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**DEBASEMENTS IN EUROPE
AND THEIR CAUSES, 1500-1800**

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Abstract:

The large literature on prices and inflation in early modern Europe has not sufficiently distinguished between price increases measured in grams of silver and price increases due to debasements. This has made it more difficult to understand the underlying causes of the variation across Europe in price stability and more generally macroeconomic stability. This paper first provides a continent-wide perspective on the proximate causes of inflation in early modern Europe. We establish that in northwestern Europe debasements were limited and price increases measured in grams of silver were the leading cause of inflation. Elsewhere, especially in eastern Europe, debasements were more frequent and were the leading proximate cause of price increases. The existing literature on debasements based mostly on the experience of western Europe emphasizes both fiscal and monetary causes. We then investigate the fiscal causes of debasements by making use of a new dataset covering 11 countries from western, southern and eastern parts of the continent for the period 1500 to 1800. Our probit regressions suggest that fiscal demands of warfare, low fiscal capacity as measured by tax revenues, and lack of constraints on the executive power were all associated with higher likelihood of debasements for early modern Europe as a whole. Our empirical analysis also points to significant differences between the west and the east of the continent in terms of the causes of debasements. Warfare and low fiscal capacity appear as the leading causes of debasements in eastern Europe (Austria, Poland, Russia and the Ottoman empire). In contrast, there were fewer debasements in western and southern Europe and these debasements were not correlated with the leading fiscal causes, warfare or low tax revenues and were negatively correlated with urbanization and constraints on the executive.

Introduction

Prices, inflation, price stability and instability have long been an important part of the debates on the origins of capitalism, the Industrial Revolution and more recently the Great Divergence. Compared to those under paper money regimes, price increases were certainly more limited under the commodity money regimes of the early modern era but there were times when inflation could be significant and they often mattered. Earl Hamilton had argued during the Interwar era that the price increases associated with the arrival of large amounts of gold and silver from the New World had played a key role in the transition to capitalism by creating profits in the hands of those most likely to invest. It turned out that during the so called price revolution of the sixteenth and seventeenth centuries agricultural prices rose faster than other prices and the beneficiaries were above all the landowners. Nonetheless, price increases of this era remained on the agenda and economic historians continued to debate after World War II whether the price revolution was caused by the arrival of large amounts of specie from the Americas or by non-monetary factors such as population increase, urbanization and increases in the velocity of circulation (Hamilton 1929 and 1935, Cipolla 1955, Flynn 1978, Goldstone 1984, Fisher 1989, Pamuk 2001) More recently, the focus has shifted to the causes of price stability and the role of institutions, especially political institutions in constraining the executive, bringing about greater macroeconomic stability including price stability and paving the way for the Industrial Revolution (North and Weingast 1989, Stasavage 2002).

Unfortunately, this large and diverse literature has not sufficiently distinguished between price increases measured in grams of silver and price increases due to debasements. As a result, it has not been easy to understand the underlying causes of inflation, price stability and more generally macroeconomic stability and instability across Europe during the early modern era. In fact, these two basic sources of inflation had very different causes. In the early modern European context, the most often mentioned cause of price increases measured in grams of silver was the arrival of large quantities of silver from the Americas but increases in the velocity of circulation and greater integration of commodity markets across Europe have also been proposed and debated. Debasements, on the other hand, refer to the reduction by the monetary authority of the specie content of the unit of account as a result of which prices measured in terms of the unit of account rose but prices measured in silver usually remained little changed in the medium and longer term. In part because the price level and price increases have often been measured in grams of silver, not sufficient attention has been paid

to debasements as a major cause of inflation in the early modern era. In fact, as we will show in this study, debasements were quite common under the commodity money regimes of late medieval and early modern Europe. They were also the most important proximate cause of inflation in large parts of the continent.

There is also a literature on debasements which has focused mostly on the experiences of a limited number of countries in southern and western Europe. Some authors in the recent literature have focused on the monetary causes of debasements and applied insights from monetary theory to understand the causes and consequences of medieval and early modern debasements. Others have emphasized the fiscal causes and have argued that, in terms of their consequences, debasements and the inflation that followed were similar to the printing of money in the era of paper money. For some of the participants in this debate, however, debasements continue to be a puzzle or at best represent futile efforts by the states to raise revenue while others see them as effective instruments of public policy for governments under duress, at least for a limited period of time (Redish 2000, Bordo 1986, Sussman 1993, Miskimin 1964 and 1984, Rolnick, Velde and Weber 1996). It is safe to say that not all aspects of debasements are well understood.

While there exists studies of individual debasements or debasement episodes in individual countries, early modern debasements have not been systematically investigated for Europe as a whole. There was in fact a good deal of variation in the frequency and overall rate of debasements by early modern European states. Moreover, while many states continued to make use of debasements until the end of the eighteenth century, it is clear that some others had begun to recognize that while debasements may be a useful tool for short term fiscal problems, the inflation, and more generally macroeconomic and institutional problems they caused were self-defeating in the longer term. It is also clear that significant differences existed in the early modern era between the western and eastern parts of the continent not only in terms of economic structure and political institutions but also in terms of the frequency with which debasements were employed by the governments. We also do not understand well under which conditions and structures monetary causes mattered and were the more important causes of debasements.

In this study, we hope to gain new insights into early modern debasements by establishing and then studying this variation across Europe for the first time. We will show that while in some parts of Europe, especially northwestern Europe, price increases measured in grams of silver were the leading cause of inflation and price instability, elsewhere, especially in eastern

Europe, debasements were the leading proximate cause of price increases in the early modern era. We will also try to learn more about the structures which gave rise to debasements and the conditions under which governments in early modern Europe made use of debasements and also began to move away from them. Our preliminary results indicate that there is strong evidence for the fiscal causes of debasements in early modern Europe. In our regressions, tax revenues per capita and warfare are strongly correlated with debasements across the continent. Constraints on the executive also appears to be significant and reduces the frequency of debasements. In the future we plan to explore these fiscal causes further and also study the monetary causes of early modern European debasements.

Three-Tier Monetary Systems across Europe

The literature on the monetary systems in different parts of Europe during the early modern era is large but uneven. These studies often focus on one country and describe and analyze the monetary systems in western and southern Europe in much greater detail than those in central, northern and eastern parts of the continent. A continent-wide perspective is rare. Cipolla (1963), Spufford (1988) and Eichengreen and Sussman (2000) offer broad perspectives for parts of the continent during the medieval era but even these have little to say for northern, eastern and southeastern Europe. Unfortunately, generalizations or theories based on parts of the continent often fail to account for the diversity of the experiences. Nonetheless, the existing literature makes clear that while there was a good deal of variation at the local and national levels and an even wider variety of terminology, monetary systems across the continent shared many common features. In what follows we will focus on the common core of the monetary systems across early modern Europe. We will also emphasize the differences especially when these are important for understanding debasements and variations in debasements.

In the medieval era availability of specie and money use was limited. Monetary systems in southern and western Europe consisted of the small silver penny whose origins go back to the Carolingian monetary system born around 800 AD (Cipolla 1963 and Spufford 1988). Large silver coins were not minted until the thirteenth century. At the other end of the continent, in southeastern Europe where urbanization rates and money use were higher and trade was more developed, the Byzantine Empire relied on the three tier gold-silver-copper system. Byzantine gold coins known today as the ‘dollar of the middle ages’ circulated not only in southeastern Europe but also around the Mediterranean during much of the medieval era.

