ 40)] (-1)			.973 (1.28)			
[Cabinet changes * (Low Ethnic Homogeneity)] (-1)				9.440 (2.04)**		
[Cabinet changes * (High Ethnic Homogeneity)] (-1)				2.833 (2.17)**		
[Cabinet changes * (Low Religious Homog.)] (-1)					10.703 (2.39)**	
[Cabinet changes * (High Religious Homog.)] (-1)					2.446 (1.75)*	
[Cabinet changes * (High Upheaval)] (-1)						8.329 (2.35)***
[Cabinet changes * (Low Upheaval)] (-1)						1.558 (1.97)**
Ethnic Homogeneity Index	-22.951 (-2.01)**	-22.488 (-1.94)*	-28.508 (-2.78)***	-19.896 (-1.65)*	-20.896 (-1.77)*	-22.896 (-2.01)**
Polity Scale	.432 (1.77)*	.390 (1.62)	.210 (1.09)	.366 (1.56)	.394 (1.66)*	.429 (1.80)*
Agriculture (% GDP)	1.476 (3.44)***	1.553 (3.69)***	.648 (5.64)***	1.537 (3.71)***	1.548 (3.73)***	1.559 (3.71)***
Real GDP per capita	-.001 (-3.68)***	-.001 (-4.69)***	-.001 (-4.85)***	-.001 (-4.50)***	-.001 (-4.74)***	-.001 (-4.13)***
# Observations	1995	2063	2017	2063	2042	2063
# Countries	101	102	100	102	101	102
Adjusted R^2	.26	.24	.37	.24	.25	.25

Notes:
- Panel regressions controlling for fixed effects;
- Seigniorage, the dependent variable, was defined as the change in reserve money (IFS, line 14a) as a percentage of government revenues (IFS line 81);
- Models estimated with a constant and 3 decade dummies (1970s, 1980s, and 1990s). Their estimated coefficients are not shown in order to economize space;
- T-statistics based on heteroskedastic consistent standard errors are in parenthesis. Significance level at which the null hypothesis is rejected: ***, 1%; **, 5%, and *, 10%.

Table 5: More Interactions of Cabinet Changes

Seigniorage	1	2	3	4	5	6
[Cabinet changes * (High Turnover)] (-1)	5.856 (2.11)**					
[Cabinet changes * (Low Turnover)] (-1)	.250 (.31)					
[Cabinet changes * (Low Econ. Freedom)] (-1)		13.077 (2.91)***				
[Cabinet changes * (High Econ. Freedom)] (-1)		.649 (.79)				
[Cabinet changes * (Polity Scale ≤ 0)] (-1)			7.226 (2.44)**			
[Cabinet changes * (Polity Scale > 0)] (-1)			1.953 (1.59)			
[Cabinet changes * (High Domestic Debt)] (-1)				8.233 (2.14)**		
[Cabinet changes * (Low Domestic Debt)] (-1)				-.625 (-.54)		
[Cabinet changes * (Low Creditworthiness)] (-1)					4.429 (2.66)***	
[Cabinet changes * (High Creditworthiness)] (-1)					-.305 (-.72)	
[Cabinet changes * (Low Openness] (-1)						4.516 (2.70)***
[Cabinet changes * (High Openness)] (-1)						2.431 (1.42)
Ethnic Homogeneity Index	-28.190 (-2.26)**	-27.670 (-2.08)**	-23.226 (-2.01)**	-13.624 (-1.21)	-28.076 (-2.73)***	-21.593 (-1.86)*
Polity Scale	.340 (1.51)	.380 (1.46)	.590 (2.24)**	.518 (2.12)**	.190 (.99)	.400 (1.66)*
Agriculture (% GDP)	.890 (2.15)**	1.691 (3.56)***	1.529 (3.71)***	1.699 (3.47)***	.656 (5.72)***	1.553 (3.68)***
Real GDP per capita	-.001 (-3.57)***	-.001 (-4.00)***	-.001 (-4.48)***	-.001 (-3.94)***	-.001 (-4.84)***	-.001 (-4.87)***
# Observations	1634	1853	2063	1612	2039	2053
# Countries	97	99	102	98	102	102
Adjusted R^2	.21	.26	.24	.19	.37	.24

Notes:
- Panel regressions controlling for fixed effects;
- Seigniorage, the dependent variable, was defined as the change in reserve money (IFS, line 14a) as a percentage of government revenues (IFS line 81);
- Models estimated with a constant and 3 decade dummies (1970s, 1980s, and 1990s). Their estimated coefficients are not shown in order to economize space;
- T-statistics based on heteroskedastic consistent standard errors are in parenthesis. Significance level at which the null hypothesis is rejected: ***, 1%; **, 5%, and *, 10%.

