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MONEY AND MONETARY STABILITY IN EUROPE, 1300-1914

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Abstract

This paper investigates the determinants of monetary stability in Europe from the late medieval era until World War I. Through this period, the nominal anchor for monetary policy was the silver/gold equivalent of the monetary unit. States, however, frequently abandoned this anchor, some depreciating their monetary units against silver/gold less than 10 times and others more than 10,000 times between 1500 and 1914. To document patterns of monetary stability and put alternative theories of stability to test, we compile a new data set of silver/gold equivalents of monetary units for all major European states. We find strong support for political and fiscal theories arguing that states with weak executive constraints and intermediate levels of fiscal capacity had less stable monetary units. In contrast, the empirical support for monetary theories emphasizing the mechanics of the monetary system is weak. These findings support the primacy of political and fiscal factors over mechanical factors for monetary stability.

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MONEY AND MONETARY STABILITY IN EUROPE, 1300-1914

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January 2018

This paper investigates the determinants of monetary stability in Europe from the late medieval era until World War I. Through this period, the nominal anchor for monetary policy was the silver/gold equivalent of the monetary unit. States, however, frequently abandoned this anchor, some depreciating their monetary units against silver/gold less than 10 times and others more than 10,000 times between 1500 and 1914. To document patterns of monetary stability and put alternative theories of stability to test, we compile a new data set of silver/gold equivalents of monetary units for all major European states. We find strong support for political and fiscal theories arguing that states with weak executive constraints and intermediate levels of fiscal capacity had less stable monetary units. In contrast, the empirical support for monetary theories emphasizing the mechanics of the monetary system is weak. These findings support the primacy of political and fiscal factors over mechanical factors for monetary stability.

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I. Introduction

States recognized the importance of providing a stable monetary unit early on in history. The extent to which they actually could and did provide monetary stability, however, varied greatly. These differences in monetary stability have been explained by political and monetary theories, mostly based on anecdotal evidence from monetary histories of individual states. There are, however, few studies that take a comparative and long run view, work with comprehensive historical data, and empirically test alternative theories.[1]

This paper contributes to the literature by documenting the patterns and investigating the determinants of monetary stability for all major European states from the late medieval era until World War I. For this purpose, we compile a new and comprehensive monetary history dataset for 11 states, review historical patterns, examine and categorize alternative theories for determinants of monetary stability and empirically test them. The review of the historical patterns points to a divergence in monetary stability, with states in Northwest Europe stabilizing their monetary units early and others lagging behind. The empirical analysis suggests that this divergence was mainly driven by political and fiscal differences.

In studying long run patterns of monetary stability, the main challenge is keeping the analysis tractable. Monetary systems evolved over the centuries, and each individual monetary system had its own idiosyncrasies. We abstract away from these details and restrict attention to the key decision in monetary policy. For European states before the 20th century, the key monetary policy decision was setting the silver or gold equivalent of their monetary unit. In this decision, states weighed monetary stability against fiscal and monetary concerns. On the one hand, states targeted monetary stability, defined as the stability of the silver/gold equivalent of the monetary unit, because it was well-understood that instability disrupted economic activity and created political dissent. On the other hand, fiscal pressures and mechanics of the monetary system compelled states to depreciate their monetary units. Faced with these choices, some states kept their monetary unit relatively stable, while others depreciated them dramatically over the centuries.

The first part of the article puts this key monetary policy decision in historical context by describing the basics of the monetary systems and monetary standards. We discuss the silver, gold and fiat standards, where states pegged their monetary units respectively to silver, gold or left it to float. We also describe the mechanics of depreciation on each standard, the institutional

[1] Most long-run studies focus on the period after 1870, the widespread adaptation of the gold standard, see Bordo and Rockoff (1996), Bordo et al. (2017), Schularick and Taylor (2012) and Taylor (2002). For the earlier period, Reinhart and Rogoff (2009) provide a comprehensive review of the historical evidence on monetary stability and default through inflation, and Chilosi and Volcart (2010) empirically investigate the determinants of monetary stability for Northern Italy and Central Europe in 14th and 15th centuries, with findings generally consistent with the current paper.

and technological innovations, and the gradual transition from intrinsic to fiduciary and fiat money through the period under study.

In the following section, we introduce the monetary history dataset that we compiled to put patterns of monetary stability on empirical footing. The dataset covers all major European states, namely England, Dutch Republic, Portugal, Spain, France, Austrian Habsburgs, Venice, Sweden, Ottoman Empire, Poland-Lithuania and Russia between 1300 and 1914. For each state, the dataset tracks the silver/gold value of its monetary unit and other important aspects of the monetary system.

Reviewing the patterns, we don't find strong continent-wide trends for monetary stability. There was, however, a significant divergence between states**.** While states in northwestern Europe stabilized their monetary units early, states in southern and eastern Europe continued depreciate their monetary units until World War I.

To understand the determinants of the differences in patterns of monetary stability, we discuss and test two broad classes of theories. The first class emphasizes the role of political and fiscal factors that shaped the capacity and incentives of the state. We find strong empirical support for these theories. In particular, we find that states at intermediate levels of fiscal capacity depreciated their monetary unit the more. This finding is consistent with the argument that weak states lacked the capacity to run a monetary system, and strong states did not need seigniorage revenues. We also find that states with weak constraints on executive authority, where economic agents lacked the institutional means to prevent predatory monetary policy, depreciated their monetary unit more. Finally, we find that warfare, the main expenditure item through the period, triggered depreciations.

To establish the robustness of these empirical results, we cast a wide net and estimate four different econometric models. As the baseline model, we estimate OLS with panel corrected standard errors and fixed effects with the annual rate of change in silver/gold equivalent as the dependent variable. Second, to account for the discrete nature of the depreciation decision and to ensure that years with extreme depreciation rates do not drive the results, we estimate Ordered Logit models. Third, to address endogeneity concerns, we estimate IV models, instrumenting wars with nearby states' wars with third states[2], instrumenting current political regime with political regime history[3], and instrumenting fiscal capacity by an inverse distance-weighted average of fiscal capacity of other European states.[4] Finally, to account for the possibility that monetary stability under silver/gold standards and fiat standard were governed

[2] The identification strategy follows Gennaioli and Voth (2015).

[3] See Persson and Tabellini (2009) for the mechanisms of the persistence of political regimes.

[4] The identification strategy builds on the spillover of state capacity across states. Acemoglu et al. (2008) relies on spillover effects to instrument for income, and Boix (2011) and Madsen et al. (2015) for democracy.

by different processes, we estimate Seemingly Unrelated Regression Models. Hence, each of the four models addresses certain concerns about the estimation, and makes simplifying assumptions about the others. The results are consistent across the four models, lending credence to political and fiscal theories of monetary stability.

The second class of theories we test is monetary theories. These theories posit that states depreciated their monetary units to correct the mispricing of different monies in circulation due to the mechanics of the monetary system. We test four different versions of the argument. They respectively claim that depreciations corrected the mispricing i) between silver monies with different silver content ii) between silver and gold monies iii) between domestic and foreign monies iv) between silver/gold monies and the goods basket.

When we test these monetary theories, we don't find empirical support. On the face of it, this is an unexpected result. There is strong anecdotal support for each of the monetary theories in the monetary history literature. A finer reading of the monetary theories, however, points to important ways they differed from political theories. First, each monetary theory is only relevant for some states and some years, while political theories are generic and relevant for all states and all years. Second, monetary theories generally predict one-off and small depreciations, while political theories predict serial depreciations at high rates. Finally, historical evidence suggests that there were ways strong states with the right incentives could solve monetary problems without resorting to depreciation. Taken together, the evidence suggests that monetary theories mattered in specific instances, but over the long run, political factors were the main determinant of patterns of monetary stability.

Another issue we tackle is the historical relationship between monetary and price stability. The distinction between the two is that monetary stability concerns the stability of the value of the monetary unit in terms of silver/gold, and price stability concerns the stability of the monetary unit in terms of the goods basket.[5] Hence, to the extent that the silver/gold value of the goods basket changed, it introduced a wedge between monetary and price stability. We investigate whether the wedge between monetary and price stability was small or large, because if it was small, by explaining patterns of monetary stability, we also explain patterns of price stability.

For this purpose, we compile price level series for nine states in our sample and compare them with our money series. We find that for most states in our sample, the wedge between

[5] In this paper, the focus is on monetary stability, because states before the 20th century targeted monetary stability rather than price or output stability. Monetary stability was a convenient target, because it was well-defined and verifiable. Price stability was not a target, because it was not properly measured until the 20th century. Likewise, output was not well-measured, the impact of monetary policy on output was not well-understood, and with franchise limited to men of property, working class lacked the political clout to push expansionary policies through (Eichengreen and Sussman 2000: 10, 22; Eichengreen 1998: 30; Capie et al. 1994: 1; Bordo 2010: 209).

monetary and price stability was small. Hence, taken together with earlier results, we find that politics shaped patterns of monetary stability, and patterns of monetary stability shaped patterns of price stability.

These findings relate to different literatures and questions. For monetary economics literature, they support the view that it was ultimately politics that underpinned the monetary system. Through the period under study, there were major technological and institutional innovations, which paved the way for the transitions from intrinsic value to fiduciary and later to fiat monies. Yet, our empirical results suggest these changes did not necessarily stabilize or destabilize monetary units. Instead, we find that it was states' capacity and incentives that determined which innovations were adopted, to what ends they were employed, and how they affected monetary stability.

The paper also closely relates to the literature on the political roots of long run economic growth. We find that fiscal capacity and executive constraints stabilized monetary units and price levels. Arguably, monetary and price stability was in turn instrumental in facilitating economic activity and growth. We also document that the differences in monetary and price stability across states was dramatic, suggesting that the impact on economic growth might have been substantial. While the theoretical literature on political roots of long run growth is extensive, the evidence on specific channels this impact worked is scarce. These findings suggest that monetary stability was an important channel through which this impact worked.

The remainder of the paper proceeds as follows. The next section provides an outline of the evolution of monetary systems and standards in Europe from the Middle Ages to WWI. Section 3 introduces the monetary history dataset and reviews patterns of monetary and price stability over the centuries. The next two sections discuss the political and fiscal theories of monetary stability and tests them using the dataset. Section 6 reviews monetary theories of monetary stability and tests them. Section 7 discusses the results and relates them to the literature. The last section concludes.

II. History of Monetary Systems and Standards in Europe

In this section, we provide an overview of the monetary systems and standards in Europe until WWI. From the Late Middle Ages to 1870s, most European states were on the silver standard, and thereafter, on the gold standard. States also issued fiduciary monies, and by suspending their convertibility to silver and gold, occasionally experimented with the fiat standard. Below, we discuss the mechanics of the monetary system on each standard.

Running the monetary system was considered a royal prerogative in Europe since the reign of Charlemagne in the 9th century.[6] De facto control, however, changed hands following the swings in domestic political power balance. In the 10th century, with the breakdown of central authority and feudalization, local magnates took over the mints and coinage. By the 14th and 15th centuries, with the rise of centralized states, the pendulum swung back towards centralized control. Thereafter, in most parts of Europe, states set the monetary standards and operated mints either directly or through closely monitored franchises.[7]

States' monetary standard decision concerned the choice of the precious metal to peg their monetary unit. From the 14th century to the 1870s, most states were on the silver standard.[8] Accordingly, states set their monetary units, in which wages, prices and debts were recorded, equal to a certain weight of silver. Silver also dominated daily transactions, in the form of petty silver coins.

There were technical reasons for the predominance of the silver standard. Other metals were too heavy (such as tin, copper) or too light (gold) when cast into coins of a value convenient for transactions.[9] Silver was also favored because it was widely available in Europe. It was mined in Central Europe during the Middle Ages and in the New World after the 16th century.[10]

States set the silver equivalent of their monetary unit through petty silver coins. Each coin was minted with a certain silver content and a certain face in terms of the monetary unit. Dividing the silver content by the face value gave the silver equivalent of the monetary unit.

States ran or closely monitored the mints that produced the coins. Moneychangers, merchants and private individuals brought silver bullion and old silver coins to the mint. They left with the new coins after the silver was melted and coined. In regular times, the state kept a small percentage of the arriving silver to cover the costs of production and for profits (seigniorage).

Being on the silver standard, by itself, did not ensure monetary stability. Since the state had the prerogative to set the silver equivalent of the monetary unit, it also had the prerogative to change it. States used this prerogative almost always to lower the silver equivalent. Understanding the causes behind these depreciations is the question we tackle in this paper.