(Lopez 1951, Watson 1967, Spufford 1988, Kaplanis 2003) During the second half of the thirteenth century as gold became available once again in southern and western parts of the continent, Italian city states and later others began to mint their own gold coins (Cipolla 1956, Spufford 1988). The numbers of currencies across Europe declined rapidly during the late medieval centuries. By the beginning of the sixteenth century, stronger central governments had emerged as monetary authorities in many but not all parts of the continent with greater standardization of the currency and greater control over the activities of the local mints. Also by the beginning of the sixteenth century, monetary systems of most European states and the monetary systems of all the states in our sample consisted of three tiers.

At the top were commodity monies, gold coins for large scale transactions and storage of value, and silver coins, both small and large, for most of the daily transactions. While there was often one type of gold coin, silver coins of many sizes often circulated simultaneously in a given country. Both gold and silver coins contained other metals and their face or market values remained close to their specie content. Individuals could bring gold or silver to the mint for the production of these coins. In return, the mint retained a fraction of the specie as a charge called seigniorage.

At the bottom of the monetary hierarchy were the small change, in most cases copper or billon coins. These circulated on the basis of their face value which was often expressed in fractions of the smallest silver coins and which exceeded the value of their metal content. Not all countries had small change or fiat money, however. While bills of exchange issued by private individuals circulated widely across the continent, paper money was yet at an experimental phase. It was issued only by a small number of states and remained the exception until the end of the eighteenth century.

The Pattern of Debasements

Debasements, defined as a reduction by the monetary authority in the specie content of the unit of account or an increase in the unit of account value of a given weight of gold or silver, are almost as old as the history of commodity money. They were not rare events during Antiquity and the Roman era. During the medieval era, the silver penny in southern and western Europe and the gold and silver currencies of states in the east, most notably the Byzantine Empire also experienced debasements. Cipolla (1963) states, for example, that progressive deterioration of the fineness and weight of the silver penny and the unit of account was seen almost like an universal law during the medieval era. (also Spufford 1988,

pp. 289-318, Wood 2004, Chilosi and Volckart 2010) There were, however, significant differences in the pace of medieval debasements in time and in space. They tended to accelerate during the late medieval era, from the thirteenth through the fifteenth centuries. Moreover, debasements occurred more often and the silver content of the currency declined more rapidly in southern Europe in contrast to northwestern Europe during this period. In the Byzantine Empire debasements of the gold and silver coins accelerated after the tenth century (Kaplanis, 2003)

There were four basic ways through which the monetary authority could reduce the specie content of the currency during both the late medieval and early modern eras. In great majority of the early modern debasements, the monetary authority either reduced the weight of the coin or, keeping the weight of the coin unchanged, it reduced the percentage of specie or fineness of the coin by adding more alloy, such as copper, to the mix. The monetary authority could also issue entirely new coins or increase the face value of the existing coins in terms of the unit of account. There were also many instances when a combination of these four basic methods was used. For example, the monetary authority could reduce both the weight and the fineness of the coins or reduce the silver content of the small denomination coins and increase the face value of the higher denominations (Redish 2000, Sussman 1993, Pamuk 2000). For the purposes of the present study, we do not see any difference between these methods.

When the currency was debased, the mint offered the individuals the opportunity to bring in the old coins and receive in exchange new coins with lower specie content. The difference in the metal content or the seigniorage rates during debasements could be substantial. Mint volumes typically increased substantially following debasements as old coins were brought in for reminting and this could lead to large revenues for the monetary authority.

Most European currencies during the early modern era were defined in terms of both gold and silver and one can measure the rate of debasements in most European states in terms of either gold or silver content of the unit of account. However, the cumulative decline in the silver content of the unit of account was greater because of the long term increases in the gold-silver ratio, as pointed out earlier. Moreover, some European states such as Venice chose not to reduce the specie content of their gold coins for long periods of time but adjusted upwards the face value of their gold coins in terms of the unit of account. Other states like the Ottoman Empire chose to fix the specie content of their monetary unit of account in terms of silver alone. The value of gold coins issued by these states was determined by the local

markets. For these and other reasons, data for the gold content of the unit of account of the European currencies is less readily available than data for the silver content of the currencies. As a result, for the sake of international comparisons, we have chosen to study early modern debasements in terms of the decline in the silver content of the unit of account in what follows even though gold figured more strongly than silver in the definition of the specie content of some of the European currencies at least for part of the early modern era.

Graph 1 summarizes the long term trends during the early modern era in the silver content of the eleven European currencies for which we have been able to gather data for this study. Every one of these currencies experienced debasements and most of them experienced large numbers of debasements as well as large overall decreases in their silver content during these three centuries. Not unlike the late medieval era, there was also considerable variation amongst these currencies in the numbers of debasements and the cumulative reduction in their silver content. At one end, the currencies of England-Great Britain and the Dutch Republic were the most stable during the early modern era. The pound experienced no more than 4 debasements with the last taking place in 1601 and lost a total of 35 percent of its silver content during these three centuries. The Dutch guilder was debased a total of 12 times with the last debasement taking place in 1681 and lost a total of 49 percent of its silver content during the same period. In other words, the value of silver in terms of the monetary unit of account of these two states increased by 55 and 96 percent respectively during the early modern era. At the other end of our sample were the currencies of Russia and the Ottoman Empire. The Russian rouble experienced 21 debasements and lost 82 percent its silver content from 1535 to 1800. The Ottoman akçe experienced 25 debasements and lost 92 percent of its silver content from 1500 to 1800. The value of silver in terms of the monetary unit of account of these two states increased by 465 and 1240 percent respectively during these three centuries. The currencies of the seven other countries in our sample, those of France, Spain, Portugal, Venice, Denmark, Austria and Poland were ranked in between these two ends in terms of stability and total decline in silver content.

Graph 1: Silver Content of the Currency and Debasement Rates in Europe, 1500-1800

