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### The political economy of seigniorage<sup>\*</sup>

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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.

Keywords: Seigniorage, political instability, institutions.

JEL codes: E31, E63.

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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.<sup>1</sup> 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 (2006) 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. Accordingly, the correlation between inflation and seigniorage in our sample fluctuates significantly depending on the rate of inflation (see Table 1). While it is positive most of the time and for most of the countries, it declines with the level of inflation and becomes negative for inflation rates above 400 percent per year. Thus, it is misleading to assume that the determinants of inflation are necessary the same as those of seigniorage, which means that separate studies of these variables should be made. As an example, changes in inflation may result from supply-side shocks, such as

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<sup>1</sup> Some studies, such as Buiters (2007), distinguish seigniorage (change in monetary base) from central bank revenue (interest earned by investing the resources obtained through the past issuance of base money). This distinction is useful to study central bank operations and monetary policy effectiveness. For the purposes of this paper, however, it suffices to broadly define seigniorage as revenues obtained by a consolidated government (treasury and central bank) from the issuance of base money.

fluctuations in oil prices, which do not directly affect seigniorage. Conversely, the structure of the economy, which affects the capacity to raise taxes and the reliance on seigniorage revenues, may not affect inflation in the same way. 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. While seigniorage seems to be a less attractive method of government financing for several countries, the truth is that it was still used to a greater extent in the 1990s than in the 1960s. Furthermore, seigniorage revenues are on average five times higher in developing countries than in industrial countries for the period 1960-1999. In the 1990s, average seigniorage revenues represented 14.65% of total government revenues for developing countries, compared to only 1.64% for industrial countries. Therefore, analyzing the determinants of seigniorage is an important endeavor, primarily for developing countries.

**-- Insert Table 1 about here --**

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;<sup>2</sup> (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.

## **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.<sup>3</sup> 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 and 2005). 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

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<sup>2</sup>Expressed in a high number of state failure events in the last 15 years, such as revolutionary wars, ethnic wars, regime crises, and genocides/politocides.

<sup>3</sup> See Catão and Torrono (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.

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 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 that 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.<sup>4</sup>

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 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<sup>5</sup>, less

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<sup>4</sup> 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.

<sup>5</sup> See Beetsma and Van Der Ploeg (1996), Bhattacharya, et al. (2005) and Albanesi (2007) for studies presenting evidence suggesting that inflation and income inequality are positively related. In Desai, et al. (2005) that relationship is conditional on the political structure. Woo (2005) finds that social polarization is associated with fiscal instability while generating incentives to engage in short-term policies leading to lower growth. Our findings indicate that the fiscal instability channel may also lead to higher seigniorage and inflation.

democratic, traditionally unstable, and highly indebted countries. Finally, political instability has 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;<sup>6</sup> Gwartney and Lawson (2002);<sup>7</sup> the *Database of Political Institutions* (DPI 3.0);<sup>8</sup> the *State Failure Task Force* dataset (SFTF);<sup>9</sup> and the *Freedom House* ratings.<sup>10</sup> Economic data was collected from the World Bank's *World Development Indicators* (WDI) and *Global Development Network Growth Database* (GDN),<sup>11</sup> the International Monetary Fund's *International Financial Statistics* (IFS), the *Penn World Tables* (PWT 6.1),<sup>12</sup> *Euromoney* creditworthiness ratings,<sup>13</sup> Cukierman, Webb, and Neyapti (1992),<sup>14</sup> Dollar and Kraay (2002),<sup>15</sup> and Levi-Yeyati and Sturzenegger (2003).<sup>16</sup>

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<sup>6</sup> Available on the Internet (<http://www.cidcm.umd.edu/inscr/polity/index.htm>).

<sup>7</sup> Available on the Internet (<http://www.freetheworld.com/release.html>).

<sup>8</sup> 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/pkeefe.htm>).

<sup>9</sup> Available on the Internet (<http://www.cidcm.umd.edu/inscr/stfail/sfdata.htm>).

<sup>10</sup> Available on the Internet (<http://www.freedomhouse.org/ratings/>).

<sup>11</sup> Available on the Internet (<http://www.worldbank.org/research/growth/GDNdata.htm>).

<sup>12</sup> Available on the Internet ([http://pwt.econ.upenn.edu/php\\_site/pwt\\_index.php](http://pwt.econ.upenn.edu/php_site/pwt_index.php)).

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). Appendix A shows the number of observations, means and standard deviations of these seigniorage measures for all countries for which data is available.<sup>17</sup>

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

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

Why may the number of cabinet changes be a good indicator of political instability? First, in a country characterized by frequent changes in the composition of government, there are also frequent changes in macroeconomic policies, as new prime ministers or ministers of finance/economics do not necessarily share the views of their predecessors. Second, frequent cabinet changes shorten the horizon of

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<sup>13</sup> The data on the *Euromoney* creditworthiness index, ranging from 0 to 100, from 1982 to 1999, was kindly provided by Reid Click.

<sup>14</sup> Underlying data available on the Internet (<http://www.tau.ac.il/~alexcuk/pdf/WebbPoltime2.xls>).

<sup>15</sup> Underlying data available on the Internet ([http://siteresources.worldbank.org/INTRES/Resources/469232-1107449512766/648083-1108140788422/Growth\\_is\\_good\\_for\\_the\\_poor\\_data.zip](http://siteresources.worldbank.org/INTRES/Resources/469232-1107449512766/648083-1108140788422/Growth_is_good_for_the_poor_data.zip))

<sup>16</sup> Underlying data available on the Internet ([http://www.utdt.edu/~fsturzen/base\\_2002.xls](http://www.utdt.edu/~fsturzen/base_2002.xls)).

<sup>17</sup> There is data on  $\Delta RM/GDP$  for 144 countries and on  $\Delta RM/GR$  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.



the members of government, as they are not certain that they will keep their posts during an entire term. The higher the probability of being replaced, the greater will be the importance attributed to short-term objectives. Then, since the costs of future inflation are not fully internalized, it is difficult to resist the temptation to finance current expenditures with seigniorage revenues.