In 1717, England, in 1854, Portugal, and in the 1870s, the rest of Europe switched to the gold standard.[11] Gold coins had been produced since the Middle Ages. However, they had played a secondary role and were mainly used for international trade and large denomination

[6] Siekmann (2016:500-501)
[7] Eichengreen and Sussmann (2000: 8).
[8] Officer (2010: 358)
[9] Eichengreen (1998: 7).
[10] Kindleberger (1984: 23).
[11] The exact dates of de facto transition to the gold standard is not always clear-cut, see the appendix for the discussion of individual states. The reasons for the switch to gold has been extensively discussed in the literature and is beyond the scope of this paper, see Flandreau (1996) for a classification of different explanations.

transactions. With the switch to the gold standard, states set their monetary unit to equal to certain weight of gold and gold equivalent became the nominal anchor for monetary policy.[12]

Both during the silver and gold standard eras, states also issued fiduciary monies in the form of copper coins and paper notes. The term fiduciary refers to the fact that, these copper and paper monies had little intrinsic value of their own, but they were convertible to silver or gold upon demand. As long as states maintained the convertibility, the fiduciary monies were valued at their face value, and played a subsidiary role in the monetary system.

Fiduciary monies were the result of a long technological and institutional evolution. The main technological challenge was preventing counterfeiting, which became feasible by innovations in minting and printing technologies. The main institutional prerequisite was bureaucracies and banking systems that could support fiduciary monies. In the 16th and 17th centuries, copper coins were issued across Europe as fiduciary monies.[13] In the 18th and 19th centuries, paper notes became widespread, building on earlier experiments with transferable ledger money.[14]

Fiduciary monies, in turn, paved the way for the fiat standard. States switched to fiat standard when they suspended the convertibility of the fiduciary copper and paper monies to silver or gold. Once on the fiat standard, the silver/gold value of the monetary unit was determined by the supply and demand for copper/paper monies. More often than not, states on the fiat standard overissued fiat money and the silver/gold equivalent of the monetary unit rapidly depreciated. There are, however, also fiat standard experiments where states managed to keep the issue of fiat money within reasonable limits and avoided the collapse of the value of the monetary unit. The fiat standard experiments could last anywhere from a few years to decades. States continued to switch back and forth between commodity and fiat standards until WWI.

III. Patterns of Monetary and Price Stability

In this section, we introduce the monetary history dataset we have compiled and use it to review the patterns of monetary and price stability. The dataset covers England, Dutch Republic, France, Portugal, Spain, Austrian Habsburgs, Venice, Sweden, the Ottoman Empire,

[12] Before the transition from the silver to the gold standard, Western European states also experimented bimetallic standard, i.e. setting the monetary unit equal to both a specific weight of silver and a specific weight of gold simultaneously. Bimetallism, however, was inherently unstable, and bimetallic monetary systems were often effectively on either silver or gold standard. See the discussion in section 6.

[13] Copper coins had a long history going back to Greek and Roman times, but were not common during the Middle Ages. In the 16th and 17th centuries, the innovations in minting that made counterfeiting difficult, and increasing copper production in Sweden, Central Europe and Japan led to their resurgence. They reappeared in Venice in 1472, Habsburg Netherlands in 1543, France in 1577, Spain in 1596, England in 1613 and spread to the rest of Europe (Spooner 1972: 19; Sargent and Velde 2002: 40, 103, 247, 308-311; Wee 1977: 298).

As discussed in the text, across Europe copper coins were used as fiduciary or fiat monies. The exception to this rule was Sweden, which was the most important copper producer in Europe and occasionally issued intrinsic value copper plates.

[14] Bearer paper notes were issued by government-chartered private banks, government-owned banks or directly by the Treasury. The years bearer notes were in circulation were: Sweden (1661-1664, 1701-1914), England (1694-1914), France (1716-1720, 1789-95, 1800-1914), Austria (1762-1914), Russia (1769-1914), Spain (1781-1783, 1794-97, 1829-1914), Ottomans (1856-61, 1876-80), Portugal (1797-1914). Note that goldsmiths, money changers and private banks also issued various forms of bearer notes, but the focus in this study is on government backed notes.

Poland-Lithuania and Russia from 1300s to 1914. It is comprehensive in the sense that it covers all major states in Europe.[15] Both territorial empires such as the Ottomans and Austrian Habsburgs, and maritime powers with sizable rural hinterlands such as the Dutch Republic, Venice and Portugal, are represented. Similarly, the dataset covers not only the states in western Europe but also those in central and eastern Europe which have received less attention in the literature.

We compile data series for a number of variables. The main variable of interest is the silver/gold equivalent of the monetary unit. As discussed earlier, the silver/gold equivalent was the nominal anchor for monetary policy. Hence, stability of the silver/gold equivalent indicates monetary stability. We also compile price level, tax revenue, political regime, urbanization, real GDP per capita, interstate and civil war series to put the silver/gold equivalent series in context and to test alternative theories for determinants of monetary stability.

Building comparable and consistent silver/gold equivalent series requires resolving a number of issues. For each monetary system, at any point in time, coins of different metals and of different denominations and various fiduciary monies were simultaneously in circulation. States also overhauled their monetary systems numerous times, switched between commodity (i.e. silver or gold) and fiat standards and introduced new units and currencies. We tried to resolve the ambiguities by cross checking alternative data sources and reviewing the monetary history of each individual state. Appendix A presents our dataset, and all source series used to construct it. Appendix B discusses the construction of dataset and monetary histories of individual states.

A. Patterns of Monetary Stability

Figure 1 presents the main variable of interest, the silver/gold equivalents of the monetary units of different states from 1300 to 1914. For each monetary unit, we initially track the silver equivalent (left axis) and later the gold equivalent (right axis). The date of transition from silver to gold is marked with a dashed vertical line. We pick this date based on the de facto transition to gold standard.[16] Figure 1 also distinguishes between the periods the monetary system was on silver/gold standard (blue line) and fiat standard (red line).

Figure 1 helps identify the broad patterns in European monetary history. First and foremost, it establishes that states decreased the silver/gold equivalent of their monetary units to ever

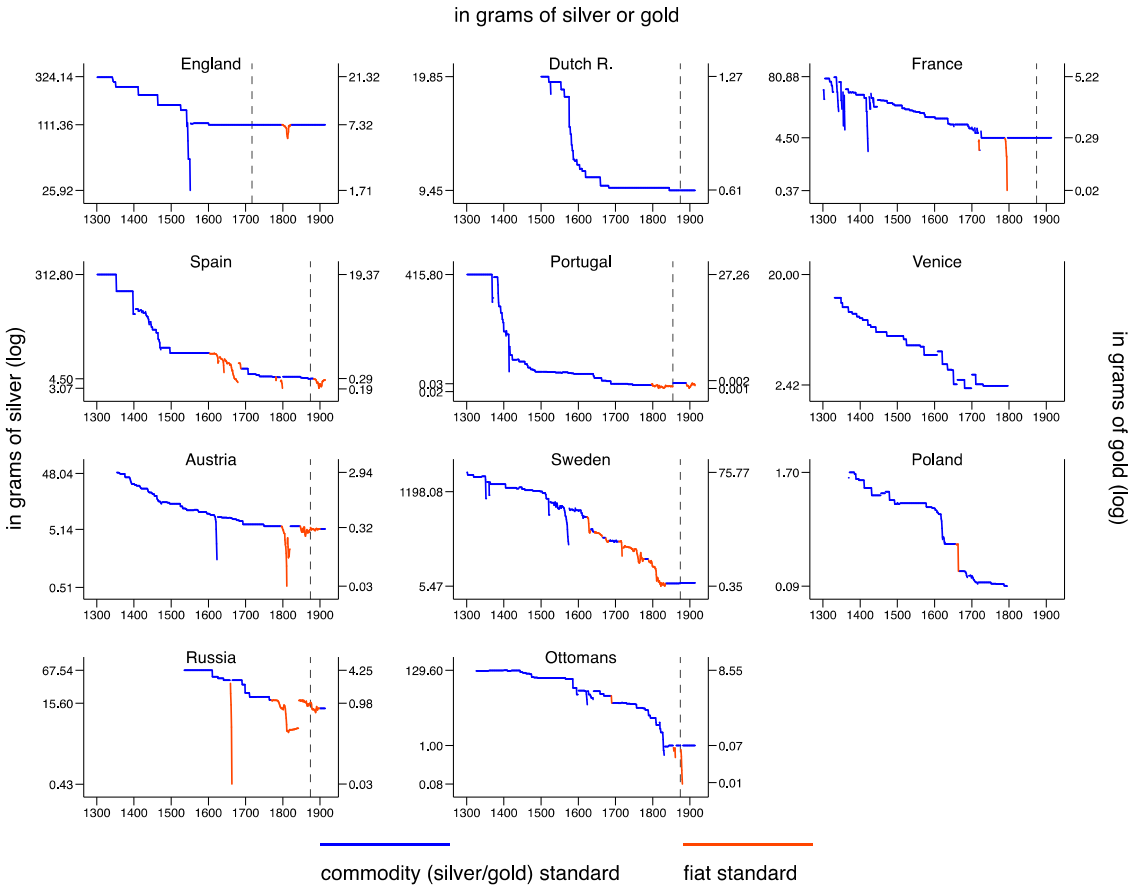
[15] The only major states in Europe that are excluded from our sample are Italy and Prussia/Germany, because their unification was completed in the 19th century, and thus do not belong to the long-term comparison. At the end of the 18th century, Poland is partitioned and Venice is occupied, so they drop from the sample.

[16] For dates of transition, see Capie and Goodhart (1994), Officer (2008) and the sources on individual polities in Appendix A. For some states, there is some ambiguity over the exact date of transition, but empirical patterns are not sensitive to the choice of date, because silver/gold price ratios were relatively stable for the relevant periods.

lower levels. For example, the silver equivalent of French franc fell from 80.880 grams of silver in 1300 to 0.370 grams in 1874, while Ottoman kuruş fell from 129.60 grams to 1 grams of silver.

These numbers understate the true extent of the depreciation, because they do not correct for redenominations. Redenominations were essentially similar to removing zeros from monetary units in the modern period. [17] After rapid depreciation episodes, states took depreciated monies out of circulation at the discounted value and reintroduced new money at the higher pre-depreciation value. In Figure 1, redenominations appear as discontinuous jumps to a higher value.[18]

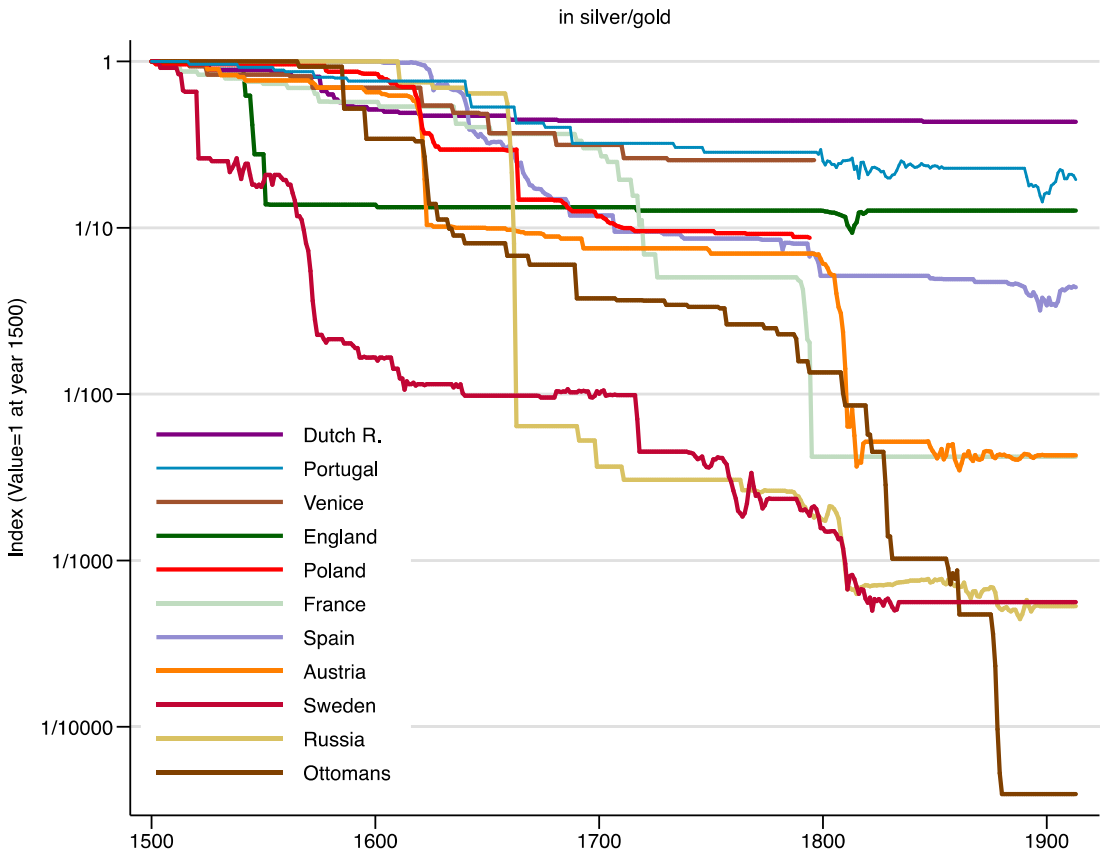
Figure 1. The Value of Monetary Unit, 1300-1914



Notes: Blue line indicates that the monetary system on a commodity (either silver or gold) and red line on a fiat standard. Left y-axis shows the value of monetary unit in grams of silver, the right y-axis in grams of gold. The dashed vertical line marks the date the figure switches from tracking the value of the monetary unit in silver to in gold.