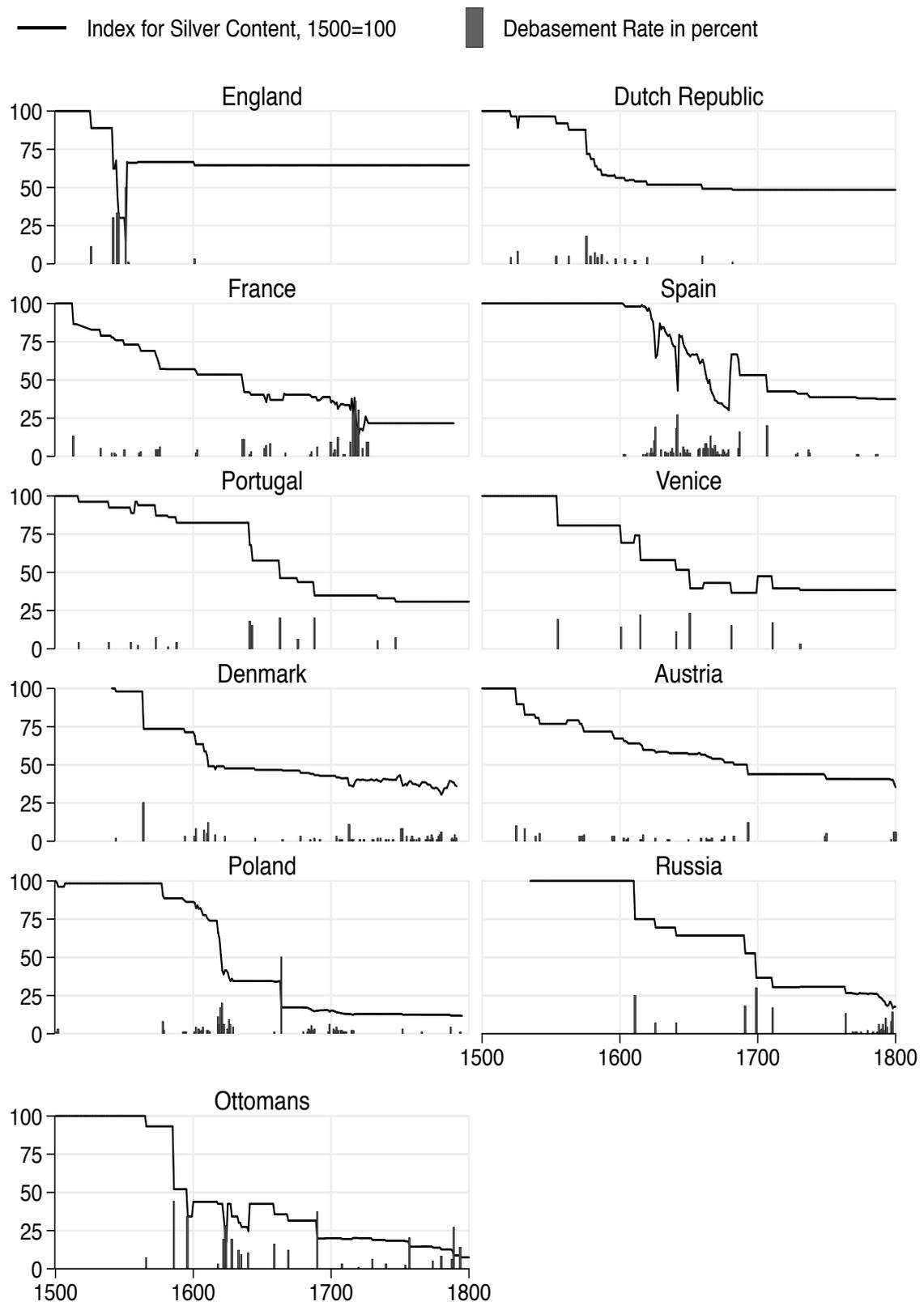


Table 1
Total Increases in the Price of Silver and in Consumer Prices
in terms of the Monetary Unit of Account, 1500 to 1800

	Price of Silver	Consumer Prices
England	55 percent	820 percent
Dutch Rep.	96	980
France	345	2000
Spain	169	1050
Venice	160	780
Austria	185	920
Poland	780	2570
Russia	465	1580
Ottoman Emp.	1240	2330

For details, see the text.

Table 2
Shares in Total Inflation, 1500-1800 (in percent)

	‘Silver Inflation’	Debasements
England	79	21
Dutch Rep	70	30
France	50	50
Spain	58	42
Venice	53	47
Austria	53	47
Poland	33	67
Russia	37	63
Ottoman Emp.	18	82

For details, see the text.

An alternative way to measure the debasements is to follow over time the official or mint price of silver as expressed in terms of the monetary unit of account. By taking the inverse of the changes in the silver content of the currency, one can see that the official price of silver increased a total of only 55 percent in England and only 96 percent in the Netherlands during these three centuries. In contrast, the official price of silver increased 169 percent in Spain, 160 percent in Venice, and further to the east, 780 percent in Poland, 465 percent in Russia and 1240 percent in the Ottoman Empire during the same period (Table 1). The large differences between the west and east of the continent in terms of total or cumulative debasements are more striking when presented in terms of this measure.

By making use of the increases in the official price of silver arising from debasements, we can also breakdown the total price increases experienced in each country during the early modern era into its two basic components. Under the reasonable approximation that in the longer term debasements led to increases in the price level measured in terms of the unit of account but not in grams of silver, one can estimate the share of debasements in total inflation in terms of the unit of account as the geometric share left after the share in total price increases of price increases measured in terms of silver are accounted for. Arrival of large amounts of silver from the New World or changes in the velocity of circulation of money or other influences such as greater integration of markets across Europe tended to increase the aggregate price level measured in grams of silver during the early modern era.

In the absence of aggregate price series for individual countries, we have used the consumer price indices constructed by Bob Allen (2000) for the leading cities in seven of the eleven countries in our sample as a proxy for the increases in the aggregate price level in that country. For Russia and the Ottoman Empire we obtained price data from other sources. Portugal and Denmark were excluded from this exercise due to the unavailability of price data. We then divided the total price increase into its two components according to the following formula:

$$\text{Increase in Log (Nominal Price Level)} = \text{Increase in Log (Price of Silver)} + \text{Increase in Log (Nominal Price Level expressed in Silver)}$$

The results summarized in Table 2 offer a striking contrast between the west and the east of the continent regarding the role of debasements in total inflation during the early modern era. Not surprisingly, debasements can explain only a small share of overall price increases in northwestern Europe, only 21 and 30 percent in England and the Netherlands respectively. At

the other end of the spectrum, in Poland, Russia and the Ottoman Empire debasements accounted for 67, 63 and 82 percent respectively of the increases in nominal prices during these three centuries. More generally, Table 2 shows that whereas debasements accounted for an unweighted average of 32 percent of the total price increases in the 5 countries in western Europe, debasements can explain as much as 67 percent of the overall price increases in the 4 countries in eastern Europe during the early modern era. It is thus not surprising that in the discussions about the price increases in western Europe during the early modern era, silver inflation associated with the arrival of gold and silver from the Americas dominates the discussion. This emphasis on the ‘silver inflation’ can be misleading for other parts of the continent, however, as price increases in the eastern Europe were caused mostly by debasements. Similarly, if we want to examine debasements in early modern Europe, it is important to take into account and understand the debasements in eastern Europe because that is where most of the action took place.

In more than half of the close to 300 debasements in our sample, the decline in the silver content of the currency was less than 10 percent. However, every one of the eleven currencies in our sample also experienced at least one debasement of 20 percent or higher during these three centuries. 13 debasements in our sample involved an at least 30 percent reduction in the specie content of the currency. There are also many examples in our samples of episodes involving multiple debasements of the same currency within a small number of years. The silver content of the currency declined by more than 50 percent or the value of silver in terms of the unit of account exceeded 100 percent in 6 of these episodes that involved 6 different currencies in our sample. However, there is no example in our sample or in early modern Europe as a whole of an episode of multiple debasements of the kind that occurred in France during the fourteenth and fifteenth centuries when the value of silver in terms of the unit of account increased by more than 1000 percent within a number of years (Sussman 1993). As can be seen from Graph 1, all of these currencies also experienced a smaller number of revaluations where the silver content of the currency was raised typically as a corrective or stabilizing measure after a period of multiple and large reductions in their silver content within a relatively short period of time.

Theories or Motives for Debasements

At the risk of over simplification, one can classify theories or motives for debasements that are available in the literature broadly under two categories, monetary and fiscal. While some authors emphasize both of these causes, many others focus exclusively on one and tend to downplay or ignore the other. In what follows, we will discuss each of these basic causes in turn. In the econometrics part of our study, we will explore the fiscal causes of debasements and leave the study of monetary causes to a later stage of the project.