- *Ethnic Homogeneity Index* (SFTF): ranges from 0 to 1, with higher values indicating ethnic homogeneity, and equals the sum of the squared population fractions of the seven largest ethnic groups in a country. For each year, it takes the value of the index in the beginning of the respective decade. According to Woo (2003, 2005) 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);<sup>18</sup>
- 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. An alternative proxy for the structure of the economy is *Urban Population (% of total)*, the urbanization ratio (WDI, WB), which according to Edwards and Tabellini (1991) should have a negative sign;

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<sup>18</sup> Although ethnic homogeneity and the polity scale may also be related with political instability, we see them more as institutional variables than as indicators of political instability.

- *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);<sup>19</sup>
- *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* (WDI, WB). Higher 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.

Appendix B 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.

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

$$S_{it} = \alpha PI_{i,t-1} + \beta SP_{it} + \delta PS_{it} + \mathbf{Eco}_{it}' \boldsymbol{\phi} + \mathbf{EcP}_{it}' \boldsymbol{\gamma} + v_i + \varepsilon_{it} \quad , \quad i = 1, \dots, N \quad t = 1, \dots, T_i \quad (1)$$

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

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<sup>19</sup> The outcome on seigniorage may be similar, even if more open countries are imposing lower tariffs. These countries may rely less on seigniorage in order to avoid the real appreciation of the home currency associated with higher inflation. We owe this rationale to an anonymous referee.

It is 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),  $\varepsilon_{it}$ , is not serially correlated. Fisher type unit root tests for panel data reject the null hypothesis that seigniorage is non-stationary in all countries.<sup>20</sup> Dickey Fuller and Augmented Dickey-Fuller tests performed on each individual country reject unit root behavior of seigniorage for all countries that have at least ten observations (in 15 countries, a drift term has to be included). These results, which are available upon request, are consistent with those of Click (2000), who rejected a unit root behavior of seigniorage in the four countries considered in his study (USA, UK, Brazil, and Argentina).

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 (2006) 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* is also lagged one period.<sup>21</sup>

#### 4. Empirical Results

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<sup>20</sup> The results of three of those tests are presented below:

Fisher Test (0 lags, no drift). Ho: unit root	
chi2(244) = 1964.3487	Prob > chi2 = 0.0000
Fisher Test (1 lag, no drift). Ho: unit root	
chi2(240) = 1360.5939	Prob > chi2 = 0.0000
Fisher Test (0 lags, with a drift term). Ho: unit root	
chi2(240) = 2095.2873	Prob > chi2 = 0.0000

<sup>21</sup> The contemporaneous values are used for the remaining explanatory variables, since they are taken as exogenous.

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, for an alternative definition of seigniorage, for a sample that only includes developing countries, when our main proxy for political instability (*Cabinet Changes*) is defined in a different way, for a cross section and for samples of 5-year and 10-year periods, when outliers are controlled for, and when instrumental variables are used to account for the possibility that some explanatory variables are endogenous.

*a) Main determinants of seigniorage levels*

The estimation results of the model described in the previous section, using a fixed effects specification,<sup>22</sup> are shown in Table 2. 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 4.15 percentage points. Higher values of the *Ethnic Homogeneity Index* (lower social polarization) are associated with lower use of seigniorage, which is consistent with the findings of Cukierman et al. (1992)<sup>23</sup> and Woo (2003), and with the

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<sup>22</sup> 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.

<sup>23</sup> 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.

theoretical model of Woo (2005). Democracy does not seem to affect seigniorage, as the *Polity Scale* is not statistically significant.<sup>24</sup> Regarding the economic variables, only *Agriculture (%GDP)*, *Real GDP per capita*, and *Growth of Real GDP(-1)* are statistically significant, with the expected signs. Finally, the coefficients on the decade dummy variables are all positive and statistically significant.

--- Insert Table 2 about here ---

Since *Trade (%GDP)* and *%Change in Terms of Trade* are not statistically significant in the first column, they are excluded from the model of column 2.<sup>25</sup> Results remain practically the same. Then, in column 3, *Agriculture (%GDP)* was replaced by an alternative proxy for the structure of the economy, *Urban Population (% of total)*, for which there is a higher number of observations. 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 only changes in results are that the *Ethnic Homogeneity Index* becomes highly statistically significant, and the coefficients of the decade dummies indicate that seigniorage increased until the 1980s and slightly decreased in the 1990s. Since this specification of column 3 increases the number of observations by 324 (or 16.3%) and the number of countries by 7 (or 7%) relative to that of column 2, it will be used as our reference model.

Results regarding political instability<sup>26</sup> conform to our expectations and are consistent with those found by Aisen and Veiga (2006) 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

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<sup>24</sup> This is not surprising, as Aisen and Veiga (2006) found that democracy marginally affects inflation and the effect is very small.

<sup>25</sup> They are never statistically significant when included in the models of the following columns of Table 4 or in those of the following Tables. Wald tests allow for the exclusion of these variables from the model.

<sup>26</sup> The results obtained when using three alternative proxies of political instability also available in the Cross National Time Series Data Archive - *Government Crises*, *Executive Changes*, and the *Weighted Conflict Index* - are very similar. These results are not shown here, but are available from the authors upon request.

(1991), and Click (1998), indicating that larger agricultural sectors, lower urbanization ratios, lower GDP per capita levels, and slower economic growth are associated with greater reliance on seigniorage revenues.<sup>27</sup>

The time-dimension of seigniorage is captured by the decade dummies (column 3) and by a quadratic trend (column 4). These indicate that seigniorage increased until the 1980s, and declined during the nineties. In fact, the estimated coefficients of *Trend* and *Trend*<sup>2</sup> indicate that seigniorage hit its peak in 1990, and declined afterwards. Although one would expect the increased independence of central banks in industrial countries to start reducing seigniorage sooner, several developing countries still had high inflation (or even hyperinflation) and seigniorage in the late 1980s and in the beginning of the 1990s.<sup>28</sup> It is also interesting to note that most explanatory variables, with the exception of *Cabinet Changes*, exhibit relatively low time-series variation within each country. In fact, while *Cabinet Changes* has an average coefficient of variation within countries of 1.48, those of the other explanatory variables are all below 0.25 (the lowest is 0.065 for the *Ethnic Homogeneity Index*, which varies very little over time).

As mentioned above, the country dummy variables are always jointly statistically significant. They account for a considerable part of the adjusted R<sup>2</sup> of 0.22 reported in columns 3 and 4. Since a pooled OLS, without fixed effects, would only have an adjusted R<sup>2</sup> of 0.07, roughly 0.15 of the variation in seigniorage is not explained by independent variables listed. This also means that more work needs to be done in this topic in order to improve the explanatory power of our models.