[17] Edvinsson and Sodenberg (2011: 276-277)
[18] For example, for the Ottomans, there were redenominations in 1600, 1641, 1818, 1832, 1863 and 1881.

Figure 2. Index of the Value of Monetary Unity, 1500-1914



Notes: The series for Russia starts in 1535 so we normalize the index to 1 at this date. Poland-Lithuania and Venetian Republic drop from the sample respectively in 1795 and 1797. The index switches from tracking the value of monetary unit in silver to gold in 1717 for England, 1854 for Portugal, and 1870s for other states. Despite the different dates for the switch, because the market silver to gold ratio fluctuated in a narrow band from 1700s to 1870s, it has negligible impact on overall patterns.

Figure 2 puts the cumulative depreciation rates in comparative perspective after correcting for the redenominations. In particular, Figure 2 plots the index of the value of the monetary unit first in terms of silver and later in terms of gold, normalizing the index value in 1500 to 1, correcting for redenominations, and putting all states in one graph. The figure makes clear that once redenominations are factored in, the cumulative depreciation rates of monetary units are significantly higher than those evident in Figure 1. It also shows that the extent to which different states depreciated their monetary units against silver/gold varied greatly. At one extreme, Dutch Republic depreciated by about 2.3 times, and at the other extreme, the Ottomans depreciated by about 25000 times. These two numbers correspond to average annual depreciation rates of 0.2 and 2.5 percent respectively, with the other states falling in-between.

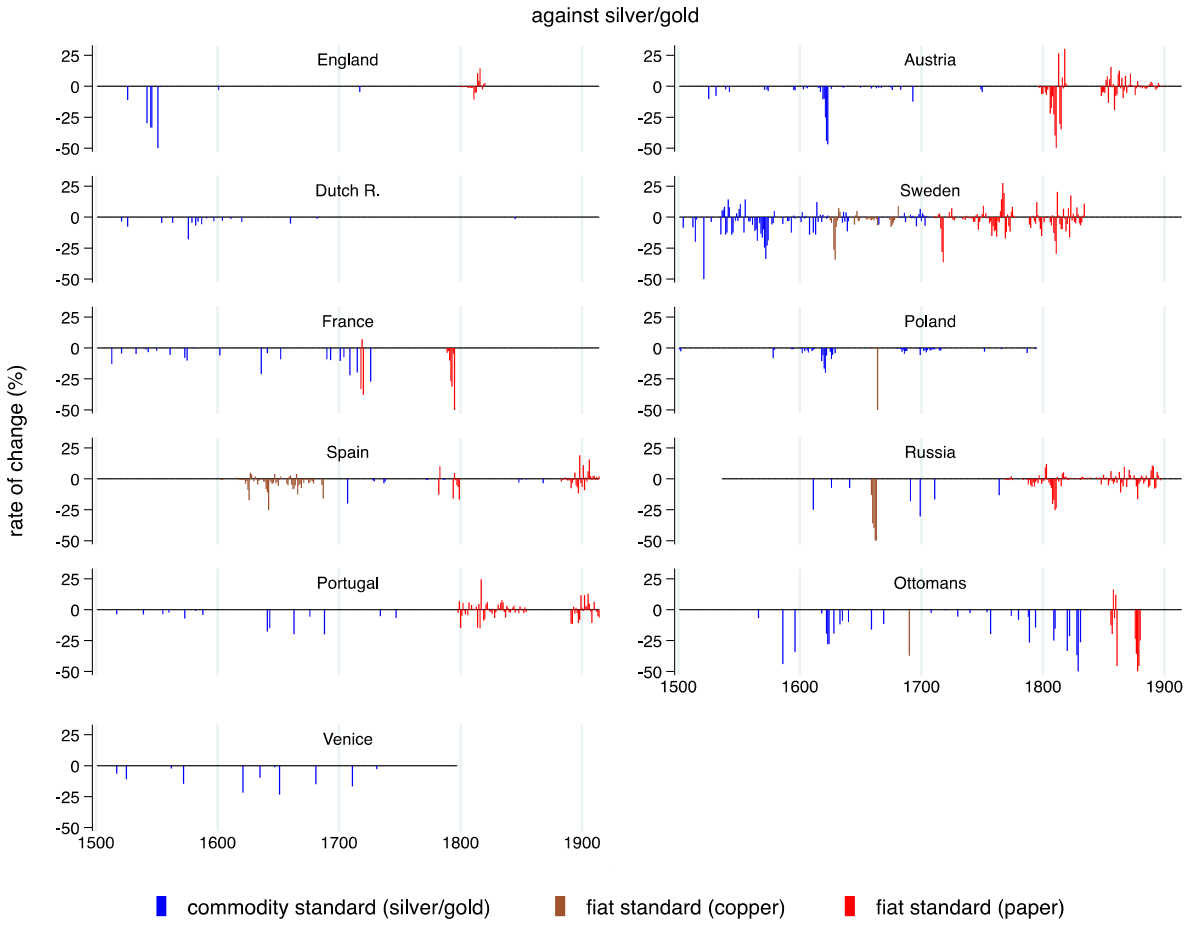
The data set also allows tracking the changes in the way states depreciated their monetary units over the centuries. To see this, consider Figure 3, which plots the annual rate of change in

silver/gold equivalent. The y-axis is the percentage change in the value of monetary unit first in terms of silver and later in terms of gold and the x-axis is the dates between 1500-1914. Figure 3 also differentiates between changes in value of monetary unit that occurred when on silver/gold standard (blue bars), fiat standard with copper coins (brown bars) and fiat standard with paper notes (red bars).

Before the 17th century, European states were on the silver standard and petty silver coins dominated the circulation. In this period, states depreciated their monetary units by decreasing the silver content of their coins, marked with blue in Figure 3.

By the 17th century, states also depreciated their monetary units by fiat copper coin issues. In these episodes, the copper coins were initially issued as fiduciary money convertible to silver, but the convertibility was later suspended. These episodes are marked with brown in Figure 3. They lasted only a few years in some states (e.g. Russia and Ottomans) and decades in others (e.g. Spain). They were invariably accompanied by a depreciation of the monetary unit against silver and an eventual return to the silver standard.

Figure 3. Rate of Change in the Value of Monetary Unit, 1500-1914



Finally, by the 18th and 19th centuries, states experimented with fiat paper note issues, marked with red in Figure 3. The paper notes were also initially issued as fiduciary money, but later made inconvertible. Figure 3 suggests that while some fiat note issues lasted a few years and collapsed in value rapidly (e.g. the Ottomans in the 19th century, France during the Revolution), others lasted for decades with fluctuating value (e.g. Austria and Russia in the late 19th century).

Overall, the evidence for a continent-wide trend for monetary stability is weak. There is, however, a clear divergence across states. Some states stabilized their monetary unit early. England did so by the mid-16th century, except for the fiat episode during the Napoleonic wars. Dutch Republic stabilized its monetary unit in the early 17th century. France stabilized its monetary unit after 1795 following the fiat money experiment of the Revolution. In contrast, states in Southern and Eastern Europe continued to depreciate their monetary units until WWI.

Another pattern that emerges from the Figures is that depreciations tended to episodic. In particular, long periods of stability alternated with episodes that states depreciated their monetary units in consecutive years. There are also instances of one-off depreciations, but they are few and at low rates. Consequently, over the long run, their contribution to the overall decline silver/gold equivalent appears limited.

B. Patterns of Price Stability

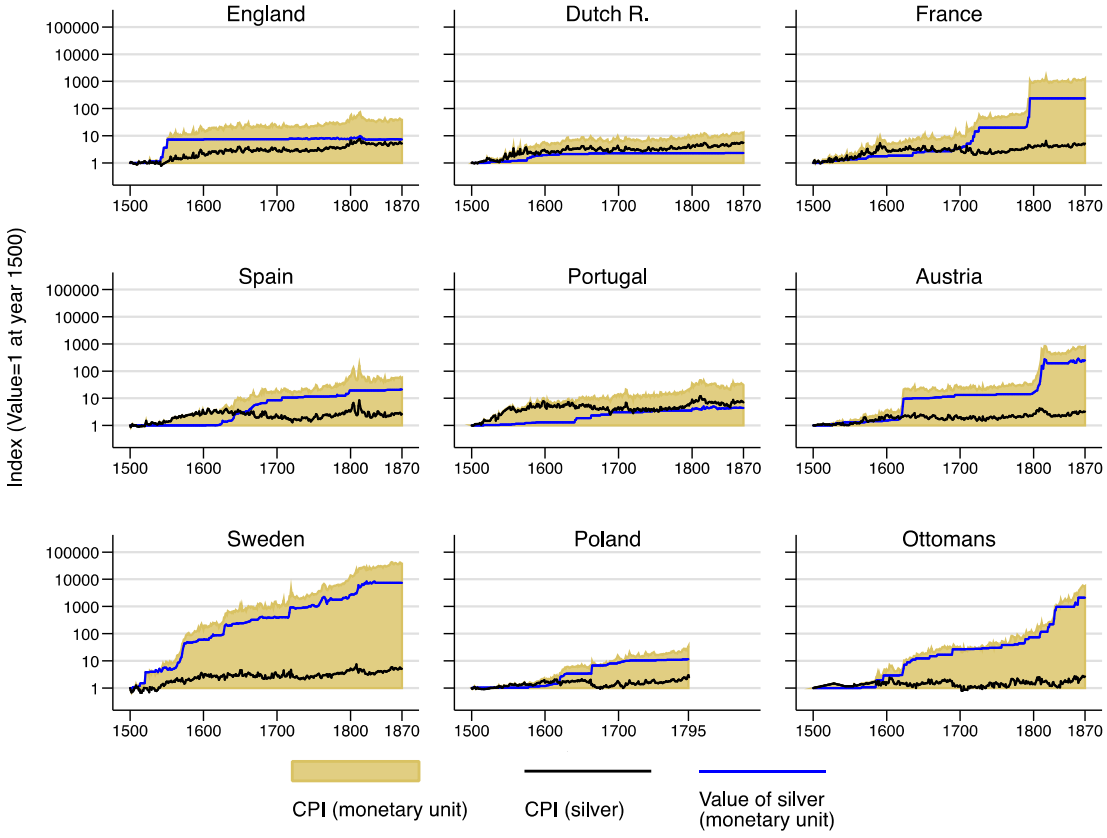
The discussion up to this point focused on monetary stability and evaded price stability. The reason is that states in this period targeted monetary stability and used the silver/gold equivalent of the monetary unit as the nominal anchor. Price stability was not a target, because price level was not accurately measured and not well-understood.

Even tough states did not explicitly target price stability, that does not mean price stability was inconsequential. On the contrary, there is a large literature on the economic and political consequences of price inflation during the Early Modern Period. In this section, we document patterns of price stability, and relate our findings to this literature.

Changes in price level in this period can be decomposed into two components. Monetary units depreciated against the goods basket first because monetary units depreciated against silver/gold, and second because silver/gold depreciated against the goods basket. The first component was discussed extensively in the earlier sections. The second component, the depreciation of silver/gold against the goods basket, was mainly driven by the inflow of silver and gold from the New World. The empirical question is the relative contribution of these two components to the changes in price level.