Monetary Causes

Face values of the gold and silver coins in terms of the monetary unit of account were usually fixed by a central monetary authority in most parts of the continent during the early modern era. Changes in the gold-silver ratio (or bimetallic ratio) in the international and local markets, due to the arrival of large amounts of silver from the New World, for example, often led to the emergence of overvalued (often silver) and undervalued (often gold) coins and even the disappearance of the undervalued coins. One basic monetary cause of debasements was thus the divergence between the gold-silver ratio in the markets, local or international, and the gold-silver ratio implicit in the relative specie content and face value of the existing coins or the mint ratio. The monetary authorities then needed to adjust the specie content of at least one kind of coins, gold or silver, or both or keep the existing coins but adjust the face value of one or both kinds of coins in order to reduce if not eliminate entirely the difference between the two ratios. They usually chose to adjust the specie content of the coins downwards but occasionally they would raise the specie content of one or both type of coins. (Glassman and Redish 1988, Redish 2000, Chilosì and Volckart 2010)

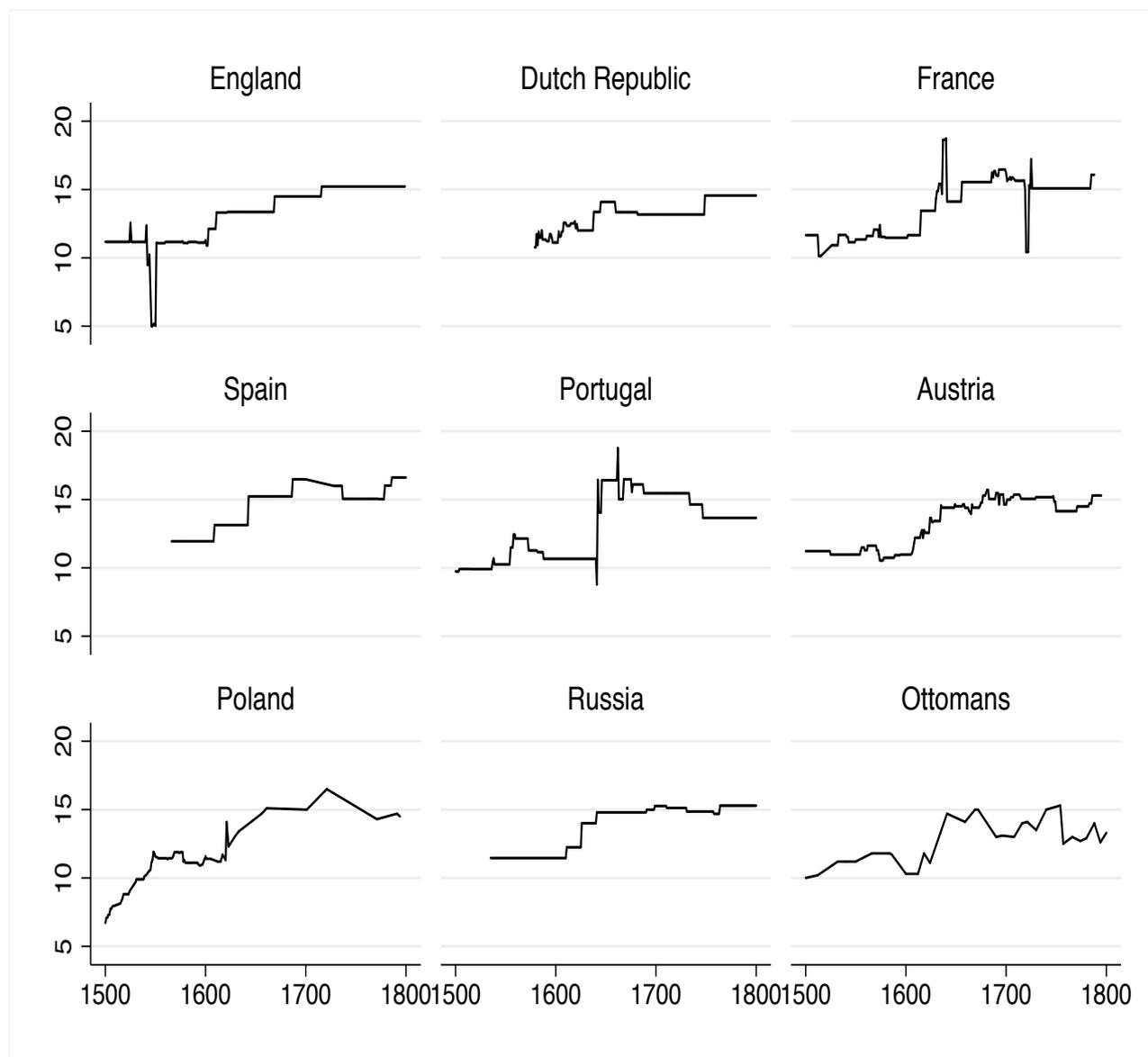
Some states, however, chose to keep the specie content of some of their coins fixed in order to maintain them as an international means of payment and continue to enjoy the seigniorage their production provided. However, they did change the specie content of other coins. Most importantly, Venice (and other Italian city states) kept unchanged the specie content of their gold coins while adjusting upwards their face value in terms of the unit of account and reduced the specie content of only the silver coins. Similarly, Spain kept unchanged the specie content of both their gold and silver coins, adjusted upward the face value of both gold and silver coins in terms of the domestic unit of account but reduced the metal content of their copper coins (Motomura 1994). Others such as the Ottoman state allowed the value of their gold coins to float or be determined by the local markets. While the

convenience of having fixed face values for both types of coins was sacrificed, this option prevented the under or overvaluation of one or the other type of coinage and ensured that both types of coins would continue to circulate. (Pamuk 2000)

The market gold-silver ratios tended to move together across the continent but there existed differences between the gold-silver market ratios in the western regions of the continent and those in the east for most of the early modern era. At any given time, the ratios in the western parts of the continent were usually higher than those in the east. The gold-silver ratio in the local and international markets across the continent increased roughly from 11 to 12 at the beginning of the sixteenth century to about 15 to 16 at the end of the eighteenth century (Graph 2). This broad trend implied that the monetary authorities across the continent were likely to reduce the gold content of the currency by a total of about 30 percent more than its silver content or raise the mint equivalent of a given weight of gold by 30 percent more than a given weight of silver during these three centuries. As can be seen from Graph 2, the gold-silver ratio did not move in one direction but tended to fluctuate in both the short and medium term. As a result, there were many instances where the pressure for debasement or revaluation arose not from a rise but a decline in the gold-silver ratio and the appreciation of silver against the gold. In the case of those monetary systems where the face value of the gold coins was not fixed by the monetary authority but allowed to be determined by the markets, this motivation for debasement did not exist.

A similar problem occasionally emerged in relation to the copper coins or small change coins with other metals or alloys. When the price of copper rose above the face value of the copper coins, the latter were melted for their metal content. The same thing could also happen, not with a rise in copper prices but a decline in the silver content of the unit of account due to debasements. These situations gave rise to recurring shortages of small change from the thirteenth to the nineteenth centuries or what Carlo Cipolla called the big problem of small coins. One way to deal with the shortages of small change was to reduce the metal content of the copper coins themselves. (Cipolla 1956, Munro 1988, Sargent and Velde 2002)

Graph 2: The Gold-Silver Ratio in Europe, 1500-1800



The nature of pre-modern technology of coin production is also important in understanding early modern monetary systems and debasements. The method of coin production had remained largely unchanged from the earliest days of coinage. It began with the hammering of a thin piece of metal to the desired thickness. These blanks were then placed on an obverse die and struck with a hammer in which the reverse die was embedded. As a result, coins were often produced with imperfectly placed dies and were not perfectly round. These irregularities facilitated clipping, that is, cutting bits of metal from the coin's edge and then melting down and selling the clipped metal, most often silver as bullion.

Hammered coins were also subject to wear and tear. The circulation of worn and clipped coins meant that the full bodied coins either circulated at a premium or they disappeared in accordance with Gresham's Law.¹ The response of the monetary authorities to the growing heterogeneity of coinage and the emergence of 'good' and 'bad' moneys was often, but not always, in the direction of changing the specie content of the unit of account downward rather than upward. In other words, they usually chose to raise the value of good money rather than lower the value of bad money (Glassman and Redish 1988, Redish 2000).