The results of robustness tests based on the model of column 3 are shown in Table 3. Those reported in column 1 indicate that higher economic freedom is associated with lower

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<sup>27</sup> The first three variables were not statistically significant in Aisen and Veiga (2006). That is, those structural variables help explain seigniorage but not inflation, supporting our assertion in the introduction that their determinants are not the same and that separate studies for inflation and seigniorage should be implemented.

<sup>28</sup> For example, Argentina had hyperinflation in 1989, Brazil in 1990 and 1994, Peru in 1990, etc.

reliance on seigniorage. A higher *Index of Economic Freedom*<sup>29</sup> is 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 2 and 3, 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. The model of column 4 indicates that fixed exchange rates<sup>30</sup> 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. The results of column 5 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. Finally, the last two columns test the effects of financial depth, which Woo (2003) found to be positively related with fiscal deficits. Two proxies taken from the database of financial development and structure of Beck, et al. (2000) are used: the ratio of deposit money bank assets to central bank assets, and liquid liabilities as a percentage of GDP. Although both have the expected negative sign, indicating that countries

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<sup>29</sup> 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 *Access to Sound Money* is affected by seigniorage, we avoided eventual endogeneity problems by using a transformed index that excludes that area (Area III).

<sup>30</sup> 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.

with more developed financial markets are more capable of financing higher deficits without resorting to seigniorage, only the first of these variables is statistically significant.<sup>31</sup>

--- Insert Table 3 about here ---

Despite all the tests implemented, which involved regressing seigniorage on a vast array of potential determinants, robustness may still be a concern. As the empirical economic growth literature has shown (see Durlauf et al, 1995, and Sala-i-Martin et al., 2004) the parameter estimates obtained in growth regressions are often sensitive to the inclusion of other conditional variables. Unfortunately, to our knowledge, there are no studies of the robust determinants of seigniorage that can be used to guide the decision of which variables to include in our estimations.<sup>32</sup> Nevertheless, considering the persistence of our main results across a vast array of alternative specifications, it might be safe to argue that they are robust.

*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 clear, it is possible that they are stronger in some circumstances or in countries with specific characteristics. Aisen and Veiga (2006) 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

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<sup>31</sup> 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), *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 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.

<sup>32</sup> Implementing an analysis such as that of Sala-i-Martin et al. (2004) to determine the robust determinants of seigniorage is beyond the scope of this paper.



to check if the same happens with seigniorage, we performed estimations based in the model of column 3 of Table 2 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, illustrated in Figure 1,<sup>33</sup> are consistent with those of Aisen and Veiga (2006). 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 Figure 1 about here** ---

According to Woo (2003, 2005), 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.<sup>34</sup> 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 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 interacting *Cabinet Changes* with dummy variables for average Gini coefficients above and below 40,<sup>35</sup> for high and low ethnic homogeneity,<sup>36</sup> and for high and low religious homogeneity. Results clearly support the hypothesis that

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<sup>33</sup> The coefficient obtained for *Cabinet Changes* (*Pol.Instability*) in Column 3 of Table 2 is shown in the first bar of Figure 1. The estimation results for the interactions of *Cabinet Changes* considered in Figure 1 are reported in Appendix C,

<sup>34</sup> In the model of Cukierman et al. (1992), this high polarization of interests results in higher seigniorage.

<sup>35</sup> 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. ( $Gini \leq 40$ ) =  $1 - (Gini > 40)$ .

<sup>36</sup> The dummy *Low Ethnic Homogeneity* takes the value of one for countries whose respective index is equal to or lower than the 25<sup>th</sup> 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.

political instability has stronger effects on seigniorage in countries with large social polarization (high income inequality and low ethnic or religious homogeneity). Finally, 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,<sup>37</sup> 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 turned out as 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.<sup>38</sup>

The hypothesis that institutions affect that relationship was tested interacting *Cabinet Changes* with dummy variables for high and low turnover rates of central bank presidents,<sup>39</sup> for high and low economic freedom,<sup>40</sup> and for *Polity Scale* below and above zero. The results, illustrated in the second and third bars of Figure 2,<sup>41</sup> 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.<sup>42</sup> Political instability also seems to affect seigniorage only in countries that have a

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<sup>37</sup> *High Upheaval* equals one when the value of *Upheaval* is above 3, and equals zero otherwise. *Low Upheaval* = 1 - *High Upheaval*.

<sup>38</sup> 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.

<sup>39</sup> Cukierman, Webb and Neyapti (1992) 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*.

<sup>40</sup> 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).

<sup>41</sup> The estimation results for the interactions of *Cabinet Changes* considered in Figure 2 are reported in Appendix D,

<sup>42</sup> It is worth noting that this result does not hold when the Cukierman, Webb and Neyapti (1992) legal index of Central Bank Independence is used instead of the turnover rate of presidents (that proxies *de facto*

low *Index of Economic Freedom*. 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 indicate that political instability affects seigniorage less in democratic countries (*Polity Scale* > 0) than in countries under authoritarian regimes (*Polity Scale* ≤ 0).

--- Insert Figure 2 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 provide empirical support for the above-referred hypothesis, as a greater number of *Cabinet Changes* is associated with higher seigniorage only in countries that have *High Domestic Debt*<sup>43</sup> or *Low Creditworthiness*.<sup>44</sup>

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 2, 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

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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.

<sup>43</sup> *High Domestic Debt (H.Dom.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*

<sup>44</sup> *High Creditworthiness (H.Creditworth.)* is a dummy variable that equals one for the countries whose average *EuroMoney's* creditworthiness rating is above 60 (the 75<sup>th</sup> percentile of the country averages), and equals zero otherwise. *Low Creditworthiness* = 1 - *High Creditworthiness*.

resort to seigniorage financing. Results shown in the last two bars of Figure 2 are consistent with this hypothesis.<sup>45</sup>

*c) Sensitivity analysis*

Three alternative indexes of political instability were constructed by applying the principal components analysis. The variables used to define each Political Instability Index were (all from the CNTS):<sup>46</sup>

- P.I. Index 1: *Assassinations, Cabinet Changes, Constitutional Changes, Coups, Executive Changes, Government Crises, and Revolutions*;
- P.I. Index 2: *Assassinations, Constitutional Changes, Coups, Government Crises, and Revolutions* (same as in Woo, 2003);
- P.I. Index 3: *Cabinet Changes, Executive Changes, and Government Crises*.