Figure 4 addresses this question. To keep the figure simple, we restrict the analysis to silver standard era (1500-1870). In the figure, the yellow area plots the price level, i.e. consumer price index in terms of the monetary unit of each state, normalized to 1 in year 1500. The figure show that there were dramatic differences in changes in the price level across the states. At one extreme, the monetary unit depreciated against the goods basket around 10 times in the Dutch Republic, and at the other extreme, around 10000 times in Sweden. The figure also separates out the contributions of the two components. The blue lines plot the depreciation of the monetary unit against silver, i.e. the contribution of monetary instability. The monetary unit depreciated against silver less than 10 times in the Dutch Republic, Portugal and England, more than 10 times in Spain and Poland[19], more than 100 times in France and Austria, and more than 1000 times in the Ottoman Empire and Sweden. The black lines plot the depreciation of the silver against the goods basket. For different states in the sample, silver depreciated against the goods basket between 3 to 6 times.

Figure 4. Consumer Price Index and Its Components, 1500-1870



[19] Poland drops out of the sample in 1795.

These numbers show that the depreciation rate of the monetary units against silver was either at the same or at higher orders of magnitude than the depreciation rate of silver against the goods basket. Hence, for most states, monetary instability was the main driver of price instability. Note also that the depreciation rate of monetary unit against silver had much higher variation across states than the depreciation rate of silver against the goods basket. As such, monetary instability drove almost all of the variation in the price inflation levels across states.[20]

These patterns make clear that states' monetary policy, and specifically, depreciation decisions shaped patterns of price stability. By extension, they shaped any disruptive effects price inflation had on economic and political outcomes. The impact of silver inflows from the New World, which can be considered an exogenous variable for most states, was less important. This finding provides further motivation for understanding why states depreciated their monetary units. We turn to this question in the next section.

IV. Political and Fiscal Theories of Monetary Stability

This section reviews political and fiscal theories of monetary stability. The first part discusses how depreciating the monetary unit provided fiscal relief. The second part discusses how fiscal capacity, political regime, and war shaped the capacity and incentives to depreciate the monetary unit against silver/gold.

The common premise of political theories is that states depreciated their monetary unit to generate seigniorage revenue. The exact mechanism through which depreciation generated revenue changed over time. Before the 17th century, states were on the silver standard, and petty silver coins dominated the circulation. In this period, states generated seigniorage revenue by decreasing the silver equivalent of the monetary unit, reminting older coins with high silver content into new coins with less silver and appropriating the difference.[21] After the 17th century,

[20] The basic findings remain robust if we extend the analysis to the gold standard era. After 1870, monetary units depreciated significantly against gold in Russia and the Ottomans, first depreciated and then appreciated against gold in Spain, Portugal and Austria, and did not change in value against gold in the rest of the states in the sample. As for the value of gold in terms of the goods basket, across Europe, it increased between 1870 and 1890 and declined between 1890 and 1914, ending the period close to the levels it started. Hence, in the gold standard era, it was again monetary instability that drove the variation in price inflation levels across states.

[21] The reason as to why private individuals would willingly accept to leave the mint with less silver/gold than they brought in has been debated in the literature. The answer is straightforward for the regular times when the silver/gold content of coins was stable and mints took a cut of around a few percent of the deposited silver/gold. Since the individuals brought nonstandard old coinage and unminted bullion and left with new standardized coins, they were willing to pay a cut for the convenience of using the new coins in transactions.

The answer is less immediate for depreciation episodes when the mint retained a much higher fraction of the silver/gold deposits, often exceeding 10 percent. The explanation offered in the literature rests on the premise that public at large lagged behind in detecting the decrease in silver/gold content of coins and arbitrageurs colluded with the state to use this lag for profit. More specifically, in depreciation episodes, states replaced old coins with new coins that had the same face value in terms of the monetary unit but had significantly lower silver/gold content, and so, for any number of old coins turned in to the mint, states produced a significantly higher number of new coins. As a result, when arbitrageurs brought old coins to the mint, the state could pay them back with a higher number of new coins, while also increasing the number of coins it kept as its cut. Arbitrageurs profited from this deal, because they left with more coins than they brought in, and could spend these coins before public at large detected the decrease in their silver/gold content and the price level in terms of the monetary unit adjusted upwards. Public at large lost, because eventually the decrease in silver/gold content of the new coins became public knowledge, prices in terms of the monetary unit rose, and purchasing power of the new coins they held fell.

states increasingly depreciated their monetary unit by switching to the fiat standard and overissuing inconvertible copper/paper money. Both depreciation of silver/gold coins[22] and fiat money issues[23] could generate substantial revenues.

There was also a second way depreciating the monetary unit could provide fiscal relief. If a state's fiscal obligations were denominated in its own monetary unit, depreciating the monetary unit decreased their real value. Hence, under fiscal pressures, states often depreciated to default on debt[24] or pay their soldiers with depreciated coins.[25]

Beyond the common premise that depreciating the monetary unit provided fiscal relief, different threads in the literature emphasize different factors that shaped state's trade-off between monetary stability and fiscal concerns.

A. Fiscal Capacity

Historical evidence suggests that fiscal capacity influenced the incentive and the capacity to generate seigniorage revenue in opposite ways. On the one hand, higher fiscal capacity curtailed the incentive to depreciate the monetary unit.[26] For states, depreciating the monetary unit was not the preferred method to raise revenue, because monetary instability hurt economic activity and created political discontent. To the extent that states could finance their expenditures by taxation, they sought to avoid depreciations. Hence, all else equal, states with high fiscal capacity would be expected to have more stable monetary units.

On the other hand, a certain level of fiscal capacity was itself a precondition for running a monetary system. Weak states lacked this capacity, had difficulties in keeping mints open, produced coins intermittently, and lacked the banking systems to circulate fiduciary and fiat monies. They had low domestic money stock to GDP ratios and economic agents switched to foreign coins or used silver/gold by weight.[27] Often, the monetary unit remained stable, because

There is widespread agreement in the literature on this explanation. Detection of the silver/gold content was difficult and required expert knowledge. While moneychangers, silver and goldsmiths could detect the changes in a short time, the detection by the public and the adjustment in prices could take up to a few years (Susmann and Zeira 2003; Munro 2008; Munro 2012). States also actively adopted policies to delay the detection and profit from depreciation, such as banning weighting of coins (Selgin and White 1999). Consequently, the minting volume and seigniorage revenues increased dramatically after depreciations (Redish 2000; Velde et al. 1999). Rolnick et al. (1996) provide evidence that under certain circumstances prices might have adjusted quickly, but they do not challenge the result that depreciations generated revenues for state.

[22] During the Great Debasement (1544-1551), the seigniorage rate from in England rose from 2.1 to around 20.1 percent (Glassman and Redish, 1988). Minting volumes also rose. As a result, the seigniorage revenues that had not exceeded 2 percent of the total revenues in regular times constituted around 25 percent of the revenues (Rolnick et al. 1996).

[23] Seigniorage revenues form fiat money issues constituted between 40%-90% of the French treasury revenues between 1789-1796 (White 1995).

[24] Reinhart and Rogoff (2009:174). As a result, lenders often demanded that the debt to be denominated in more stable international coins.

[25] Pamuk (2000).

[26] See Glassman and Redish (1988: 93).

[27] Bonfatti et al. (2017).

no new coins were issued for long periods of time. All in all, weak states tended to lack the capacity to circulate money and profit from depreciations.[28]

Taken together, these two arguments suggest that states at intermediate levels of fiscal capacity depreciated the more, because strong states lacked the incentive and weak states lacked the capacity to generate revenue through depreciations:

H1: States at intermediate levels of fiscal capacity depreciated their monetary unit more.

B. Political Regime

A second set of arguments concern the impact of political regime on monetary stability. Political regime determined who had a say in monetary decisions. Consequently, it determined the incentives with respect to the trade-off between monetary stability and seigniorage revenues. Broadly speaking, nobility, soldiers and public at large did not favor depreciations, because monetary instability hurt them. As such, when they had a say in monetary decisions, they used it to constrain predatory monetary policy.[29] For example, the parliament in England[30] and the Cortes in Spain[31] worked to prevent depreciations.

A second channel through which executive constrains might have facilitated monetary stability was through public debt. Historically, limits on executive power and the credible commitment to repay debt facilitated public borrowing.[32] In periods of fiscal emergency, public debt was a more effective and less costly way to raise revenue than depreciating the monetary unit. To the extent that states could borrow, they refrained from depreciating the monetary unit. Both arguments are consistent with the following hypothesis:

H2: States with greater constraints on executive authority depreciated their monetary unit less.

C. Warfare

Monetary history literature provides abundant evidence that the fiscal demands of war was a major cause of depreciations.[33] For one, wars constituted by far the largest expenditure item

[28] As cases in point, consider the Ottoman and Polish monetary systems. Ottoman monetary unit was stable in the 16th century, the high point of the Empire. Early 17th century, state capacity declined, accompanied by depreciations. Between 1640-1680, monetary unit was relatively stable, but this was ultimately because mints were closed and European coins replaced Ottoman coins in circulation. With the buildup of state capacity in the 19th century, Ottoman state resorted to dramatic depreciations and experimented with fiat money issues to generate revenue (Pamuk, 2000). For Polish-Lithuanian state, 16th century was the golden age followed by decline in state capacity in 17th and 18th centuries. Despite the weakness of the state, in comparative perspective, monetary unit was relatively stable, because mints worked only intermittently and currency substitution was widespread. The single attempt to issue copper fiat money was short-lived (1659-1662), and the only paper note issue was on the year before its final partition (1794) (Wójtowicz and Wójtowicz, 2003).

[29] See Chilosi and Volckart (2010:41); Kohn (1999: 24).

[30] Eichengreen and Sussman (2000: 10); Cipolla (1976: 34), Allen (2016:50)

[31] Van Zanden et al. (2012)

[32] Stasavage (2007, 2011)

[33] Chilosi and Volckart (2010); Kindleberger (1991); Motomura (1994); Eichengreen and Sussman (2000); Bordo and Vegh (2002); Bordo

through the early modern period, ranging from 50% to 90% of public expenditure.[34] Not only warfare was expensive, but also more volatile than other expenditure items. Because regular taxes were difficult to adjust in a short time, during wars, states turned to seigniorage.[35] Consequently:

H3: States depreciated their monetary unit more during wars.

V. Testing the Theories

While monetary histories of individual states provide anecdotal support for political and fiscal theories, they have not been systematically tested. Below, we discuss the variables, the econometric models, and test the theories.

A. Variables

As the dependent variable, in different econometric models, we use two different proxies of monetary stability. In most models, the dependent variable is the annual rate of change in the silver/gold equivalent of the monetary unit. Only for the Ordered Logit Model, the dependent variable is whether the state depreciates, holds constant, or appreciates its monetary unit against silver/gold. For both proxies, we rescale the dependent variable such that when monetary unit depreciates, it takes a positive value and when it appreciates, it takes a negative number. Hence, a positive estimated coefficient for an explanatory variable means that an increase in the explanatory variable is associated with the depreciation of the monetary unit.

The fiscal capacity argument (H1) posits that states at intermediate levels of fiscal capacity depreciated their monetary unit the more. To proxy for fiscal capacity, we use real tax revenues per capita.[36] To filter out year-to-year fluctuations and alleviate simultaneity bias, we calculate a 10-year moving average of real tax revenues per capita and lag it one year. Since H1 argues for a nonlinear effect, we also add the square of the real tax revenues per capita to the regression equation.

The political regime argument (H2) posits that states with stronger constraints on executive authority depreciated their monetary unit less. The proxy for this argument is the executive constraints variable based on Acemoglu et al. (2005) before 1800 and Polity IV database after. The variable captures the institutionalized constraints on the decision-making powers of chief

and Kydland (1995); Selgin and White (1999); Kahan and Hellie (1985: 322).

[34] Hoffman (2015).

[35] Click (1998).

[36] Per capita tax revenues per year, in grams of silver, are based on Karaman et al. (2017). The consumer price index, which tracks the daily cost of food items totaling 1941 calories, fuel and clothing in grams of silver, is based on Allen (2001) and other sources listed in Appendix B. The proxy for fiscal capacity, real tax revenues per capita, is calculated by dividing the former by the latter.

executives by accountability groups such as legislatures, councils of nobles and the judiciary apparatus. It is rescaled to vary between 0 and 1 with a higher score indicating more constraints.