With the introduction of mechanized minting processes in Italy in the early sixteenth century, clipping began to disappear. The spread of the new technology to the rest of the continent was delayed due to the opposition of guilds, however. Hammered coinage was not replaced by mechanized coin production in France, England and elsewhere in the continent until the seventeenth century (Redish 2000, 54-61). The mechanical technology was adopted in Istanbul at the eastern end of the continent in 1686 (Pamuk 2000, 155). The new technology sharply reduced wear and tear and clipping of coins but counterfeiting continued until the introduction of the steam engine driven minting press in Great Britain in the 1790s and elsewhere in the continent during the first half of the nineteenth century.

It has also been argued that a related motive for "defensive" debasements emerged when a neighboring state lowered the silver content of its coinage which turned all or part of the country's existing coinage into good moneys and threatened their outflow (Cipolla 1963, Munro 2012). Difficulties of the central states in controlling local mints created similar problems especially during the sixteenth and seventeenth centuries but the problems with the local mints were less important during the early modern centuries in comparison to the late medieval era. With the shift from hammered to milled or machine made coins in most parts of Europe during the seventeenth century, this cause and motivation for debasements mostly disappeared. In the literature on late medieval debasements, there is also a strong emphasis on the shortages of bullion or the "silver famine" at least as an apparent cause of debasements (Cipolla 1963, Bordo 1986, Pamuk 2000, Chilosì and Volckart 2010). Whether these shortages were an actual cause of the late medieval debasements or not, it is clear that after

¹ For a model that attempts to explain the coexistence of coins with different specie content and how wear and tear, clipping and other monetary causes may give rise to debasements, see Velde, Weber and Wright 1999; also Glassman and Redish 1988, Reddish 2000 and Rolnick, Velde and Weber 1996.

the arrival of large volumes of gold and silver from the Americas, this motive is mentioned much less frequently in the literature on early modern debasements.

Fiscal Causes

The second category of explanations for debasements is fiscal. In the literature there is more debate on fiscal causes of debasements than on monetary causes. To begin with, there are studies that question whether debasements were effective in raising revenues for the state. Assuming they were, there are also alternative theories about the factors that shaped the incentives for and constraints on debasements. Below, we summarize these arguments.

One strong thread in the literature argues states did not benefit fiscally from debasements. Amongst others, Miskimin (1964 and 1984) has viewed debasements as futile fiscal exercises and consequently as puzzles that need to be understood and explained. Theoretically, most of these studies rest on the premise that coins circulated on the basis of their metallic content. For example, Rolnick, Velde and Weber (1996) have argued that if coins circulated on the basis of their metallic content, the monetary authority would not be able to induce merchants and others to bring their old coinage to the mints after a debasement.

On the other side of the debate, there is plenty of historical evidence that debasements were an effective instrument of public finance, especially for limited periods of time (Cipolla 1963, Gould 1970, Bordo 1986, Sussman 1993, Pamuk 2000, Karaman and Pamuk 2010). The argument rests on the premise that historically coins often circulated by tale or on the basis of their face value (Cipolla 1982, Sussman 1993). Consequently, the mint could produce coins of lower metallic content but of higher nominal value, and attract merchants to bring old coins to the mint, with the expectation that they could pass on the new coins at their nominal value. In addition, all the obligations of the state to employees, soldiers and suppliers would be paid with a currency with lower metallic content, until prices, wages and salaries adjusted upwards. There are numerous historical accounts and budget documents across the continent that identify the critical role played by revenues from debasement at critical fiscal junctures.

An important distinction between fiscal and monetary explanations for debasements is that they predict different magnitudes for debasements. Raising revenue from debasements, while also ensuring cooperation from merchants and money dealers, required large reductions in metallic content. On the contrary, the adjustments in the specie content of the currency necessitated by monetary fluctuations were usually small in size. Consequently, most if not

all of the debasements exceeding a threshold of 10 percent and even of those exceeding 5 percent that appear in Graph 1 were likely associated with fiscal causes.

Assuming that the state could raise revenues through debasements, the question that follows is the incentives and trade-offs associated with it. In the premodern era, by far the largest spending item in state budgets was war. One should expect, as a result, that fiscally motivated debasements should be more likely during periods of war, especially when they lasted long and fiscal pressures built up, and anecdotal historical evidence is generally consistent with this conjecture.

While debasements brought immediate revenues to states, there were also longer term fiscal costs associated with it. For one, debasements tended to reduce the real revenues of the states since those revenues fixed in terms of the unit of account declined in real terms after the rise in the price level. The state then needed to adjust the nominal taxes and other incomes upwards to keep up with the rise in prices which was often difficult. Second, for most of the period under study, coins of different origin circulated freely in domestic markets, and public could react to debasement by reducing its holdings of domestic currency or currency substitution.

The decision by the state to debase the currency also related to what the alternatives were. The main alternative was taxation. The advantage of debasement over taxation was that it was often easier to implement and resulted in immediate revenues, which was critical at times of war. On the other hand, for silver and gold coins, the reduction in the metallic content of the coin and the difficulties in attracting the coins to the mint for debasement placed an upper bound on the revenues to be made from debasement. During the early modern era, many European states made dramatic gains in terms of tax revenues while others lagged behind (Karaman and Pamuk 2013). Consequently, for states that increased their tax revenues, the potential revenues from debasement may have become less significant, while they remained important for the laggards.

There was, however, one caveat to the argument above. Various states across Europe, including those with high tax revenues, occasionally experimented with various forms of fiat money. The limits of revenues to be made from commodity money debasements did not apply to fiat money. Hence, experiments with fiat money almost always resulted in unrestrained money growth, significant revenues, and eventual failure of fiat money.

Examples include over produced copper coins in the Spain in the seventeenth century, Law Affair in France in the 1710s, and “Assignant” issues in Russia in the eighteenth century.

The second alternative to debasement was borrowing. For the territorial states in our sample, large scale, public borrowing from market in domestic currency developed either relatively late or was absent altogether. More common was implicit forms of borrowing where states received often large advance payments in exchange for the assignment of rights to future taxes and others sources of state income. Examples include sale of venal offices in France and life-time tax farms in France and the Ottoman Empire. In fiscal emergencies, the long term fiscal costs of these arrangements were often no less burdensome than debasements.

The discussion up to this point treated debasement decisions from a revenue maximization perspective for the state. Debasements also had economic consequences for various social groups, however. To the extent these groups, landowners, tenants, merchants, manufacturers, laborers, creditors and debtors could influence fiscal policy, they also played a role in determining the incidence and frequency of debasements. As a first order approximation, the disruption and instability caused by the large, fiscally motivated debasements hurt most if not all groups. Beyond that, it could be argued, they hurt creditors and those with fixed incomes such as landowners. Wage earners also stood to lose at least until they demanded and received raises (Cipolla, 1963; Spufford, 1988, 289-318).

Historical evidence suggests that the institutional environment, and especially the political institutions were critical in determining whether the groups that were hurt could keep the state from predatory debasements. It has been argued, for example, that in the more representative political regimes, monetary authorities were more responsive to the concerns of and pressures from various groups about debasements. (Chilosi and Volckart 2010). In this vein, England’s lower debasement rates has been explained by the strength of its parliament while in France monetary policy remained an instrument in the hands of the monarch (Eichengreen and Sussman 2000). Similarly, Van Zanden et al. (2012) documents that the Cortes in Spain agreed to raise taxes for the king in exchange for limiting debasements. At the other end of the continent, in eastern Europe, monetary authority remained in the hands of the monarch, with the exception of Poland.