Table 4 reports the results of estimations using these alternative indexes. They are very similar to those obtained for *Cabinet Changes*, reported in Table 2 and Appendix C. Thus, our results are not sensitive to the choice of the proxy for political instability. That is, for all variables used, political instability is positively related to seigniorage.

--- Insert Table 4 about here ---

Columns 1 to 3 of Table 5 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

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<sup>45</sup> . It is worth noting that the interactions of *Cabinet Changes* with *High Turnover* and with *High Domestic Debt* are only statistically significant at the 10% level.

<sup>46</sup> This technique for data reduction describes linear combinations of the variables that contain most of the information. It analyses the correlation matrix and the variables are standardized to have mean zero and standard deviation of 1 at the outset. Then, for each of the three groups of variables, the first component identified, the linear combination with greater explanatory power, was used as the political instability index.

persistent situations of political instability. In all cases, results are similar to those obtained in Tables 2 and Appendix C, meaning that our conclusions regarding the effects of political, institutional and economic variables on seigniorage levels remain practically the same.

**--- Insert Table 5 about here ---**

Results for alternative data frequencies are shown in Table 6. In columns 1, 3 and 5 the reference model was estimated for a cross section of 108 countries and for panels of 10-year and 5-year averages. Results are still supportive of the hypothesis that political instability leads to greater seigniorage. Although the *Ethnic Homogeneity Index* is not statistically significant in the cross section (column 1), the results for the panel estimations provide evidence in favor of the view that social polarization leads to seigniorage. The *Index of Economic Freedom* was added in columns 2, 4 and 6. As happened in Column 1 of Table 3, this variable is highly statistically significant, with a negative sign, reinforcing the conclusion that greater economic freedom is associated with lower reliance on seigniorage revenues.

**--- Insert Table 6 about here ---**

It is possible that outliers associated with high inflation and high seigniorage episodes affect the results of our regressions. This possibility is accounted for, using annual data, in columns 1 to 4 of Table 7. In column 1, all observations for which annual inflation was above 1000% were excluded. Then, in column 2, we only included the observations for which seigniorage (as a percentage of government revenues) was smaller or equal to its mean plus two standard deviations ( $\leq 156.76\%$ ). Results in both cases are very similar to those of the reference model. Then, we used two robust estimation procedures: least median of squares (LMS), in column 3; and, least absolute deviation (LAD), in column 4. In both cases, a greater number of cabinet changes is associated with higher seigniorage, but the *Ethnic Homogeneity Index* is not statistically significant when using LAD (column 4).

**--- Insert Table 7 about here ---**

Finally, we estimated instrumental variables (IV) models in order to account for the possibility that some explanatory variables are endogenous. Dealing with inflation, Aisen and Veiga (2006), used the system Generalized Method of Moments (GMM-SYS) estimator for dynamic panel data models. But, since lagged seigniorage is never statistically significant when included in our estimations, we do not have a dynamic panel. Thus, in columns 5 and 6, we performed two-step feasible GMM and LIML (Limited Information Maximum Likelihood), respectively, with instrumental variables.<sup>47</sup> Results are consistent with the hypothesis that political instability and social polarization lead to greater reliance on seigniorage revenues.<sup>48</sup>

## 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, 2005).

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

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<sup>47</sup> These estimations were performed using the *ivreg2* command of Stata. Lagged values one and two periods of *Cabinet Changes* were used as instruments for that variable. Using geographical dummies and other variables as additional instruments does not significantly change the results. Orthogonality tests do not reject the exogeneity of the other explanatory variables. The option *cluster* was used in order to account for intra-country correlation.

<sup>48</sup> One should note that the estimated coefficients for *Cabinet Changes* get very large. This may be due to weak instruments. In fact, when good instruments are not available, it may be preferable not to perform instrumental variables estimations.

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.

Although the results concerning political instability and institutional variables are similar to those of Aisen and Veiga's (2006) study of inflation, there are several differences regarding other explanatory variables, which support our assertion that the determinants of inflation and seigniorage are not exactly the same and that it is necessary to conduct separate studies for these variables. In fact, seigniorage does not seem to be affected by changes in oil prices or US Treasury Bill rates (which affect inflation), but is determined by structural variables that condition the government's ability to raise taxes, such as the size of the agricultural sector, the urbanization ratio, and the level of GDP per capita, which do not seem to affect inflation.

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.

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**Table 1: Correlation between Inflation and Seigniorage**

<b>Sample</b>	<b>Observations</b>	<b>Correlation</b>
All	3171	0.214
Inflation < 10%	1967	0.102
Inflation <100%	3083	0.305
Inflation >100%	88	0.132
Inflation >200%	43	0.058
Inflation >300%	34	0.0001
Inflation >400%	28	-0.007
Inflation >500%	26	-0.038
Inflation >1000%	18	-0.139

Notes:

- Inflation is the annual inflation rate (IFS line 64x)
- Seigniorage is the change in reserve money (IFS, line 14a) as a percentage of government revenues (IFS line 81).

**Table 2: Results for Seigniorage**

Seigniorage	1	2	3	4
Cabinet Changes (-1)	4.149 (2.52)**	3.688 (2.45)***	4.282 (3.01)***	4.309 (2.99)***
Ethnic Homogeneity Index	-22.776 (-1.78)*	-22.419 (-1.86)*	-24.054 (-2.65)***	-24.747 (-2.78)***
Polity Scale	.380 (1.44)	.379 (1.55)	.300 (1.45)	.306 (1.50)
Agriculture (% GDP)	1.748 (3.62)***	1.594 (3.57)***		
Urban population (% of total)			-.486 (-2.39)**	-.565 (-2.58)***
Trade (%GDP)	.013 (.20)			
Real GDP per capita	-.001 (-3.77)***	-.001 (-4.23)***	-.002 (-5.32)***	-.002 (-5.11)***
% Change in Terms of Trade	.89e-07 (1.32)			
Growth of Real GDP (-1)	-.467 (-2.97)***	-.432 (-3.05)***	-.664 (-3.85)***	-.655 (-3.87)***
Dummy1970s	10.247 (3.88)***	8.779 (4.09)***	7.088 (3.83)***	
Dummy1980s	18.575 (3.97)***	16.998 (4.17)***	13.448 (3.85)***	
Dummy1990s	19.476 (3.34)***	17.651 (3.56)***	12.367 (2.80)***	
Trend				1.622 (4.67)***
Trend <sup>2</sup>				-.026 (-4.06)***
# Observations	1836	1982	2306	2306
# Countries	97	101	108	108
Adjusted R <sup>2</sup>	.25	.25	.22	.22
Adjusted R <sup>2</sup> (without fixed effects)			.07	.07

Notes: - Panel regressions with fixed effects of countries and a constant. 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).