Warfare argument (H3) posits that wars between states caused depreciations. We calculate the proxy for warfare as follows. First, for each state and year, we calculate the number of wars the state is involved in based on Brecke's (1999) war dataset. We then calculate a 3-year moving average of this variable, since the fiscal pressure of war built up over time. Lastly, we lag the variable one year to alleviate the simultaneity bias in estimation**.**

In some specifications, we also include a proxy for civil wars, calculated again as a lagged 3-year moving average of the number of civil wars for each state based on Brecke (1999). The underlying argument is similar to the argument for interstate wars. Civil wars required financing, and might have induced states to depreciate their monetary units to generate revenue.[37]

As the proxies for economic development, we include the urbanization rate and real GDP per capita. These series are respectively based on de Vries (2006) and Broadberry et al. (2015). The theoretical prediction for the effect of economic development is not clear cut, because urbanization was related to a variety of different economic and social processes, with countervailing effects.[38]

Population is included in the regressions as a proxy for the size of the polity and any impact it might have on the incentives for and feasibility of depreciations. In some specifications, we include a dummy for the gold standard era, which is often described in the literature as a particularly stable period.[39]

In all specifications, we include state fixed effects, which control for any omitted attributes that do not vary over time. In some specifications, we include century fixed effects, and in others, linear and quadratic time trends to control for period specific factors common to all states.

We estimate the regressions for independent states between 1500-1910. The years that states were under occupation or under suzerainty of other states are left out, as the monetary decisions were no longer shaped by domestic considerations. The years before 1500 are also left out because in this period executive authority was often fragmented and local magnates had

[37] Aisen and Veiga (2008).

[38] On the one hand, economic development and urbanization are associated with greater ease to collect taxes and, thus, states might seek seigniorage revenues less (Aisen and Vega 2008; Click 1998). On the flipside, economic development is correlated with monetization (Wee 1977: 290), which might imply greater incentives to seek seigniorage revenue. Furthermore, urbanization exacerbates political conflicts, which might in turn induce to monetary instability (Cukierman 1992). Urbanization was also associated with the rise of commercial interests. These interests might demand stability for lower transaction costs, or depreciations to depress real wages (Chilosi and Volckart 2010; Eichengreen and Sussman 2000:12; Allen 2009: 388-389; Allen 2016: 42, 48).

[39] Sources for population are listed in Appendix B.

significant prerogative over monetary decisions, complicating the political calculus.[40] The summary statistics for the variables are presented in Table 1.

TABLE 1: SUMMARY STATISTICS FOR VARIABLES

Variable	Description	Obs.	Mean	Std Dev.	Min.	Max
Depreciation Rate	Depreciation rate of the monetary unit (percent)	4063	0.89	5.18	-30.33	92.00
Depreciation Decision	1 if depreciation of 3 percent or more, -1 if appreciation of 3 percent or more, 0 otherwise	4063	0.06	0.32	-1	1
Real Tax Revenues Per Capita	Per capita taxes, in grams of silver, divided by the silver price level, 10 year moving average, lagged one year	3867	36.66	32.42	0.56	163.24
Executive Constraint	Constraint on the executive	4105	0.24	0.27	0	1.00
War	Number of wars, 3-year moving average, lagged one year	4327	0.75	0.91	0	5.33
Civil War	Number of civil wars, 3-year moving average, lagged one year	4521	0.13	0.33	0	2.33
Urbanization	Urbanization Rate (percent)	4266	10.25	9.36	0	61.90
Real GDP per capita	Real GDP per capita (1990 international dollars)	4521	993.03	484.04	496	4316.55
Population	Log of population (in millions)	4268	1.91	1.11	-0.22	5.08

B. OLS with Panel Corrected Standard Errors

Testing theories of monetary stability is not straightforward. The estimation is complicated by endogeneity, serial correlation, the switches between different monetary standards and the discrete nature of the decision to whether to depreciate the monetary unit or not. Consequently, the approach we adopt is to estimate four different econometric models, each addressing different concerns. These models are, in the order discussed below, OLS with panel corrected standard errors, Ordered Logit, Two Stage Least Squares and Seemingly Unrelated Regressions.

Our base econometric specification, specification 1 in Table 2, is OLS with state fixed effects and panel corrected standard errors. We assume that the disturbances are heteroscedastic, serially correlated and contemporaneously correlated across panels. The dependent variable is the depreciation rate, taking a positive value in depreciation years and negative value in appreciation years. As explanatory variables we include executive constraints, real tax revenues per capita and its square, proxies for war and civil war. The regression equation is:

$$(1)\quad Depreciation\ Rate_{i,t} = \alpha_i + \theta_1 Executive\ Constraint_{i,t} + \theta_2 Real\ Tax\ Revenue_{i,t} + \theta_3 \left(Real\ Tax\ Revenue_{i,t}\right)^2 + \theta_4 War_{i,t} + \theta_5 Civil\ War_{i,t} + \varepsilon_{i,t}$$

[40] Redish (2000:48), Eichengreen and Sussman (2000:8), Cipolla (1963:421), Vilar (1991:170).

where α_i are state dummies and $\varepsilon_{i,t}$ is the disturbance term that exhibits heteroscedasticity, contemporaneous correlation and autocorrelation. Specification 2 adds urbanization rate and log population as control variables. Specification 3 replaces urbanization rate with real GDP per capita. Specification 4 includes a dummy for gold standard years. Specification 5 runs the regression for 1500-1799. In the 19th century the politics of monetary policy might have changed, because of industrialization, advent of mass armies, and the extension of franchise. Moreover, Venice and Poland-Lithuania drop from the sample, which might cause sample selection issues. Finally, specification 6 includes year and year squared and specification 7 century dummies to control for common trends over time.

TABLE 2: DETERMINANTS OF DEPRECIATION OF MONETARY UNIT, OLS WITH PCSE

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Executive Constraint	-3.2989**** (0.6426)	-3.4974**** (0.6705)	-3.4151**** (0.6690)	-3.8209**** (0.7319)	-7.5313**** (2.0119)	-3.6590**** (0.6892)	-3.6231**** (0.7075)
Real Tax per Capita	0.0431*** (0.0143)	0.0448*** (0.0165)	0.0463*** (0.0170)	0.0393** (0.0164)	0.0351* (0.0199)	0.0289* (0.0161)	0.0362** (0.0167)
Real Tax per Capita Squared	-0.0002** (0.0001)	-0.0002** (0.0001)	-0.0002** (0.0001)	-0.0002** (0.0001)	-0.0002** (0.0001)	-0.0002* (0.0001)	-0.0002* (0.0001)
War	0.7079**** (0.1105)	0.6989**** (0.1246)	0.7140**** (0.1151)	0.7156**** (0.1242)	0.5910**** (0.1196)	0.7854**** (0.1201)	0.7165**** (0.1267)
Civil War	0.7811*** (0.2712)	0.8213*** (0.2725)	0.8039*** (0.2827)	0.8410*** (0.2840)	0.8277*** (0.3232)	0.8145*** (0.2723)	0.7461*** (0.2768)
Population (log)		-0.2106 (0.3424)	-0.1601 (0.3756)	-0.2748 (0.3402)	0.1312 (0.5236)	-1.0972** (0.5302)	-0.9026* (0.5006)
Urbanization		0.0413* (0.0230)		0.0372 (0.0230)	0.1035** (0.0427)	0.0552** (0.0239)	0.0524** (0.0249)
Real GDP per Capita			0.0004 (0.0004)				
Gold Standard Dummy				0.6892 (0.4804)			
Observations	3739	3734	3734	3734	2779	3734	3734

Notes: The dependent variable is the depreciation rate. Estimated using Stata xtpcse procedure with c(ar1) and pairwise options. All specifications include state fixed effects. Specification (5) restricts the sample to years between 1500-1799. Specification (6) controls for linear and quadratic time trends. Specification (7) includes century fixed effects. Standard errors in parentheses. Levels of statistical significance: * 0.1 ** 0.05 *** 0.01 **** 0.001.

The results are reported in Table 2. Across the seven specifications, we find strong support for political and fiscal theories. States depreciated less when there were constraints on executive authority, and more under war pressure. Civil wars were also associated with depreciations. These findings are significant at 0.1 percent level. States at intermediate levels of fiscal capacity depreciated more. The coefficient for real tax revenues per capita is positive and significant and

its square is negative and significant at 5 percent level for specifications 1-4 and 10 percent level for specifications 5-7.

Among the control variables, urbanization has positive coefficient in all five specifications it is included in, and is significant at 10 percent level in four. Real GDP per capita also has a positive, but insignificant coefficient. The result that proxies for economic development have positive but not always significant coefficients carries over to the other econometric models we estimate in later sections. Population mostly has negative coefficient, but it is only significant in two specifications. Finally, gold standard dummy is insignificant.

C. Ordered Logit Model

Table 3 reports the Ordered Logit model estimates with robust standard errors. Compared to OLS, the ordered logit model accounts for the discrete nature of the monetary decisions, and ensures that few extreme depreciation rates don't drive the results.

The dependent variable in the regressions is an ordinal variable that takes value 1 in years with depreciation rate greater than 3%, -1 in years with appreciation rate greater than 3%, and 0 otherwise.[41] For specification 1, we estimate the following equations:

(2) $$Depreciation\ Decision^{*}_{i,t} = \alpha_i + \theta_1 Executive\ Constraint_{i,t} + \theta_2 Real\ Tax\ Revenue_{i,t} + \theta_3 \left(Real\ Tax\ Revenue_{i,t}\right)^2 + \theta_4 War_{i,t} + \theta_5 Civil\ War_{i,t} + \varepsilon_{i,t}$$

(3) $$Depreciation\ Decision_{i,t} = \begin{cases} 1 & if\ \ Depreciation\ Decision^{*}_{i,t} > 3, \\ -1 & if\ \ Depreciation\ Decision^{*}_{i,t} < -3 \\ 0 & otherwise \end{cases}$$

where $Depreciation\ Decision_{i,t}$ is the ordinal dependent variable, $Depreciation\ Decision^{*}_{i,t}$ is the underlying latent variable, $\varepsilon_{i,t}$ is the error term assumed to have logistic distribution. The explanatory variables in specifications 1-7 in Table 3 are respectively the same as those in specifications 1-7 in Table 2.

The results are again consistent in supporting political and fiscal theories. The coefficients for constraint on the executive are negative and significant and the coefficients for war are positive and significant at 0.1 percent level. Real tax revenues per capita and its square have respectively positive and negative coefficients and are significant at 0.05 or lower levels**.** Civil war and except for specification 5 urbanization also have positive and significant coefficients. Real GDP per capita and gold standard dummy are insignificant.

[41] The reason we set a threshold of 3%, is that on a fiat standard there are year-to-year fluctuations in the value of monetary unit and with a threshold of 0% these minor fluctuations would be classified as depreciation or appreciation. When alternative thresholds from 1% to 5% are used, the regression results are similar, and are not reported here for the sake of brevity.

TABLE 3: DETERMINANTS OF DEPRECIATION OF MONETARY UNIT, ORDERED LOGIT MODEL

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Executive Constraint	-1.7782**** (0.3988)	-1.8543**** (0.4418)	-1.6937**** (0.4559)	-1.9310**** (0.4623)	-2.8292*** (1.0030)	-1.8381**** (0.4416)	-1.8376**** (0.4151)
Real Tax per Capita	0.0197*** (0.0062)	0.0228*** (0.0071)	0.0215*** (0.0071)	0.0209*** (0.0072)	0.0244* (0.0127)	0.0217*** (0.0076)	0.0226*** (0.0080)
Real Tax per Capita Squared	-0.0001** 0.0000	-0.0001*** 0.0000	-0.0001** 0.0000	-0.0001*** 0.0000	-0.0002** (0.0001)	-0.0001*** 0.0000	-0.0001** 0.0000
War	0.3326**** (0.0601)	0.3151**** (0.0644)	0.3259**** (0.0628)	0.3174**** (0.0642)	0.2658**** (0.0756)	0.3152**** (0.0653)	0.2959**** (0.0646)
Civil War	0.2799* (0.1519)	0.3071** (0.1518)	0.2782* (0.1527)	0.3107** (0.1515)	0.5704**** (0.1688)	0.3074** (0.1518)	0.2758* (0.1538)
Population (log)		-0.2616 (0.2425)	-0.0827 (0.2452)	-0.2784 (0.2488)	-0.0902 (0.4833)	-0.2894 (0.2953)	-0.2133 (0.2955)
Urbanization Rate		0.0361*** (0.0135)		0.0368*** (0.0137)	0.0491 (0.0354)	0.0358*** (0.0138)	0.0276** (0.0140)
Real GDP per Capita			0.0000 (0.0003)				
Gold Standard Dummy				0.1778 (0.2728)			
Observations	3739	3734	3734	3734	2779	3734	3734

Notes: The dependent variable takes value 1 in depreciation years, -1 appreciation years, 0 otherwise. Estimated using Stata ologit procedure with vce(robust) option. All specifications include polity fixed effects. Specification (5) restricts the sample to years between 1500-1799. Specification (6) controls for linear and quadratic time trends. Specification (7) includes century fixed effects. Standard errors in parentheses. Levels of statistical significance: * 0.1 ** 0.05 *** 0.01 **** 0.001.