Empirical Analysis

In this section we turn to econometric analysis of the fiscal determinants of debasements across Europe. At this stage, we are unable to test monetary explanations. This is mainly because monetary theories require detailed series on the deviations between official and market prices of gold and silver. Currently we have these series only for some of the polities, and hence attempting to test monetary theories would leave out most polities in the sample and the results would not present a comprehensive view of the European experience.

Variables

Our dataset for regression analysis covers 10 polities (England, Dutch Republic, France, Spain, Portugal, Venice, Austria, Poland, Russia, and the Ottoman Empire) with annual data from 1500 to 1800. We had to exclude Denmark from our regressions due to the absence of tax revenue series. For the dependent variable, the debasement rates are calculated by using the silver value of currency series from the Allen-Unger and Global Price and Income Group databases as well as other country specific sources.²

Central treasury revenues of many European states increased sharply during the 17th and especially the 18th centuries. Most striking in this respect were England and France but revenues of some central states outside western Europe such as Austria and Russia also increased significantly. By contrast, those of Venice, the Ottomans, Poland lagged behind. In order to proxy for fiscal capacity of states, we divide per capita tax revenues of the central states by the daily wages of unskilled workers in the leading city as given in Karaman and Pamuk (2013). This gives us per capita tax revenues expressed in numbers of daily wages. This allows us to control for both the effects of changes in average real incomes and the price level in silver. The wage series in the leading city are available annually for most countries from Allen (2001) and other sources and due to their high quality are frequently used by as a proxy for per capita income for the early modern era for which per capita GDP estimates are often lacking or of poor quality.

Wars are measured by number of years in war in the last 5 years (war in 5-years), based on Clodfelter (2002). Political regime is proxied by constraint on the executive variable by Acemoglu et. al. (2005). As control variables we use economic structure for which the urbanization rate is generally used as the proxy for the early modern era. Our main data

² Perc (1935), Tomaszewski (1934), Pribram (1938), Macedo et. al. (2001), Pamuk (2000).

source for this variable is de Vries (1984), who uses a threshold of 10,000 inhabitants to define urban centers and provides the most detailed series for the period with estimates for each half century. We interpolate for the decades in between. We also use population based on McEvedy and Jones (1978).

Cross-country summary statistics are presented in Table 3. There are 10 polities in the sample and 300 years, implying a maximum of 3000 observations. Cross-country summary statistics are presented in Table 1. There are 10 polities in the sample and 300 years, implying a maximum of 3000 observations. Debasement data is complete except for Russia before 1535 and Poland after 1796. We drop France after the revolution and during Law Affair (1716-1726) because the series are not reliable. 40 observations are lost for 1500-1503, because our war variable that goes back 5 years starts in 1500. 1104 further observations are lost because of gaps in the tax database. Hence, for the full set of countries, there are 1896 observations in the regressions.

Variable	Description	Obs.	Mean	Std Dev.	Min.	Max
<i>debrate</i>	Debasement rate	2938	0,65	3,34	0,00	50,00
<i>deb dum1</i>	Dummy for years with debasement greater than 1 percent	2938	0,08	0,27	0	1
<i>warin5yr</i>	Number of years in war in last 5 years	2950	2,42	2,21	0	5
<i>realtaxpc</i>	Per cap. tax revenues (in days of wages)	1990	7,10	5,61	0,22	24,73
<i>regexec</i>	Constraint on Executive	2990	2,52	1,97	1	7
<i>urb</i>	Urbanization rate	2990	10,02	8,03	0,00	33,60
<i>pop</i>	Population (in millions)	2950	8,81	6,84	0,98	28,20

Econometric Results

We test our hypotheses regarding the fiscal causes of debasements with Probit regressions. In the Probit model, our dependent variable is a dummy variable that takes the value 1 if there is a debasement larger than 1% and 0 if there is no debasement or there is a debasement but it is smaller than 1%. The estimated equation for the probit model is as follows:

$$\text{Debase}^*_{i,t} = \beta_1 + \sum_{k=2}^n \beta_k X_{k,i,t} + \theta_i + \gamma_t + \varepsilon_{i,t}$$
$$\text{Debase}_{i,t} = \begin{cases} 1 & \text{if } \text{Debase}^*_{i,t} > 0.01 \\ 0 & \text{otherwise} \end{cases}$$

where $X_{k,i,t}$ denotes the independent variables in the regression, and θ_i and γ_t are the country and decade fixed-effects, respectively.

In the three sets of regressions we present below, we explore the three basic fiscal explanations for debasements. Specifically, we examine the arguments that i) wars made debasements more likely, and that ii) higher tax revenues by the central administration and iii) institutional constraints on the executive authority reduced them. In all three sets of regressions, we also include various specifications with controls for population and urbanization. Population is mainly a proxy for the overall size of the polity, and controls for any impact size might have on incentives for and feasibility of debasement. Urbanization is correlated with economic structure, economic development and monetization and controls for effects they might have. Finally, in all specifications we include country and decade fixed effects. Country fixed effects control for all time invariant factors that differ between countries. Decade fixed effects control for common shocks and trends across the continent such as changes in coinage technology.

In the first set of regressions presented in Table 4 we explore the three basic fiscal explanations for debasements, wars, per capita tax revenues by the central administration divided by the daily urban wage and institutional constraints on the executive authority, using panel data for the ten polities across Europe for the period 1500 to 1800. The results support the hypotheses that war increases debasements, whereas executive constraint and higher tax revenues reduce it. The coefficients of all three variables, wars, tax revenues and institutional

constraints on the executive have the right sign and they are significant at the level of 1 or 5 percent in each of the four regressions. These findings are consistent with fiscal explanations of debasements. Moreover, urbanization, our control variable for economic structure has negative sign and is also significant at the 1 percent level suggesting that with economic development the frequency of debasements tended to decline across the continent during the early modern era.

Table 4
All Europe, 1500-1800 (10 polities)
Probit Regressions

Dependent Variable: Dummy for Debasements of 1 percent or higher

	(1)	(2)	(3)	(4)
warin5yr	0.077*** (0.03)	0.063** (0.03)	0.087*** (0.03)	0.077*** (0.03)
realtaxpc	-0.058** (0.03)	-0.064** (0.03)	-0.088*** (0.03)	-0.090*** (0.03)
regexec			-1.043*** (0.20)	-0.929*** (0.21)
urb	-0.075** (0.04)	-0.115*** (0.04)	-0.084** (0.04)	-0.110*** (0.04)
pop		0.088*** (0.03)		0.058** (0.03)
N	1896	1896	1896	1896
r ² _p	0.16	0.17	0.18	0.19
chi ²	185.14	197.26	212.71	217.55

Standard errors in parentheses.

Levels of statistical significance: * 0.1 ; ** 0.05 ; *** 0.01.

Table 5**Eastern Europe, 1500-1800 (4 polities, Aust, Pol, Rus, Ott)****Probit Regressions****Dependent Variable: Dummy for Debasements of 1 percent or higher**

	(1)	(2)	(3)	(4)
warin5yr	0.211*** (0.05)	0.173*** (0.06)	0.211*** (0.05)	0.173*** (0.06)
realtaxpc	-0.341*** (0.08)	-0.326*** (0.08)	-0.341*** (0.08)	-0.326*** (0.08)
regexec			-0,83 (1.77)	-1,75 (1.83)
urb	-0.16 (0.34)	-0.42 (0.37)	-0.16 (0.34)	-0.42 (0.37)
pop		0.074* (0.04)		0.074* (0.04)
N	516	516	516	516
r2_p	0.21	0.22	0.21	0.22
chi2	91.47	94.77	91.47	94.77

Standard errors in parentheses.