**Table 3: Additional Determinants of Seigniorage**

Seigniorage	1	2	3	4	5	6	7
Cabinet Changes (-1)	4.638 (2.62)***	4.372 (3.07)***	4.299 (3.03)***	5.686 (2.59)***	5.965 (2.78)***	3.150 (2.76)***	1.253 (1.51)
Ethnic Homogeneity Index	-56.688 (-3.22)***	-23.074 (-2.62)***	-23.869 (-2.68)***	-86.308 (-1.89)*	-74.736 (-3.29)***	-22.404 (-2.15)**	-6.727 (-.63)
Polity Scale	.529 (1.74)*	.266 (1.35)	.313 (1.49)	.550 (1.32)	.148 (.31)	.121 (.49)	.178 (1.18)
Urban population (% of total)	-.573 (-2.19)**	-.430 (-2.29)**	-.548 (-2.46)**	-1.144 (-2.52)**	-.654 (-1.64)	-.502 (-2.21)**	-.033 (-.22)
Real GDP per capita		-.002 (-5.15)***	-.001 (-5.62)***	-.001 (-1.13)	.001 (1.41)	-.001 (-1.94)*	-.001 (-4.11)***
Growth of Real GDP (-1)	-.568 (-2.89)***	-.617 (-3.88)***	-.616 (-3.85)***	-.701 (-3.03)***	-.624 (-2.97)***	-.510 (-3.43)***	-.380 (-2.72)***
Index of Economic Freedom	-9.381 (-5.27)***						
Revolutionary war		12.561 (1.86)*					
Civil/ethnic conflicts in border states			5.530 (1.99)**				
Exchange Rate Regime				-2.416 (-2.91)***			
Creditworthiness					-.309 (-2.40)**		
Deposit Money Bank Assets / Central Bank Assets						-32.155 (-1.95)*	
Liquid Liabilities (% GDP)							-3.325 (-.41)
# Observations	1758	2295	2293	1433	1168	2182	1688
# Countries	93	108	108	101	106	107	94
Adjusted R <sup>2</sup>	.24	.22	.22	.20	.34	.25	.25

Notes: - Panel regressions with country 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: Results for indexes of political instability generated by Principal Components Analysis**

Seigniorage	Political Instability Index 1			Political Instability Index 2			Political Instability Index 3		
	1	2	3	4	5	6	7	8	9
Political Instability Index (-1)	1.642 (3.04)***			1.105 (1.67)*			2.274 (3.34)***		
[Political Instability Index* (Inflation ≥ 50%)] (-1)		9.430 (3.38)***			7.430 (2.62)***			14.618 (3.53)***	
[Political Instability Index * (Inflation < 50%)] (-1)		.056 (.14)			-.470 (-.86)			.438 (1.23)	
[Political Instability Index * (Develop. Countries)] (-1)			2.117 (3.05)***			1.211 (1.63)*			3.978 (3.50)***
[Political Instability Index * (Industrial Countries)] (-1)			-.061 (-.17)			.247 (.35)			-.237 (-1.24)
Ethnic Homogeneity Index	-29.887 (-3.21)***	-29.735 (-3.29)***	-29.699 (-3.17)***	-30.688 (-3.30)**	-30.818 (-3.38)***	-30.614 (-3.29)***	-29.388 (-3.20)***	-27.612 (-3.13)***	-28.425 (-3.08)***
Polity Scale	.353 (1.69)*	.361 (1.76)*	.350 (1.68)*	.374 (1.77)*	.382 (1.80)*	.374 (1.77)*	.318 (1.52)	.311 (1.56)	.286 (1.38)
Urban population (% of total)	-.483 (-2.38)**	-.435 (-2.19)**	-.468 (-2.32)**	-.519 (-2.52)**	-.512 (-2.47)**	-.517 (-2.51)**	-.466 (-2.34)**	-.363 (-1.97)**	-.419 (-2.16)**
Real GDP per capita	-.002 (-4.96)***	-.001 (-4.86)***	-.002 (-5.02)***	-.002 (-5.01)***	-.002 (-5.01)***	-.002 (-5.04)***	-.002 (-4.90)***	-.001 (-4.61)***	-.002 (-5.01)***
Growth of Real GDP (-1)	-.627 (-3.75)***	-.467 (-2.97)***	-.606 (-3.67)***	-.658 (-3.93)***	-.570 (-3.52)***	-.656 (-3.93)***	-.636 (-3.79)***	-.437 (-2.77)***	-.582 (-3.55)***
# Observations	2300	2300	2300	2306	2306	2306	2300	2300	2300
# Countries	108	108	108	108	108	108	108	108	108
Adjusted R <sup>2</sup>	.22	.24	.22	.21	.23	.21	.22	.25	.22

Notes: - Panel regressions controlling for country 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%.

- Variables used in the Principal Components Analysis to define each Political Instability Index (all variables were taken from the CNTS):
  - P.I. Index 1: Assassinations, Cabinet Changes, Constitutional Changes, Coups, Executive Changes, Government Crises, and Revolutions;
  - P.I. Index 2: Assassinations, Constitutional Changes, Coups, Government Crises, and Revolutions;
  - P.I. Index 3: Cabinet Changes, Executive Changes, and Government Crises.