D. Instrumental Variables Model

There are good reasons to suspect that the estimated impact of war might suffer from omitted variable and reverse causation biases. For omitted variable bias, for example, rulers that pursued bellicose policies abroad might also have been more likely to pursue predatory monetary policies at home. For reverse causation, depreciations created political dissent and might have forced states to cut wars short.

To address these concerns, we adopt an identification strategy that builds on Gennaioli and Voth (2015). The intuition for the strategy is that wars in Europe tended to be contagious and spilled over from one polity to another. To operationalize this intuition, we instrument the war variable for each state by the lagged value of the inverse distance weighted average of the number of wars other states fought among themselves.[42] Because the instrument is both temporally and geographically removed, there is good reason to argue that the exclusion

[42] The instrument for war variable for state i in year t ($War_{i,t}$) is calculated as follows. First, for each year and each state j≠i, we calculate the number of wars state j fights that does not involve state i. Second, for each year, we calculate a weighted average of the number of wars of all states j fight that do not involve state i, where the weights are given by the inverse distance of each state j's capital to i's capital. Third, we calculate a 3-year moving average of the resulting series and lag it four years. Hence, in the instrumental variables regression, we estimate the impact of state i's wars between years t-1 and t-3, instrumenting it by an inverse distance weighted average of wars all other states j fight among themselves between years t-4 and t-6.

restriction that it affects monetary stability only through its effect on domestic involvement in wars is plausible.[43] For instrument validity, the F test rejects weakly identified instrument at 0.001 level.

The 2SLS results, reported as specification 1 in Table 4, support the argument that wars triggered depreciations. The estimated impact in the 2SLS setup is stronger than OLS setup, suggesting that the fiscal pressures associated with depreciations might have forced states out of war.

The cases for endogeneity bias for the estimated impacts of executive constraints and fiscal capacity are weaker. For reverse causation, note that the explanatory variables, fiscal capacity and political regime, are slow changing attributes of a political system, and the dependent variable, state's decision to depreciate or appreciate money, is a short-term policy decision that is unlikely to change political system immediately. As for the omitted variable bias, note that the set of explanatory variables in the regressions are comprehensive and control for fundamental attributes of each polity including its size, economic structure, fiscal capacity and political regime as well as time invariant characteristics and trends over time.

TABLE 4: DETERMINANTS OF DEPRECIATION OF MONETARY UNIT, 2SLS MODEL

	(1)	(2)	(3)	(4)
Executive Constraint	-3.0186****	-4.0021***	-17.0982*	-8.9571**
	(0.7656)	(1.2572)	(10.2280)	(4.0721)
Real Tax per Capita	0.0541***	0.0634**	0.1489*	0.0885***
	(0.0171)	(0.0279)	(0.0833)	(0.0331)
Real Tax per Capita Squared	-0.0002***	-0.0003*	-0.0003**	-0.0003***
	(0.0001)	(0.0002)	(0.0001)	(0.0001)
War	2.0765**	0.7342****	0.6541****	0.7193****
	(0.8369)	(0.1451)	(0.1498)	(0.1466)
Observations	3739	3734	3734	3734

Notes: The dependent variable is the depreciation rate. Estimated using Stata xtivreg2 procedure with fe and robust options. Specification (1) instruments for war, specification (2) for real tax revenues per capita and its square, and specification (3) and (4) for executive constraints. All specifications include state fixed effects. The p value for the first stage F-statistics is 0.000 for specifications (1), (2) and (4) and 0.035 for specification (3). Standard errors in parentheses. Levels of statistical significance: * 0.1 ** 0.05 *** 0.01 **** 0.001.

Nevertheless, we also run 2SLS models for these two variables. We instrument domestic fiscal capacity by an inverse distance-weighted average of fiscal capacity of other states in the sample. Fiscal capacity might spill over across states in more than one way. For one, through the period under study, states adopted bureaucratic know-how and administrative measures

[43] A potential concern for the exclusion restriction is that when nearby states depreciate their monetary units to finance wars among themselves, it might trigger domestic depreciations. In the next section, however, we test and reject the spillover of depreciations across states.

from nearby states, and so fiscal capacity spilled over by learning. Alternatively, since neighboring states posed a military threat, the increases in their fiscal capacity created the incentive to increase domestic fiscal capacity as well.[44] For instrument validity, the F-test rejects weakly identified instrument at 0.001 level. The estimation result, reported in specification 2 in Table 4, is consistent with earlier result that states with intermediate levels of fiscal capacity depreciated their monetary unit more.

In specifications 3 and 4, we instrument for executive constraints by its past values. The identification strategy builds on the idea that "democratic capital" accumulates over time.[45] In particular, a polity gains experience with the mechanics of a political regime gradually, and formal and informal institutions that support the regime build up over time. To capture this notion, we construct a new proxy for accumulated experience with executive constraints by calculating a weighted average of past values of executive constraints going back to 1100 with a discount factor of 50% for each century. In specification 3, we instrument the current executive constraints variable by this new variable. In specification 4, we only use the value of executive constraints a century lagged as the instrument.[46] In the two specifications, weak instruments are rejected respectively at 0.05 and 0.001 levels, and the results support the conjecture that executive constraints prevent depreciations.

E. Seemingly Unrelated Regression Model

The first three econometric models did not account for the fact that monetary policy-making actually consisted of three separate decisions:

1. The choice between commodity (silver/gold) and fiat standards
2. On a commodity standard, whether to depreciate the monetary unit, and by how much
3. On the fiat standard, whether to appreciate or depreciate the monetary unit, and by how much

In this section, we estimate two SUR models with separate equations for each of these three decisions. There are upsides and downsides to estimating a SUR model. On the upside, the SUR model accounts for the potential differences in the factors that drive the three decisions. On the downside, in the SUR model, the estimates for the impacts of explanatory variables are difficult to interpret, because each explanatory variable affects both the monetary standard decision (1)

[44] An increase in a nearby state's fiscal capacity might also affect domestic depreciation directly through war between the two states but since war is already included in the regression, this impact does not violate the exclusion restriction.

[45] Persson and Tabellini (2009).

[46] The concern for using lagged values of a variable for current values is that the error terms can be correlated. Note, however, in the current setup, the instrument is in the distant past.

and the depreciation decision conditional on being on each monetary standard (2 or 3).[47] In this respect, the earlier OLS, Ordered Logit, and 2SLS models, which estimate the unconditional impact of each explanatory variable, provide a more straightforward estimate of their impacts. Other issues with the SUR models include the smaller sample sizes which decreases the statistical power of the tests[48] and states that drop from the sample[49] which weaken the claim that the estimation results are representative of the monetary history of the whole continent.

Table 5 reports the estimation results for the two SUR models, each with three equations. In model 1, equation 1 is a Probit model where the dependent variable takes value 1 if the monetary system is on the fiat standard and 0 if it is on a commodity (silver/gold) standard. In addition to the set of explanatory variables used in earlier specifications, we include the lagged value of the dependent variable (i.e. a dummy for last year's standard) to the regression equation, to capture the persistence of monetary standards over time.

Equation 2, only estimated for states and years on a commodity (silver/gold) Standard, is a Tobit model where the dependent variable is the depreciation rate when it is greater than 0 and 0 otherwise. The Tobit model allows us to capture the asymmetry in the change in the value of money on silver/gold standards: when fiscal conditions were unfavorable, states depreciated money to generate revenue, when they were favorable, states did not alter the silver/gold equivalent.

Equation 3, only estimated for states and years on the fiat standard, is OLS where the dependent variable is the depreciation rate, which takes positive values on depreciation years and negative values on appreciation years. The OLS model captures that the change in silver/gold equivalent of the monetary unit on the fiat standard is continuous and can both increase and decrease.

In model 2, equation 1 is the same, but equations 2 and 3 are respectively replaced by Probit and Ordered Probit models. In particular, in equation 2, the dependent variable takes value 1 in years monetary unit depreciates more than 3 percent and 0 otherwise. In equation 3, the ordinal dependent variable takes value 1 on years where the monetary unit depreciates more than 3 percent, takes value -1 when monetary unit appreciates more than 3 percent, and takes value 0 otherwise. The purpose of estimating model 2 is to account for discrete nature of monetary decisions and ensure few extreme observations don't drive the results.

[47] For example, states in this period often switched to the fiat standard with the intention to depreciate their monetary unit. Hence, it is possible, that an explanatory variable such as constraints on executive authority has insignificant positive impacts for switching to fiat standard and depreciating the monetary unit on the fiat standard while the overall effect of constrained executive on depreciations is positive and significant.

[48] Equations 2 and 3 are only estimated respectively for commodity (silver/gold) and fiat standard years.

[49] For equations 1 and 3 Dutch Republic and Venice drop from the sample, because they never adopted the fiat standard.

The results are consistent with the earlier results, with some additional insights. For executive constraints, the evidence suggests that its impact worked mainly by preventing depreciations on both commodity and fiat standards. Specifically, in models 1 and 2, the coefficient of executive constraints is negative and significant in both commodity standard (eq. 2) and fiat standard (eq. 3) equations.

TABLE 5: DETERMINANTS OF DEPRECIATION OF MONETARY UNIT, SUR MODEL

	Model 1			Model 2		
	(1)	(2)	(3)	(4)	(5)	(6)
Lagged Monetary Standard	3.9412****			3.9438****		
	(0.1411)			(0.1411)		
Executive Constraint	-0.0812	-22.2489***	-6.5449**	-0.0850	-1.2640**	-1.0049*
	(0.5956)	(7.9096)	(3.3254)	(0.5954)	(0.5209)	(0.5538)
Real Tax per Capita	0.0367***	-0.0775	0.0991	0.0365***	0.0009	0.0201
	(0.0138)	(0.1391)	(0.1133)	(0.0138)	(0.0116)	(0.0128)
Real Tax per Capita Squared	-0.0002*	-0.0018	0.0000	-0.0002*	-0.0002	-0.0001
	(0.0001)	(0.0018)	(0.0009)	(0.0001)	(0.0002)	(0.0001)
War	0.2870****	2.7711****	1.4820****	0.2867***	0.1854****	0.1190***
	(0.0871)	(0.7948)	(0.3887)	(0.0871)	(0.0511)	(0.0432)
Civil War	0.1477	5.2614***	(0.3018)	0.1548	0.3202***	(0.0918)
	(0.1726)	(1.9742)	(0.7576)	(0.1733)	(0.1173)	(0.1174)
Urbanization	(0.0226)	0.2209	(0.1733)	(0.0217)	0.0030	(0.0084)
	(0.0244)	(0.3791)	(0.1428)	(0.0238)	(0.0236)	(0.0248)
Model	Probit	Tobit	OLS	Probit	Probit	Ordered Probit
Observations	3150	3145	594	3150	3145	594

Notes: Estimated using Stata cmp procedure with robust option. All specifications include polity fixed effects. Equations (1) and (4) are estimated for states with both fiat and commodity standard experience, so Venice and Dutch Republic, which never switched to the fiat standard, drop out. Equations (2) and (5) are estimated for commodity (silver/gold) and (3) and (6) for fiat standard years. Standard errors in parentheses. Levels of statistical significance: * 0.1 ** 0.05 *** 0.01 **** 0.001.

As for fiscal capacity, the evidence suggests its impact worked mainly by allowing states to switch to fiat standard, on which they could more conveniently depreciate their currency. In particular, in models 1 and 2, the coefficient of real tax revenues per capita is positive and real tax revenues per capita squared is negative and significant in the monetary standard choice equation (eq. 1). This finding is consistent with the pattern in Figure 3 that it wasn't the high capacity (e.g. England, Dutch Republic) or low capacity (e.g. Poland-Lithuania, the Ottomans) states that issued fiat money the most, but rather the states with intermediate capacity.

Finally, the coefficient of warfare is positive and significant in all three equations, suggesting that warfare triggered both a switch to the fiat standard and triggered depreciations on both commodity and fiat standards. As highlighted earlier, however, these results should be

interpreted with caution, due to changing samples and the interdependence of the monetary standard and depreciation decisions.