Table 6: Results for other proxies of political instability

Seigniorage	1	2	3	4	5	6
Government crises (-1)	3.068 (1.90)*					
[Government crises * (Inflation ≥ 50%)] (-1)		30.179 (2.39)**				
[Government crises * (Inflation < 50%)] (-1)		-.540 (-1.03)				
[Government crises * (Dev. Countries)] (-1)			4.617 (1.88)*			
[Government crises * (Ind. Countries)] (-1)			.042 (.13)			
Executive changes (-1)				4.446 (2.16)**		
[Executive changes * (Inflation ≥ 50%)] (-1)					33.582 (2.51)**	
[Executive changes * (Inflation < 50%)] (-1)					-.232 (-.28)	
[Executive changes * (Dev. Countries)] (-1)						6.137 (2.12)**
[Executive changes * (Ind. Countries)] (-1)						.284 (.56)
Ethnic Homogeneity Index	-24.809 (-2.05)**	-24.709 (-2.08)**	-24.252 (-2.00)**	-21.019 (-1.86)*	-22.090 (-2.02)**	-20.837 (-1.85)*
Polity Scale	.409 (1.74)*	.411 (1.66)*	.394 (1.70)*	.378 (1.55)	.332 (1.40)	.362 (1.48)
Agriculture (% GDP)	1.537 (3.66)***	1.507 (3.80)***	1.521 (3.66)***	1.581 (3.73)***	1.532 (3.61)***	1.578 (3.73)***
Real GDP per capita	-.001 (-4.38)***	-.001 (-3.75)***	-.001 (-4.56)***	-.001 (-4.84)***	-.001 (-4.04)***	-.001 (-4.98)***
# Observations	2075	2054	2075	2070	2048	2070
# Countries	102	102	102	102	102	102
Adjusted R^2	.24	.26	.24	.24	.26	.24

Notes:
- Panel regressions controlling for fixed effects;
- Seigniorage, the dependent variable, was defined as the change in reserve money (IFS, line 14a) as a percentage of government revenues (IFS line 81);
- Models estimated with a constant and 3 decade dummies (1970s, 1980s, and 1990s). Their estimated coefficients are not shown in order to economize space;
- T-statistics based on heteroskedastic consistent standard errors are in parenthesis. Significance level at which the null hypothesis is rejected: ***, 1%; **, 5%, and *, 10%.

Table 7: Additional Sensitivity Analysis

	Δ Reserve Money (%GDP)			Developing Countries Δ RMoney (%GovRev)		3-Year MA of Cabinet Changes Δ Reserve Money (%GovRevenues)		
	1	2	3	4	5	6	7	8
Cabinet Changes (-1)	.187			5.470		6.980		
	(1.89)*			(2.92)***		(2.73)***		
[Cabinet changes * (Inflation ≥ 50%)] (-1)		1.250			32.001		31.822	
		(2.31)**			(1.96)**		(1.94)*	
[Cabinet changes * (Inflation < 50%)] (-1)		-.029			3.510		2.206	
		(-.30)			(1.39)		(1.21)	
[Cabinet changes * (Devel. Countries)] (-1)			.236					9.683
			(1.98)**					(2.92)***
[Cabinet changes * (Ind. Countries)] (-1)			-.046					-1.637
			(-.79)					(-2.11)**
Ethnic Homogeneity Index	-3.810	-3.516	-3.811	-22.472	-23.399	-23.024	-24.225	-22.576
	(-2.75)***	(-2.63)***	(-2.75)***	(-1.81)*	(-1.74)*	(-1.89)*	(-1.97)**	(-1.84)*
Polity Scale	.028	.038	.027	.419	.485	.407	.465	.372
	(1.39)	(1.90)*	(1.35)	(1.68)*	(1.74)*	(1.69)*	(1.77)*	(1.57)
Agriculture (% GDP)	.057	.050	.057	1.595	1.510	1.531	1.451	1.514
	(3.32)***	(2.66)***	(3.32)***	(3.53)***	(3.51)***	(3.68)***	(3.61)***	(3.69)***
Real GDP per capita	-.0001	-.0001	-.0001	-.001	-.001	-.001	-.001	-.001
	(-4.37)***	(-4.45)***	(-4.36)***	(-2.31)***	(-1.39)	(-4.24)***	(-3.10)***	(-4.61)***
# Observations	2712	2571	2712	1629	1523	2041	1932	2041
# Countries	116	116	116	84	81	102	101	102
Adjusted R^2	.24	.26	.25	.22	.25	.24	.26	.24

Notes:
- Panel regressions with fixed effects. T-statistics based on heteroskedastic consistent standard errors are in parenthesis. Significance level at which the null hypothesis is rejected: ***, 1%; **, 5%, and *, 10%;
- Models estimated with a constant and 3 decade dummies (1970s, 1980s, and 1990s). Their estimated coefficients are not shown in order to economize space;
- The sample and the definition of seigniorage used (the dependent variable) are indicated in the first row.