**Table 5: Additional Sensitivity Analysis**

	$\Delta$ Reserve Money (%GDP)			Developing Countries $\Delta$ RMoney (%GovRev)		3-Year MA of Cabinet Changes $\Delta$ Reserve Money (%GovRevenues)		
	1	2	3	4	5	6	7	8
Cabinet Changes (-1)	.202 (2.00)**			6.076 (3.03)***		9.467 (3.29)***		
[Cabinet changes * (Inflation $\geq$ 50%)] (-1)		2.019 (3.41)***			52.191 (2.99)***		51.331 (2.95)***	
[Cabinet changes * (Inflation < 50%)] (-1)		-.046 (-.50)			7.575 (2.39)**		4.252 (2.06)**	
[Cabinet changes * (Devel. Countries)] (-1)			.276 (2.11)**					15.067 (3.61)***
[Cabinet changes * (Ind. Countries)] (-1)			-.029 (-.37)					-2.817 (-3.77)***
Ethnic Homogeneity Index	-3.982 (-3.64)***	-3.621 (-3.51)***	-3.987 (-3.63)***	-25.868 (-2.56)**	-25.541 (-2.39)**	-26.390 (-2.81)***	-24.714 (-2.60)***	-25.903 (-2.70)***
Polity Scale	.032 (1.77)*	.037 (2.17)**	.032 (1.75)*	.450 (1.88)*	.507 (1.92)*	.308 (1.50)	.364 (1.62)	.284 (1.40)
Urban population (% of total)	-0.15 (-1.11)	-0.15 (-1.11)	-0.15 (-1.13)	-.548 (-2.10)**	-.653 (-2.41)**	-.486 (-2.53)**	-.546 (-2.60)***	-.472 (-2.51)**
Real GDP per capita	-.0002 (-5.85)***	-.0001 (-5.48)***	-.0002 (-5.81)***	-.002 (-4.64)***	-.001 (-2.43)**	-.002 (-5.09)***	-.001 (-3.75)***	-.002 (-5.10)***
Growth of Real GDP (-1)	-.043 (-3.68)***	-.037 (-3.07)***	-.043 (-3.62)***	-.713 (-3.69)***	-.532 (-3.17)***	-.655 (-3.86)***	-.450 (-3.01)***	-.629 (-3.77)***
# Observations	3040	2908	3040	1674	1547	2282	2179	2282
# Countries	122	122	122	89	88	108	107	108
Adjusted R <sup>2</sup>	.24	.27	.25	.19	.24	.22	.27	.23

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.

**Table 6: Results for cross-section and period averages**

Seigniorage	Cross Section		10 – year periods		5 – year periods	
	1	2	3	4	5	6
Cabinet Changes (-1)	13.909 (1.73)*	13.857 (1.70)*	12.059 (2.14)**	16.132 (1.98)**	8.021 (2.74)***	8.415 (2.14)**
Ethnic Homogeneity Index	-2.800 (-.52)	-4.978 (-.89)	-8.937 (-1.86)*	-14.330 (-2.69)***	-6.887 (-2.20)**	-12.871 (-3.24)***
Polity Scale	-.539 (-2.23)**	-.423 (-1.82)*	-.213 (-1.23)	-.243 (-1.05)	-.268 (-2.00)**	-.266 (-1.42)
Urban population (% of total)	.246 (1.94)*	.171 (1.43)	.266 (3.13)***	.127 (1.47)	.221 (3.51)***	.094 (1.36)
Real GDP per capita	-.001 (-2.84)***		-.001 (-5.14)***		-.001 (-5.82)***	
Growth of Real GDP (-1)	.142 (.38)	.471 (.90)	-1.300 (-1.56)	-1.567 (-1.32)	-1.134 (-1.94)*	-1.047 (-1.46)
Index of Economic Freedom		-7.198 (-2.63)**		-7.148 (-4.27)***		-6.656 (-4.49)***
# Observations	108	94	282	219	548	416
# Countries	108	94	96	87	108	94
Adjusted R <sup>2</sup>	.14	.21	.15	.18	.13	.14

Notes: - Cross section regressions estimated in columns 1 and 2 (including a constant);

- Panel regressions controlling for country fixed effects in columns 3 to 6. Models estimated with a constant and period dummies. 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%;
- Seigniorage, the dependent variable, was defined as the change in reserve money (IFS, line 14a) as a percentage of government revenues (IFS line 81);
- In the cross-section regressions of columns 1 and 2, there are no lagged values of *Cabinet Changes* and *Growth of Real GDP* available. Thus, their average values for the entire sample period were used. In the other columns, the first lag is the average over the previous period.



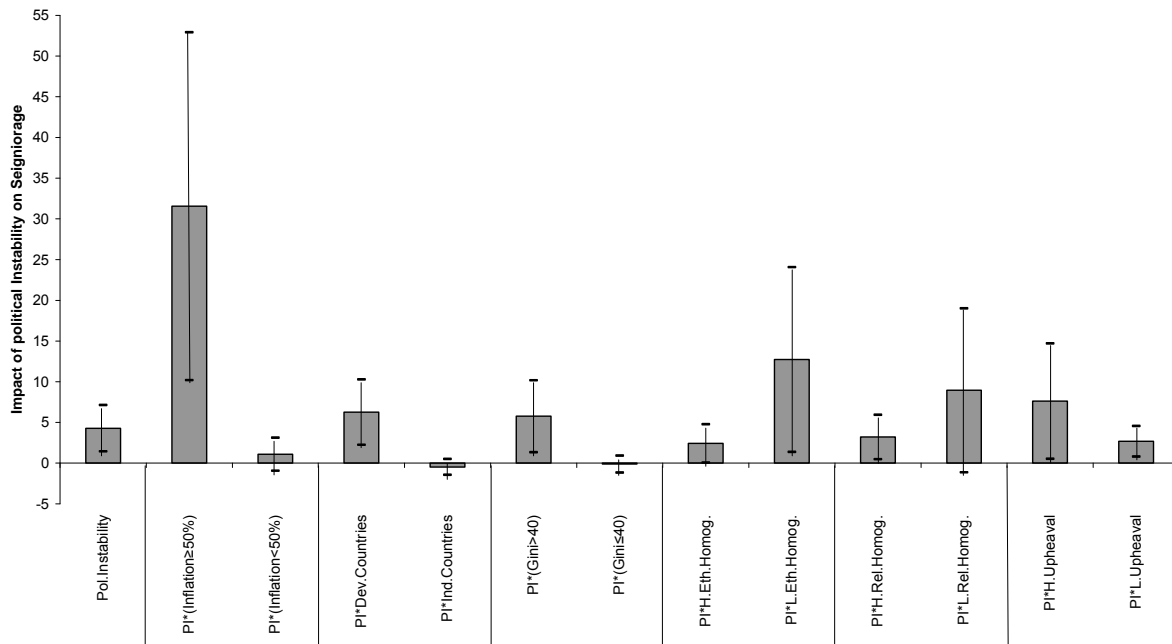
**Table 7: Controlling for Outliers and Instrumental Variables Estimations**