Levels of statistical significance: * 0.1 ; ** 0.05 ; *** 0.01.

In Tables 5 and 6, we try to take a more disaggregated look at the continent and repeat the same set of four regressions separately for Eastern Europe and Western Europe, for the same period, 1500 to 1800. In the second set of regressions presented in Table 5, four polities are included in Eastern Europe, the Habsburg Empire, Poland, Russia and the Ottoman Empire. The results are again consistent with fiscal explanations of debasements. In these four polities, wars were correlated positively and increasing tax revenues were correlated negatively with debasements during the early modern era. The coefficients of these two variables are significant at the level of 1 percent in each of the four regressions. Our variable for constraint on the executive has the expected negative sign in the two specifications but is not statistically significant. This is understandable since there was little change in this variable in the four polities of Eastern Europe during the early modern era. Moreover,

urbanization, our control variable for economic structure also has the expected negative sign in all four specifications although it is not significant at the 10 percent level.

Table 5
Western Europe, 1500-1800 (6 polities)
Probit Regressions

Dependent Variable: Dummy for Debasements of 1 percent or higher

	(1)	(2)	(3)	(4)
warin5yr	0.00 (0.04)	0.01 (0.04)	0.03 (0.05)	0.01 (0.05)
realtaxpc	0.089** (0.04)	0.074* (0.04)	0.04 (0.05)	0.06 (0.05)
regexec			-1.419*** (0.28)	-2.334*** (0.40)
urb	-0.177*** (0.04)	-0.184*** (0.05)	-0.182*** (0.05)	-0.164*** (0.05)
pop		0.12 (0.08)		-0.389*** (0.12)
N	940	940	940	940
r2_p	0.18	0.18	0.23	0.25
chi2	112.30	114.67	142.42	153.89

Standard errors in parentheses.

Levels of statistical significance: * 0.1 ; ** 0.05 ; *** 0.01.

In the third set of regressions presented in Table 6, we repeat the same set of four regressions, this time for Western Europe. The six polities included in these regressions are England, the Dutch Republic, France, Spain, Portugal and Venice, all for the period 1500 to 1800. The results are interesting and require further scrutiny and elaboration. Whereas wars and tax revenues both had the right signs and were significant mostly at the 1 percent level in the regressions for Europe as a whole and also for Eastern Europe, these two variables are not significant in the regressions for Western Europe. Instead, the constraint on the executive variable and the urbanization variable both have the right sign are significant at the 1 percent

level. The results were similar when we repeated the same set of four regressions for two subsets of Western Europe, first for England, the Dutch Republic and Venice and then for France, Spain and Portugal. In these two additional sets of regressions too, variables for wars and tax revenue were not significant but the variables for constraint on the executive and urbanization were significant.

These results suggest strongly that whereas the fiscal motivation for debasements remained intact in Eastern Europe during the early modern era, the same fiscal logic was weaker if not non-existent in the debasements in Western Europe. One can offer a number of related explanations for the different pattern in Western Europe and the contrast between the two halves of the continent. Significant increases in tax revenues by the central administrations made the fiscal or seigniorage gains from debasements less important and more costly during the early modern era. The emergence of other alternatives to debasements such as state borrowing from domestic and international lenders also made debasements less attractive. The availability of borrowing as an alternative to debasements was an important difference between Western and Eastern Europe during the early modern era. Debasements were also opposed by those mostly urban elites who were able to put constraints on the monarchs in the West. Urban elites were not equally powerful and the political institutions did not give them a comparable degree of power in the Eastern European polities. It thus appears this combination of more urban economic and political structures and related political institutions as well as higher level of per capita tax revenues and the availability of alternative forms of war finance led to major differences between the West and the East. While fiscally motivated debasements were common in Eastern Europe, these differences raised the threshold for optimum amount of debasements and made it more unlikely for fiscal motives to actually lead to a debasement in Western Europe. These results also suggest that monetary causes became more important in explaining debasements in Western Europe during this period but not in Eastern Europe.

These results require additional empirical analysis and further interpretation. While they were different from those in Eastern Europe, we feel that the causes of debasements in Western Europe are not yet fully understood. After extending our study to the monetary causes of debasements, we hope to obtain a more detailed and nuanced picture regarding the causes of debasements inside Western Europe and possible differences within Western Europe.

Conclusion

Debasements had been quite common in all regions of Europe in the late medieval era. In the early modern era, however, significant differences began to emerge in the use of debasements across Europe. While many states continued to make use of debasements, others began to move away from them. This paper investigated the causes of debasements and monetary stability across Europe during the early modern centuries. We first provided a continent-wide perspective on the proximate causes of inflation in early modern Europe. We established that in northwestern Europe debasements were limited and price increases measured in grams of silver were the leading cause of inflation. Elsewhere, especially in eastern Europe, debasements were more frequent and were the leading proximate cause of price increases.

We then investigated the leading fiscal causes of debasements by making use of a new dataset. We find that fiscal demands of warfare, low fiscal capacity as measured by tax revenues, and lack of constraints on the executive power were all associated with higher likelihood of debasements for early modern Europe as a whole. Our empirical analysis also points to significant differences between the west and the east of the continent in terms of the causes of debasements. The basic fiscal causes, namely warfare and low fiscal capacity appear as the leading causes of debasements in eastern Europe. In contrast, debasements in western and southern Europe were not correlated with warfare and or tax revenues and negatively correlated with urbanization and constraints on the executive. The combination of more urban economic and political structures and related political institutions as well as higher level of per capita tax revenues and the availability of alternative forms of war finance led to major differences between the West and the East. The economic structures and political institutions in Western Europe raised the threshold for optimum amount of debasements and made it more unlikely for fiscal motives to actually lead to a debasement.

These results also suggest that monetary causes became more important in explaining debasements in Western Europe but not in Eastern Europe during the early modern era. Because exploring the monetary causes require new data series such as the differences between the official and market gold-silver price ratios, we have not been able to do so until now. In the near future, we hope extend our data set and investigate to what extent monetary factors contributed to debasements especially in Western Europe.

REFERENCES

- Acemoglu, Daron, Simon Johnson, and James Robinson (2005). "The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth." *American Economic Review*, 95(3): 546-579.
- Allen, Robert C. (2001), "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War", *Explorations in Economic History*, 38, 2001, pp. 411-47.
- Allen, Robert (2007). Allen-Unger Database: European Commodity Prices 1260-1914. On-line: http://www2.history.ubc.ca/unger/html_files/new_grain.htm.
- Bordo, Michael (1986), "Money, Deflation and Seigniorage in the Fifteenth Century: A Review Essay", *Journal of Monetary Economics*, 18, 337-46.
- Chilosi, David and Oliver Volckart (2010), "Good or Bad Money? Debasement, Society and the State in the Late Middle Ages", London School of Economics, Department of Economic History Working Papers, No. 140/10.
- Cipolla, Carlo (1955), "La pretendu 'revolution des prix': Reflexions sur l'experience italiennes", *Annales, Economies, Societes, Civilizations*, 10, 513-36.
- Cipolla, Carlo (1956), *Money, Prices and Civilization in the Mediterranean World*, Princeton University Press, Princeton, New Jersey.
- Cipolla, Carlo (1963), "Currency Depreciation in Medieval Europe", *The Economic History Review, New Series*, 15, 413-22.
- Cipolla, Carlo (1955), "La pretendu 'revolution des prix': Reflexions sur l'experience italiennes", *Annales, Economies, Societes, Civilizations*, 10, 513-36.
- Cipolla, Carlo M. (1983), *The Monetary Policy of Fourteenth-Century Florence*, University of California Press, Berkeley and Los Angeles.
- Cipolla, Carlo M. (1989), *Money in Sixteenth Century Florence*, University of California Press, Berkeley and Los Angeles.
- Clodfelter, Michael (2002). *Warfare and Armed Conflicts: A Statistical Reference to Casualty and Other Figures, 1500–2000*. London McFarland.
- Eichengreen, Barry and Nathan Sussman (2000), "The International Monetary System in the (Very) Long Run", IMF Working Paper, No. 00/43.
- Fisher, Douglass (1989), The Price Revolution, A Monetary Interpretation, *The Journal of Economic History*, Vol. 15.
- Flynn, Dennis O. (1978), "A New Perspective on the Spanish Price Revolution, the Monetary Approach to the Balance of Payments", *Explorations in Economic History*.