VI. Monetary Theories of Monetary Stability

The second class of theories in the literature, monetary theories, explain depreciations as corrections necessitated by the mechanics of monetary systems. We review and test four monetary theories that explain depreciations as policies to correct the mispricing of monies and goods relative to each other. In particular, H4 concerns mispricing of coins with the same face value but with different silver content, H5 mispricing of silver and gold monies, H6 mispricing of domestic and foreign monies and H7 mispricing of silver/gold monies relative to the goods basket.

A. Wear and Tear and Clipping

One widely discussed monetary theory is the wear and tear and clipping of coins. According to this argument, the silver content of coins in circulation decreased over time due to natural wear and tear and individuals who clipped the edges of the coins to extract silver.[50] Over time, this created a heterogeneous money supply, as despite having the same face value in terms of the monetary unit, older coins contained less silver than their newly minted counterparts. The heterogeneity disrupted the monetary system, because economic agents preferred to pay with older and lower silver content coins in transactions, while keeping the newer coins to themselves.

The solution to this problem, it is argued, was to depreciate monetary unit against silver. The silver coins in circulation were recalled to the mints, melted, recoined with lower silver content, and hence silver coins in circulation were standardized. Glassman and Redish (1998) and Redish (2000) provide evidence that this explanation played a role in the depreciations in England and France in the 16th and 17th centuries. By the 18th century, the mechanized minting technology made it easier to identify worn out and clipped coins and this explanation became less relevant.

One testable implication of this conjecture is that the longer the time that passed since the last depreciation, the higher the proportion of worn out and clipped coins in circulation, and the greater the incentive for states to depreciate their monetary units to standardize coinage.

[50] Estimates of decline in silver content vary between 0.1 to 1 percent per annum (Munro 2010: 16; Redish 2000:28; Cipolla 1976: 133; Mayhew 1974:3).

H4: The longer the time passed since the last depreciation, the more likely a state depreciates its monetary unit.

In Table 6, we test the impact of the number of years since the last depreciation for two samples and two econometric models. Specification 1 tests the impact for the whole sample. Specification 2 restricts the sample to 16th and 17th centuries, the period when the coinage technology was primitive. The specifications are estimated with both OLS with PCSE and Ordered Logit models. The regression equations include executive constraints, real tax revenue per capita, real tax revenues per capita squared, war, civil war and state fixed effects as explanatory variables.

For both samples and both econometric models, the estimated coefficient for the years since the last depreciation is insignificant and does not support H4. The estimated coefficients for the political theories (H1-H3), not reported for the sake of brevity, remain significant at 5 percent or lower levels.

B. Changes in the Gold-Silver Market Price Ratio

A second monetary theory argues that states depreciated their monetary units against silver in order to bring the ratio of official monetary unit values of gold and silver in line with the ratio of their market prices. As discussed earlier, European monetary systems were mostly on a de facto silver standard before 1870s. However, gold coins, which were useful in high value transactions, were also in circulation. This raised the problem of setting the official value of gold coins in terms of the monetary unit.

There were two main alternatives. The first alternative was to let the market determine the value of gold coins in terms of the monetary unit. If this alternative was adopted, the value of the gold coins in terms of the monetary unit followed the market price ratio of gold to silver and no depreciation was necessary.

The more ambitious and challenging alternative was bimetallism, i.e. officially setting the monetary unit equal to both to a certain weight of silver and a certain weight of gold. The challenge of bimetallism was that the ratio of official monetary unit value of gold and silver could deviate from the ratio of their market prices and needed corrections. If the market price ratio of gold to silver fell, the official price ratio would overvalue gold, arbitrageurs would bring gold coins to the mints, exchange them for silver coins and take the silver out of country. The remedy for this problem, it is argued, was to depreciate the monetary unit against silver and

bring the ratio of official monetary unit value of silver and gold in line with market price ratio.[51] Hence:

H5: States depreciated their monetary units against silver if the official price ratio undervalued it relative to gold.

Despite historical instances of depreciation consistent with this explanation[52], there are good reasons to doubt its overall importance. For one, Eastern European states did not adopt bimetallism, so the argument is not relevant for them.[53] As for Western European states, they adopted bimetallism only in certain periods, and even when they did, they did not always vigorously pursue it.[54] Second, between 1500 and 1870, the gold to silver market price ratio was increasing. Consequently, even if H5 is a theoretical possibility, the actual gold-silver market price trends worked against depreciating the monetary unit against silver.[55] Finally, the argument no longer applies after 1870s and the transition to the gold standard.

To test the argument formally, we construct two proxies. The first proxy is the rate of change in the gold to silver market price ratio in the last 10 years when it is negative and 0 otherwise. The second proxy calculates the same variable for the last 20 years. H5 predicts that in periods that the market price ratio was on the decline, states depreciated their monetary unit against silver, and so the expected sign for the coefficient is negative. Specifications 3 and 4 in Table 6 report the estimation results for OLS with PCSE and Ordered Logit models, and the estimated coefficients are insignificant. The coefficients for the proxies of political theories (H1-H3), not reported for brevity, remain significant at 5 percent or lower levels.

C. Competitive Depreciation

A third monetary explanation for depreciations is the contagion of depreciation across states. Because monetary systems across Europe were based on silver and later gold, coins of a particular state were also accepted in neighboring states at an exchange rate based on its silver/gold content. In theory, when a state reduced the silver/gold content of its coins, the exchange rate in neighboring states should have decreased proportionally. In practice, the exchange rates did not adjust immediately, due to the difficulty of detecting the changes in the

[51] The symmetric argument implies that in periods when market price ratio of gold to silver rose, it induced states to depreciate their monetary unit against gold.

[52] See Macedo (2001) for depreciations in Portugal in the first half of 18th century, Chilosi and Volckart (2010) for examples from 14th and 15th centuries.

[53] Austria, Sweden, Russia, Ottomans let the market determine the monetary unit equivalent of gold coins. (Eichengreen, 1998)

[54] In the 18th century, England and Portugal switched to gold standard, leaving France and Spain as the only major bimetallic states in our sample.

[55] Between 1500 to 1700, the inflow of silver from the New World increased market price ratio of gold to silver from 10.75 to 15, and hence bimetallism required depreciating the monetary unit against gold, not silver. For example, England decreased the gold equivalent of the monetary unit in 1601-12, 1670 and 1717, but did not alter the silver equivalent (Redish 2000: 68). The market ratio fluctuated around 15 in the 18th century and 15.5 in the 19th, so even if bimetallism required corrections in the silver equivalent of the monetary unit, the necessary corrections were small in magnitude (Officer 1998).

metal content of coins and stickiness of the exchange rates in traditional societies. Consequently, the depreciating state's coins were overvalued in neighboring states, which offered arbitrageurs with better information a profit opportunity. In particular, arbitrageurs could collect neighboring states' undervalued coins, redeem them at the depreciating state's mint to be reminted into overvalued coins, and use them in transactions in neighboring states. This process put pressure on the neighboring states to depreciate their own coins, because otherwise their own coins were driven out of circulation and replaced by the depreciating state's coins.[56]

H6: Depreciations in nearby states triggered domestic depreciations.

To test this line of argument formally, we construct two proxies. The first proxy is a weighted average of the depreciation rates of other states in the preceding 5 years, where the weights are given by the inverse of the distance between the states' capitals. The second proxy calculates the same weighted average for the preceding 10 years. H6 implies that these proxies should have positive and significant coefficients.

Specifications 5-6 in Table 6 report the OLS with PCSE and Ordered Logit results. The estimated coefficients are insignificant. The proxies for political theories (H1-H3), not reported, remain significant at 5 percent or lower significance levels.

D. Silver and Gold Famines

Finally, a fourth monetary theory posits that states depreciated their monetary units against silver/gold to prevent the adverse consequences of the declines in the price level in terms of silver/gold. In particular, if the price of goods in terms of silver/gold declined, and state kept silver/gold equivalent of its monetary unit constant, this put a downward pressure on the nominal price level of goods in terms of the monetary unit. Depending on how sticky the nominal prices were, two alternatives could follow, both problematic for the monetary system. If nominal prices were sticky and did not decrease, economic agents would hoard silver/gold coins, resulting in "silver/gold famines". Alternatively, if nominal prices of goods were flexible, they would adjust downwards, leading to deflation. As a remedy, it is argued, states lowered the silver/gold equivalent of their monetary unit, thereby increasing the money supply in terms of the monetary unit and preventing hoarding and deflation.

H7: When price of the goods baskets in terms of silver/gold declined, states depreciated their monetary unit against silver/gold.

[56] Wee (1977: 294), Eichengreen and Sussman (2000:14), Munro (2012:15), Glassman and Redish (1988: 82)

Historically, the argument is relevant only for specific periods. It is extensively discussed for the 15th century, when the lull in silver production put downward pressure on the silver price level of goods.[57] Its empirical relevance is more dubious for the post-1500 period, when silver/gold from the New World increased the prices of goods in terms of silver/gold and hence put upward pressure on nominal price levels, except for brief downturns in the early 18th and 19th centuries in silver[58] and in the late 19th century in gold price level.

To test the argument formally, we construct two proxies. The first proxy is the rate of change in the silver price level on silver standard and gold price level on gold standard in the preceding 5 years when it was negative and 0 otherwise. The second proxy is calculated the same way, but for the preceding 10 years. H7 implies deflation in silver or gold price level should trigger depreciations and the estimated coefficient should be negative.

Specifications 7-8 in Table 6 report the results for OLS with PCSE and Ordered Logit models. Both proxies in both models have insignificant coefficients. The proxies for political theories (H1-H3) remain significant at 5 percent level.

TABLE 6: MONETARY THEORIES OF DEPRECIATION, OLS WITH PCSE AND ORDERED LOGIT MODELS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MODEL	Monetary Variables							
	Years since last depreciation (whole sample)	Years since last depreciation (16th-17th centuries)	Decrease in gold to silver market price ratio in preceding 10 years	Decrease in gold to silver market price ratio in preceding 20 years	Weighted average of rate of depreciation in other states in preceding 5 years	Weighted average of rate of depreciation in other states in preceding10 years	Deflation rate in silver price level in preceding 5 years	Deflation rate in silver price level in preceding 10 years
OLS with PCSE[a]	-0.0012	0.0003	0.3793	1.6983	3.7891	0.0201	0.7367	-0.0936
	(0.0023)	(0.0035)	(9.7570)	-8.4361	(2.3876)	(3.2615)	(0.7223)	(0.6213)
Ordered Logit[b]	-0.0003	-0.0041	4.5674	5.5121	3.2119	2.3181	0.6721	0.0658
	(0.0017)	(0.0032)	(6.3987)	(4.8799)	(2.0536)	(1.7412)	(0.4129)	(0.4541)

Notes: All specifications executive constraint, real tax per capita, real tax per capita squared, war, civil war and state fixed effects as control variables. Standard errors in parentheses. Levels of statistical significance: * 0.1 ** 0.05 *** 0.01 **** 0.001.

[a] The dependent variable is the depreciation rate. Estimated using Stata xtpcse procedure with c(ar1) and pairwise options.
[b] The dependent variable takes value 1 in depreciation years, -1 appreciation years, zero otherwise. Estimated using Stata ologit procedure with vce(robust) option.

[57] Chilosi and Volckart (2010: 4).
[58] See Figure 4.

VII. Discussion

The empirical analysis in the preceding sections provided strong support for political and fiscal theories of monetary stability, but not for monetary theories. In this section, we discuss these findings and how they relate to different literatures.

A. Politics and Monetary Stability

For fiscal capacity, we find that states with high and low capacity had more stable monetary units than those with intermediate capacity. Note, however, the causes and implications of stability in high and low capacity states are different. High capacity states had high domestic money stocks and had the capacity to generate seigniorage revenue, but did not have the incentive to do so. Low capacity states lacked the means to run monetary systems, circulate their own currency and effectively generate seigniorage revenue. Consequently, while high capacity states provisioned a stable and well-functioning monetary system, the stability in low capacity states can be interpreted as a manifestation of a weak state.

For political regime, we find that constraints on the executive prevented depreciations. The underlying insight is that while executive authorities were inclined to depreciate monetary units to generate revenue, economic interest groups predominantly preferred stability, and constraints on the executive shifted the political balance towards the latter. Executive constraints continued to play the same stabilizing function until early 20th century, when the extension of franchise and a better understanding of consequences of monetary policy on output complicated the political equation by introducing demands for expansionary monetary policy.