	Inf ≤ 1000	Seig ≤ (Mean+2SD)	LMS	LAD	IV GMM	IV LIML
Seigniorage	1	2	3	4	5	6
Cabinet changes (-1)	3.436 (2.97)***	1.284 (2.23)**	1.903 (7.04)***	1.148 (2.86)***	41.135 (1.91)*	39.256 (1.79)*
Ethnic Homogeneity Index	-25.853 (-2.76)***	-17.043 (-2.40)**	-5.340 (-8.30)***	.821 (.86)	-12.812 (-1.86)*	-11.837 (-1.66)*
Polity Scale	.037 (.19)	.142 (1.25)	.378 (13.9)***	-.167 (-4.13)***	-.195 (-.99)	-.199 (-1.02)
Urban population (% of total)	-.115 (-.76)	-.010 (-.12)	-.029 (-3.02)***	.081 (5.49)***	.297 (2.32)**	.313 (2.38)**
Real GDP per capita	-.001 (-4.08)***	-.001 (-7.08)***	-.001 (-15.5)***	-.001 (-11.0)***	-.001 (-2.33)**	-.001 (-2.38)**
Growth of Real GDP (-1)	-.293 (-2.62)***	-.323 (-3.58)***	.208 (6.43)***	-.068 (-1.42)	-.564 (-2.48)**	-.531 (-2.27)**
# Observations	2150	2293	2306	2306	2293	2293
# Countries	107	108	108	108	108	108
Adjusted R <sup>2</sup>	.18	.25	.02	.05	.13	.10

Notes:- In Columns 1 and 2, panel regressions controlling for country fixed effects were performed on the observations that complied with the conditions shown in the first row. Least Median of Squares estimation (LMS) was performed on the full sample in Column 3, and Least Absolute Deviation (LAD) in Column 4. Finally, instrumental variables estimations were performed in columns 5 and 6, using 2-step feasible Generalized Method of Moments (IV-GMM) and Limited Information Maximum Likelihood (LIML), respectively;

- Seigniorage, the dependent variable, was defined as the change in reserve money (IFS, line 14a) as a percentage of government revenues (IFS line 81);
- All 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%;
- The IV estimations of columns 5 and 6 were implemented using the command *ivreg2* of Stata. Lagged values one and two periods of *Cabinet Changes* were used as instruments of that variable. Orthogonality tests do not reject the exogeneity of the other explanatory variables. The option *cluster* was used in order to account for intra-country correlation.

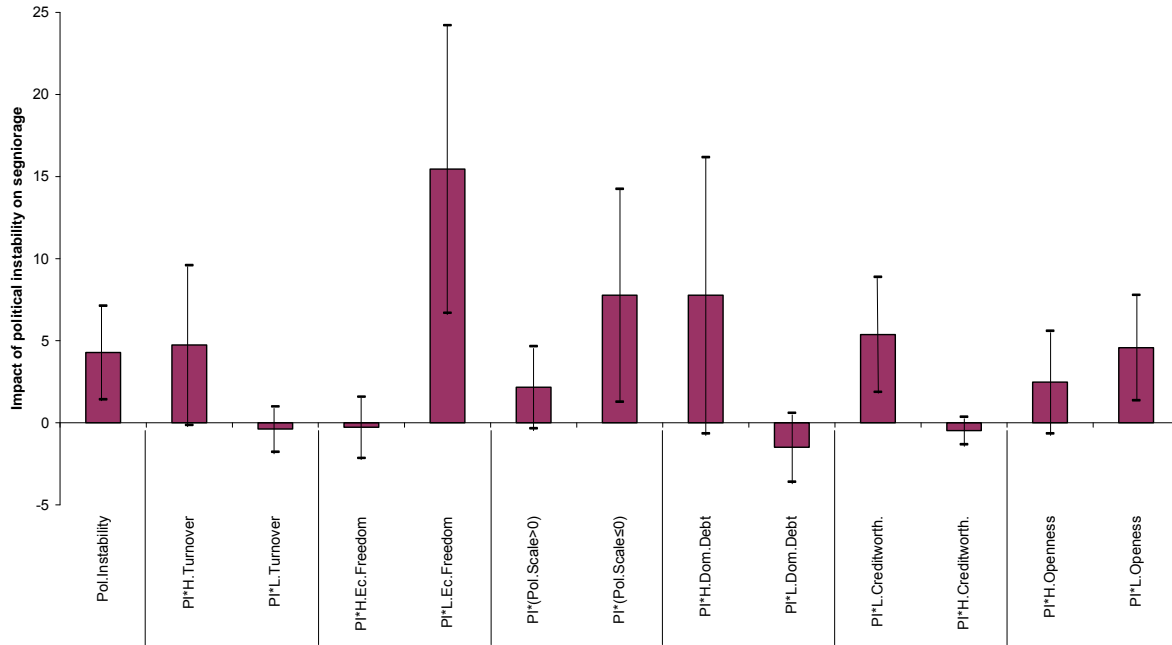
**Figure 1: Interactions of Political Instability**



**Notes:**

- The grey bars show estimated coefficients of panel regressions: see Column 3 of Table 2 for the coefficient of “Pol.Instability” (*Cabinet changes*), and Table A.3, in the Appendix, for the remaining coefficients (each pair, separated by vertical lines, corresponds to a separate estimation).
- 2-standard error bands are shown on top of the bars.
- In the horizontal axis, “H.” stands for *High*, and “L.” stands for *Low*.
- Seigniorage, the dependent variable, was defined as the change in reserve money (IFS, line 14a) as a percentage of government revenues (IFS line 81);
- The proxy used for political instability was *Cabinet Changes* (CNTS).