Friedman, Milton (1990), "Bimetallism Revisited", *Journal of Economic Perspectives*, Vol. 4, 85-104.

Glassman, Debra and Angela Redish (1988), "Currency Depreciation in Early Modern England and France", *Explorations in Economic History*, Vol. 25, 75-97.

Global Price and Income History Group. (On-going). Downloadable data on incomes and prices 1200-1950. <http://gpih.ucdavis.edu> .

Goldstone, Jack A. (1984), "Urbanization and Inflation: lessons from the English price revolution of the sixteenth and seventeenth centuries", *American Journal of Sociology*,

Gould, John Dennis (1970), *The Great Debasement, Currency and Economy in mid-Tudor England*, Oxford, Clarendon.

Hamilton, Earl (1929), "The American Treasure and the Rise Capitalism", *Economica*,

Hamilton, Earl (1935), *American Treasure and the Rise of Capitalism in Spain, 1501-1650*,

Kaplanis, Costas (2003), "The Debasement of the 'Dollar of the Middle Ages'", *The Journal of Economic History*, Vol. 53, no. 3, 768-801.

Karaman, Kivanc K. and Şevket Pamuk (2010), "Ottoman State Finances in Comparative European Perspective, 1500-1914", *The Journal of Economic History*, Vol. 70, 2010, 593-627.

Karaman, Kivanc K. and Şevket Pamuk (2013), "Different Paths to the Modern State in Europe: The Interaction between Warfare, Economic Structure and Political Regime", *American Political Science Review*, Vol. 107, No.3, 2013, 603-26.

Lopez, Raymond S. (1951), "The Dollar of the Middle Ages", *The Journal of Economic History*, Vol. 11, 209-34.

Macedo, J. B. D., Silva, Á. F. D., & Sousa, R. M. D. (2001). War, taxes and gold: the inheritance of the real. *Transferring Wealth and power from the Old to the New World: Monetary and Fiscal Institutions in the 17th through the 19th centuries*

McEvedy, Colin and Richard Jones (1978). *Atlas of World Population History*. Harmondsworth: Penguin Books Ltd.

Miskimin, Harry A. (1964), *Money, Prices and Foreign Exchange in Fourteenth Century France*, Yale University Press, New Haven, Conn..

Miskimin, Harry A. (1984), *Money and Power in Fifteenth Century France*, Yale University Press, New Haven, Conn..

Motomura, Akira (1994), "The Best and Worst of Currencies: Seigniorage and Currency Policy in Spain, 1597-1650", *The Journal of Economic History*, Vol. 54, no. 1, 104-27.

- Munro, John (1988), “Deflation and the Petty Coinage Problem in the Late Medieval Economy: the Case of Flanders, 1334-1484”, *Explorations in Economic History*, Vol. 25, 387-423.
- Munro, John (2012), “The Technology and Economics of Coinage Debasements in Medieval and Early Modern Europe: with special reference to the Low Countries and England”, Department of Economics, University of Toronto, Working Paper No. 456.
- North, Douglass and Weingast (1989), “Constitutions and Commitment: The Evolution of institutions governing public choice in seventeenth-century England”, *The Journal of Economic History*,
- Pamuk, Şevket (2000), *A Monetary History of the Ottoman Empire*, Cambridge University Press, Cambridge and New York.
- Pamuk, Şevket (2001), “The Price Revolution in the Ottoman Empire Reconsidered”, *International Journal of Middle East Studies*,
- Pamuk, Şevket (2002), “The Great Ottoman Debasement, 1808-1844: A Political Economy Framework” in Israel Gershoni, Hakan Erdem and Ursula Woköck (eds.), *Histories of the Modern Middle East, New Directions*, Lynne Rienner Publishers, 21-36.
- Pelc, Julian (1935). *Ceny w Krakowie w Latach 1369-1600*. Lwow: Sklad Glowny.
- Pribram, Alfred Francis, Rudolf Geyer, and Franz Koran (1938). *Materialien zur Geschichte der Preise und Löhne in Österreich*. C. Ueberreuter.
- Redish, Angela (2000), *Bimetallism; An Economic and Historical Analysis*, Cambridge University Press, Cambridge and New York.
- Rolnick, Arthur J., François R. Velde and Warren E. Weber (1996), “The Debasement Puzzle: An Essay on Medieval Monetary History”, *The Journal of Economic History*, Vol. 56, no. 4, 789-808.
- Sargent, Thomas J. and Bruce D. Smith (1997), “Coinage, Debasements and Gresham’s Laws”, *Economic Theory*, 10, 197-226.
- Sargent, Thomas J. and François R. Velde (2002), *The Big Problem of Small Change*, Princeton University Press, Princeton, New Jersey.
- Spufford, Peter (1970), *Monetary Problems and Politics in the Burgundian Netherlands, 1433-1496*, Brill Publishers, Leiden.
- Spufford, Peter (1988), *Money and Its Use in Medieval Europe*, Cambridge University Press, Cambridge and New York.
- Stasavage, David (2002), “Credible Commitment in early modern Europe, North and Weingast revisited”, *Journal of Law, Economics and Organization*,

Stasavage, David (2007), “Cities, Constitutions and Sovereign Borrowing in Europe, 1274-1785”, *International Organization*, Vol. 61, 489-525.

Stasavage, David (2010), *States of Credit, Size, Power and the Development of European Politics*, Princeton University Press, Princeton New Jersey.

Sussman, Nathan (1993), “Debasements, Royal Revenues and Inflation in France during the Hundred Year’s War, 1415-1422”, *The Journal of Economic History*, vol. 53, no. 1, 44-70.

Sussman, Nathan (2003), “Inflation Tax”, *The Oxford Encyclopedia of Economic History*, Volume 3, 65-8.

Tomaszewski, E (1934). *Ceny w Krakowie w Latach, 1601-1795*. Lwow: Sklad Glowny.

Van Zanden, Jan Luiten, Buringh, E., & Bosker, M. (2012). “The rise and decline of European parliaments, 1188–17891”. *The Economic History Review*, 65(3), 835-861.

Velde, François R., Warren E. Weber, Randall Wright (1999), “A Model of Commodity Money, with Applications to Gresham’s Law and the Debasement Puzzle”, *Review of Economic Dynamics*, Vol. 2, 291-323.

de Vries, Jan (1984). *European Urbanization 1500–1800*. Methuen and Co. Ltd, London.

Watson, Andrew (1967), “Back to Gold and Silver”, *Economic History Review, New Series*, Vol. 20, 1-34.

Wood, Diana (2004), *Medieval Money Matters*, Oxbow Books, Oxford.