The empirical support for political theories also relates to the debate concerning the relationship between gold standard era and monetary stability. The evidence we compile shows gold standard was neither a necessary nor a sufficient condition for monetary stability. Before the transition to the gold standard, states stabilized their monetary unit while on the silver standard.[59] After the transition, gold standard did not guarantee stability, because states retained the prerogative to go off to the fiat standard. Gold standard was a convenient nominal anchor[60], but whether to stick to this anchor or not was ultimately a political decision.

[59] Selgin (1999); Redish (2000:10)
[60] Bordo and Rockoff (1996), Bordo and Kydland (1996)

B. Politics and Economic Growth

Our findings also relate to the literatures on the impact of fiscal capacity and political regime on long run economic growth. For fiscal capacity, the literature has convincingly established that in the early modern period, some European states increased their revenues dramatically, while others lagged behind.[61] It is not clear**,** however, whether the increases in fiscal capacity had an impact on economic growth. In this period, states spent the bulk of their revenues for warfare, and public goods only received a small share of the budgets.[62] Consequently, the mechanism through which fiscal capacity affected growth is not well-established.[63]

The current study suggests that increases in fiscal capacity might have contributed to growth through monetary stability. We find that, beyond a certain threshold, fiscal capacity facilitated monetary stability. A stable monetary system was in turn a public good that pervaded all sectors of the economy and facilitated market activity.[64] Hence, fiscal capacity might have aided growth through the provision of monetary stability, even though this channel doesn't explicitly appear as an expenditure item the budgets.

For political regime, the central tenant of the literature is that executive constraints contributed to economic growth by keeping states' predatory policies in check.[65] As the specific historical channel through which this impact worked, following North and Weingast (1989), the literature has focused on public debt. Executive constraints, it is argued, made the commitment to repay public debt credible, facilitated borrowing, and shielded economic activity from predatory taxation.

We identify a second channel through which executive constraints might have contributed to growth. Executive constraints prevented predatory monetary policy, stabilized monetary units and price levels, and in turn facilitated market activity. Arguably, this channel was at least as important as the public debt channel. While large scale public borrowing in Europe was late, rare and irregular[66], monetary stability mattered for all states and all periods.

C. Monetary Theories and Monetary Stability

The empirical analysis does not provide support for monetary theories. This lack of support, however, does not imply monetary theories are wrong. When evaluated together with the

[61] Karaman and Pamuk (2010, 2013); Bonney (1995, 1999); Dincecco (2009); Cardosa and Lains (2010).
[62] Hoffman (2015); Vries (2002).
[63] It has been conjectured that increases in fiscal capacity might have aided growth through market integration, nation building, defense, justice, but the impact is not empirically well-documented and tested. See Johnson and Koyama (2017) for a comprehensive review.
[64] Kindleberger (1984:22)
[65] Acemoglu et al. (2005).
[66] Reinart and Rogoff (2009: 103-111)

specifics of the monetary theories and anecdotal evidence, it instead suggests that monetary theories mattered, but they had small effects on long run patterns of stability, and consequently were hard to pin down empirically. To see why, first note that, each monetary theory worked under specific conditions and in certain periods. Therefore, even if they mattered in those specific instances, when tested for the whole sample, their proxies might be insignificant. Second, monetary theories concern corrections to mispricing of various monies. As such, they predict few, one-off, and usually small depreciations. Third, monetary theories are hard to quantify and their proxies are noisy, which makes it difficult to identify their effects. Taken together, these characteristics of monetary theories suggest the lack of empirical support is mainly a result about the magnitude of the effects, rather than their existence.

The broad patterns that we observe in the data set also support the argument that political factors shaped long run patterns and monetary theories played a relatively minor role. Figure 3 makes clear that most depreciations in our sample were concentrated in certain periods, and often in consecutive years, as predicted by political theories. One-off depreciations predicted by monetary theories were few, and usually at low rates. Figure 2 highlights a dramatic divergence in monetary stability across states, with cumulative depreciation rates differing by up to four orders of magnitude. This difference can be explained by political theories, because political variables also varied significantly across states and over time, and triggered high rate depreciations. Not only monetary theories predict few and small depreciations, but they also predict similar rates of depreciation across states, and hence cannot explain the divergence.[67]

Historical evidence also suggests that not only political factors had a greater impact than monetary theories, but also, by the early modern period, high capacity states with the right incentives could afford to solve monetary problems without resorting to depreciations. Hence, states such as England and Dutch Republic could run their monetary systems without a single depreciation for very long periods of time. This pattern might also help explain why when both political and monetary variables are included in the regressions together, only the former are significant.

An example from English monetary history is the Great Recoinage of 1696. As discussed in earlier, when worn out and clipped silver coins became a problem, one solution was to depreciate the monetary unit and standardize the coinage at a lower silver content (H4). Faced

[67] Wear and tear (H4) argument would predict similar cumulative depreciation rates across states, because the decline in the silver content of coins would itself be at similar rates. Competitive depreciations (H6) argument is based on the premise that states retaliated against depreciations by the neighboring states, and hence would predict similar depreciation rates across states. As for silver and gold famines (H7), the silver and gold price levels, shown in Figure 4, followed the same trends across states. Hence, if declines in silver or gold price levels caused depreciations, they would do so at similar rates across states. Changes in gold-silver market ratio (H5) could in theory drive a wedge in depreciation rates across states, because the argument only applies to states on bimetallic standard. In practice, bimetallic standard was rare, and the necessary adjustments were small.

with the same problem at the end of 17th century, England debated for five years whether to depreciate the monetary unit. In the end, the argument that the silver content of British pound was inviolate, advocated by John Locke, won the debate. Instead of depreciating the monetary unit, old and worn out coins were accepted at face value, replaced with new coins with higher silver content, and the cost of recoinage was paid by the Exchequer.[68]

In the Dutch Republic, public banking played a stabilizing role. In the early 17th century, the coinage in the Dutch Republic suffered from wear and tear (H4) and poor-quality coinage produced in Southern Netherlands (H6). In response, Bank of Amsterdam was established in 1609, issuing transferable ledger money and overseeing the quality of coinage, and in turn, stabilizing the monetary unit.[69] Monetary authorities in other European states were well aware that ledger banking could help stabilize the monetary unit. Frederick the Great's counselor Calzabigi, however, wrote in 1765 that "a ledger-money bank is not allowed under a monarchy because it makes most coin payments unnecessary, and therefore reduces the income from seigniorage".[70]

D. Technological and Institutional Innovations and Monetary Stability

Our findings also allow assessing the impact of technological and institutional innovations on monetary stability. Through the centuries, these innovations drove the evolution of money from intrinsic value coins to fiduciary and fiat monies. A review of the historical evidence suggests that while it was private individuals and organizations that created these innovations, states eventually adopted, regulated and often monopolized their use.[71] Consequently, politics determined whether they were used to stabilize or destabilize the monetary units.

For monetary technology, the main innovations were the replacement of hammered coinage by mechanized minting in the mid-17th century and steam press in the 1790s. These innovations spread rapidly across Europe.[72] The evidence suggests, however, that they did not have a clear-cut stabilizing or destabilizing effect. On the one hand, the new minting technologies facilitated monetary stability, by making it easier to detect silver and gold content of coins. On the other, they paved the way for fiat money depreciations, by making counterfeiting copper and paper money more difficult. Hence, they changed the way states depreciated their monetary units, but did not necessarily make depreciations more or less likely.

[68] Redish (2000: 66), Bordo and Redish (2016: 596).
[69] Kindleberger (1984: 48): Roberds and Velde (2016b)
[70] Roberds and Velde (2016a).
[71] Roberds and Velde (2016b: 330-331), Siekmann (2016: 490, 502), Sargent and Velde (2002: 83).
[72] For example, mechanized minting was adopted in France in 1640s, England in 1660s, the Ottoman in 1680s and Russia in 1690s (Redish 2000:57-58; Pamuk 2000:155; Raskov 2006:70).

For monetary institutions, the main innovations were in public banking.[73] Public banks refer to banks owned or regulated by the government that had special privileges and were predecessors of modern central banks. It is possible to distinguish between two generations of public banks. The first generation, public ledger banks, issued deposits that were transferable as book entries. Ledger banking was originally a private innovation[74], but state and municipal governments quickly adopted it, first in Barcelona (Taula de Canvi-1401), and in our sample, in the Dutch Republic (Bank of Amsterdam-1609) and Venice (Banco del Giro-1619). The second-generation public banks issued bearer paper notes. Paper notes was also a private innovation[75] that was adopted by public banks first in Naples, Sweden and most successfully in England in the late 17th century.

Historical evidence suggests that for both ledger and note issuing banks the purpose they served varied greatly depending on the politics. As discussed earlier, in the fiscally sound Dutch Republic, the ledger bank served to stabilize the monetary unit. In the weaker Venetian Republic, however, the convertibility of ledger money was suspended twice (1648-1666, 1714-1739) to finance warfare. Similarly, the monetary unit series make clear, while note issuing public banks in some states kept their notes convertible, other states switched to the fiat standard and depreciated their notes to different degrees. Hence, by themselves, innovations in public banking cannot explain the variation in patterns of monetary stability.

VIII. Conclusion

This study put long run patterns of monetary stability in comparative perspective, making use of a new and comprehensive dataset of silver/gold equivalents of monetary units for eleven major European states. The available evidence points to significant variation in patterns of stability across states. In broad lines, we find that states in Northwest Europe stabilized their monetary units by the 17th and 18th centuries, while states in Eastern and Southern Europe continued to depreciate their monetary units until the 20th century.

We don't find evidence that mechanics of the monetary system had a substantial role in driving these patterns. We instead find that it was fiscal factors, and going one step back, politics, that shaped monetary policy, and determined patterns of stability. While constraints on the executive authority stabilized monetary units, wars destabilized them. The increases in fiscal capacity cut both ways**.** It gave states greater leeway to pursue predatory monetary

[73] The discussion of public banking is based on Roberds and Velde (2016a, 2016b, 2016c).

[74] In the Medieval period, money-chargers issued depositum regulare (a deposit claim on a specific coin), which later evolved into the depositum irregulare (a claim on fungible coin). Holders of these claims were also allowed to make payments occurring as book-entry transfers of deposit claims, creating so called "ledger" or "giro" money.

[75] Bordo (2010: 205-206)**.**

policies, but beyond a certain threshold, also undercut the incentives to do so. Eventually, it was strong states with executive constraints that stabilized their monetary units first.

The paper offers a historical perspective on a number of ongoing debates in monetary economics. One debate concerns the relationship between technological and institutional innovations and monetary stability. Through the period we study, monetary systems were transformed more than once with the introductions of ledger, fiduciary and fiat monies. These new monies were made possible by technological innovations in minting and printing and institutional innovations in banking and legal systems. Our findings suggest that these innovations by themselves did not necessarily make monetary systems more or less stable. Instead, depending on fiscal capacity and political incentives, states could employ the innovations to stabilize or destabilize the monetary units.

A related second debate is whether states can institute mechanisms to insulate monetary policy from politics. Historically, this debate has revolved around preventing discretionary monetary policy by adopting the gold standard, and currently, by central bank independence. Leaving aside the question of whether insulating monetary policy is desirable in the first place, historical evidence suggests it is not feasible. In particular, we find that neither gold, nor the earlier silver standards were hard commitments. On both standards, states retained the prerogative to reset the silver or gold equivalent, or switch to fiat standard altogether. Consequently, when silver or gold standards kept the monetary units stable, it was ultimately because underlying politics favored stability.[76]

A third debate concerns whether the state can be shut out of the monetary system altogether. Historically, the debate has centered on the feasibility of privately issued monies, and currently, digital currencies. Our findings suggest that the prospects for privately run monetary systems are dubious. Historically, it was private banks, goldsmiths and moneychangers that innovated and developed new forms of money. States, however, sooner or later appropriated and monopolized these innovations, supported or banned them, and retained the control over the monetary system.[77] Money was and will arguably be too important to leave to the prerogatives of private actors.

[76] This finding is consistent with the literature on central bank independence, which finds that independence is endogenous and stabilizes the price level only to the extent that there are checks and balances in the political system (Bodea and Hicks 2015; Hayo and Hefeker 2002; Keefer and Stasavage 2003; Keefer and Stasavage 2002; Lohmann 1998; Moser 1999).

[77] Rogoff (2016: 16, 208); Fox et al. (2016:6); Siekmann (2016: 491, 516-517); Tobin (2010:230-231).

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