**Figure 2: More Interactions of Political Instability**



**Notes:**

- The grey bars show estimated coefficients of panel regressions: see Column 3 of Table 2 for the coefficient of “Pol.Instability” (*Cabinet changes*), and Table A.4, in the Appendix, for the remaining coefficients (each pair, separated by vertical lines, corresponds to a separate estimation).
- 2-standard error bands are shown on top of the bars.
- In the horizontal axis, “H.” stands for *High*, and “L.” stands for *Low*.
- Seigniorage, the dependent variable, was defined as the change in reserve money (IFS, line 14a) as a percentage of government revenues (IFS line 81);
- The proxy used for political instability was *Cabinet Changes* (CNTS).

## Appendix A: Seigniorage Across Countries

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

## Appendix A (cont.): Seigniorage Across Countries

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

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

## Appendix B: Descriptive Statistics

Variables	Obs.	Mean	Std.Dev.	Min.	Max.	Source
<b>Dependent:</b>						
Δ Reserve Money (% Government Revenues)	3172	14.41	71.18	-380.78	3108.74	IFS-IFM
Δ Reserve Money (%GDP)	4376	1.87	3.62	-29.40	65.53	IFS-IFM
<b>Explanatory:</b>						
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
Deposit Money Bank Assets / Central Bank Assets	4973	0.78	0.22	-0.11	1.34	BDKL
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 GDP	4725	3.73	7.44	-84.12	181.14	WDI-WB
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
Liquid Liabilities (%GDP)	3572	0.39	0.28	0	2.22	BDKL
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	CWN
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;  
 BDKL: Beck, Demirgüç-Kunt and Levine (2000);  
 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);  
 CWN: based on Cukierman, Webb and Neyapti (1992).

### Appendix C: Interactions of Cabinet Changes

Seigniorage	1	2	3	4	5	6
[Cabinet changes * (Inflation ≥ 50%)] (-1)	31.560 (2.95)***					
[Cabinet changes * (Inflation < 50%)] (-1)	1.096 (1.08)					
[Cabinet changes * (Dev. Countries)] (-1)		6.270 (3.12)***				
[Cabinet changes * (Ind. Countries)] (-1)		-.478 (-.98)				
[Cabinet changes * (Gini > 40)] (-1)			5.753 (2.60)***			
[Cabinet changes * (Gini ≤ 40)] (-1)			-.117 (-.22)			
[Cabinet changes * (Low Ethnic Homogeneity)] (-1)				12.714 (2.24)**		
[Cabinet changes * (High Ethnic Homogeneity)] (-1)				2.423 (2.06)**		
[Cabinet changes * (Low Religious Homog.)] (-1)					8.940 (1.78)*	
[Cabinet changes * (High Religious Homog.)] (-1)					3.203 (2.34)**	
[Cabinet changes * (High Upheaval)] (-1)						7.610 (2.14)**
[Cabinet changes * (Low Upheaval)] (-1)						2.685 (2.86)***
Ethnic Homogeneity Index	-23.214 (-2.59)***	-24.193 (-2.64)***	-25.843 (-2.90)***	-19.759 (-2.01)**	-22.867 (-2.44)**	-24.289 (-2.69)***
Polity Scale	.336 (1.64)	.295 (1.43)	.120 (.70)	.261 (1.28)	.305 (1.46)	.322 (1.57)
Urban population (% of total)	-.546 (-2.44)***	-.482 (-2.38)**	-.093 (-.87)	-.460 (-2.36)**	-.497 (-2.39)**	-.460 (-2.30)**
Real GDP per capita	-.001 (-4.48)***	-.002 (-5.32)***	-.001 (-5.75)***	-.002 (-5.31)***	-.002 (-5.03)***	-.002 (-5.19)***
Growth of Real GDP (-1)	-.521 (-3.09)***	-.640 (-3.73)***	-.421 (-3.47)***	-.644 (-3.80)***	-.660 (-3.72)***	-.647 (-3.78)***
# Observations	2247	2306	2250	2306	2284	2306
# Countries	107	108	105	108	107	108
Adjusted R <sup>2</sup>	.25	.22	.33	.22	.22	.22

Notes: - Panel regressions controlling for country 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%.

## Appendix D: More Interactions of Cabinet Changes

Seigniorage	1	2	3	4	5	6
[Cabinet changes * (High Turnover)] (-1)	4.735 (1.95)*					
[Cabinet changes * (Low Turnover)] (-1)	-.383 (-.55)					
[Cabinet changes * (Low Econ. Freedom)] (-1)		15.460 (3.53)***				
[Cabinet changes * (High Econ. Freedom)] (-1)		-.274 (-.29)				
[Cabinet changes * (Polity Scale ≤ 0)] (-1)			7.774 (2.40)**			
[Cabinet changes * (Polity Scale > 0)] (-1)			2.166 (1.74)*			
[Cabinet changes * (High Domestic Debt)] (-1)				7.766 (1.85)*		
[Cabinet changes * (Low Domestic Debt)] (-1)				-1.495 (-1.43)		
[Cabinet changes * (Low Creditworthiness)] (-1)					5.382 (3.08)***	
[Cabinet changes * (High Creditworthiness)] (-1)					-.476 (-1.13)	
[Cabinet changes * (Low Openness)] (-1)						4.580 (2.86)***
[Cabinet changes * (High Openness)] (-1)						2.481 (1.59)
Ethnic Homogeneity Index	-32.133 (-3.24)***	-29.650 (-2.93)***	-24.808 (-2.72)***	-18.016 (-2.11)**	-25.416 (-2.85)***	-24.931 (-2.73)***
Polity Scale	.205 (1.05)	.347 (1.52)	.487 (2.09)**	.294 (1.49)	.155 (.88)	.319 (1.53)
Urban population (% of total)	-.065 (-.32)	-.413 (-1.92)*	-.471 (-2.36)**	-.330 (-1.49)	-.095 (-.89)	-.498 (-2.45)**
Real GDP per capita	-.001 (-3.35)***	-.002 (-4.56)***	-.002 (-5.36)***	-.002 (-5.24)***	-.001 (-6.03)***	-.002 (-5.26)***
Growth of Real GDP (-1)	-.348 (-2.48)**	-.631 (-3.38)***	-.615 (-3.71)***	-.574 (-2.97)***	-.421 (-3.45)***	-.659 (-3.78)***
# Observations	1852	2082	2063	1788	2282	2297
# Countries	102	105	102	104	108	108
Adjusted R <sup>2</sup>	.21	.23	.24	.16	.32	.22

- Notes: - Panel regressions controlling for country 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%.