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MWP 2016/11  
Max Weber Programme

Money and Modernization: Liquidity, Specialization,  
and Structural Change in Early Modern England

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EUI Working Paper **MWP** 2016/11

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ISSN 1830-7728

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Printed in Italy  
European University Institute  
Badia Fiesolana  
I – 50014 San Domenico di Fiesole (FI)  
Italy  
[www.eui.eu](http://www.eui.eu)  
[cadmus.eui.eu](http://cadmus.eui.eu)

## **Abstract**

Classic accounts of the English industrial revolution present a long period of stagnation followed by a fast take-off. This picture has been adopted by models of the unified growth theory school (Galor 2005, 2009) and seems to be confirmed by the real wage data of economic historians (Phelps-Brown 1956, Robert Allen 2001 and Gregory Clark 2005, 2007). However, recent GDP data (as well as earlier evidence from historians of material culture) suggest this is a historically inaccurate portrait of early modern England. Slow but steady per capita economic growth preceded the transition. The changes were in part driven by specialization and structural change accompanied by an increase in market participation at both the intensive and extensive levels. These, I suggest, were supported by the gradual increase in money supply made possible by the discovery and exploitation of rich mines of precious metals in America. They allowed for a substantial increase in the monetization and liquidity levels of the economy, hence decreasing transaction costs, increasing market “thickness”, changing the relative incentive for participating in the market, and allowing for agglomeration economies. By making trade with Asia possible, they also induced demand for new desirable goods, which in turn encouraged market participation at both the intensive and extensive levels. Finally, the increased monetization and market participation made it easier for governments to collect taxes, helping build up fiscal capacity and as a consequence provide for public goods. The structural change and market participation that ensued helped pave the way to modernization, hence transforming a level effect on a growth effect. The conclusion is that we need to pay closer attention to monetary developments and the avoidance of deflationary forces as critical preconditions for the emergence of modern economic growth.

## **Keywords**

Origins and persistence of modern economic growth, the industrious, industrial and financial revolutions, early modern monetary injections, the great divergence, the little divergence, state-formation, provision of public goods.

**JEL codes:** E10, E40, E50, N13, N33, O40

*I am thankful to Bruce Campbell, Rui Pedro Esteves, Regina Grafe, and Jan Luiten van Zanden for helpful comments. The usual disclaimer applies.*

*Nuno Palma*

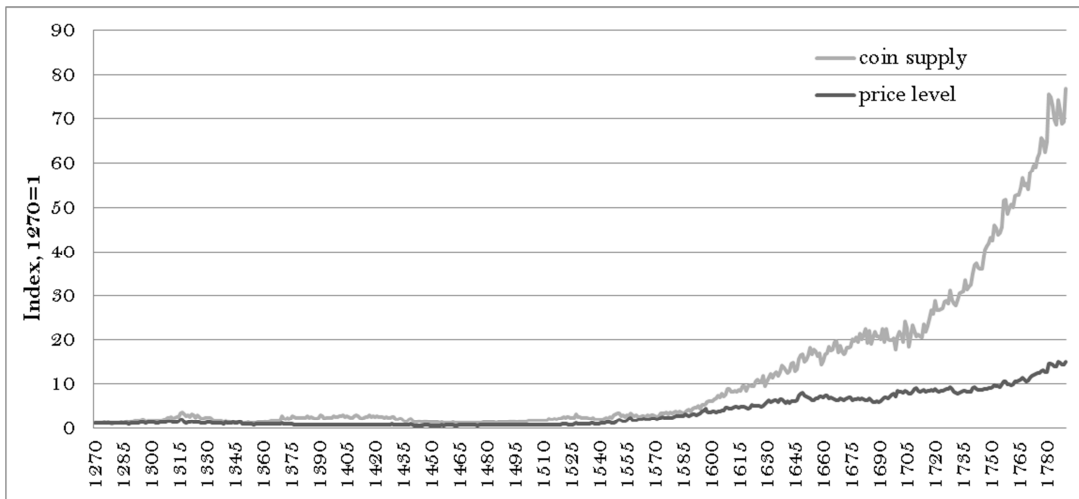
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## 1. Introduction

Fast structural change is now seen as the main discontinuity associated with the classical period of the English Industrial Revolution (Crafts and Harley 1992). And yet recent research has shown that much of the critical occupational migration from agriculture to industry had already happened even earlier, during the early modern period – in particular, after 1522 (Broadberry et al 2013, p. 369; Leigh Shaw-Taylor and Wrigley 2014, p. 59). In this paper I argue that structural change, market participation and specialization in England were facilitated by large-scale monetary injections which resulted from the discovery of significant amounts of precious metals in America. These injections affected, to different degrees, other European countries as well, but they interacted positively with certain characteristics of the Northwestern European economies.

Figure 1 illustrates the scale of the English monetary injection in aggregate terms. In the figure the price level is given by the GDP deflator of Broadberry et al (2015). The figure shows that prices simply failed to keep up with the enormous increase in per capita coin supply.<sup>1</sup> The long-run evidence for England clearly contradicts a quantity-theory interpretation of the evolution of prices over the long run. In the main body of the paper below, I show that over the early modern period real money supply per capita increased substantially in England, from £1 to 1.5 in the 1550s to over £4 by the end of the eighteenth century. I argue that this large-scale increase in real money supply combined with other historical developments over the early modern period to cause a significant decrease in the cost of participating in markets. In turn, this led to increased levels of specialization through division of labor, and to labor expansion on both the intensive and extensive margins. The greater ease in making and receiving payments meant that it was then easier for firms to pay the wage bill and for people to work additional days – one feature of the early modern industrious revolution.<sup>2</sup>



**Figure 1.** Coin supply and price level, 1270-1790. Source: coin supply from Palma (2016a), and the price level is the GDP deflator of Broadberry et al (2015).

<sup>1</sup> Using instead the retail price index of Clark (2014) would lead to the same conclusion.

<sup>2</sup> My contribution to the study of the industrious revolution does not pretend to substitute the reasons which have been pointed out for this increase, such as demand for new goods (deVries 1994, 2009, Hersh and Voth 2009), but to complement it by pointing out that there was a complementary monetary element. Indeed, many of the “new goods” which led to an increased labor supply depended on the availability of precious metals to be imported from Asia (Palma and Silva 2015).

The large reserve of precious metals in America was critical in allowing the European money supply to expand as it did in the early modern period. In the counterfactual absence of these reserves, forms of “inside” money including fiat, bank deposits, bills of exchange or other forms of credit could not have compensated for the relative decrease in coin supply anywhere in Europe before 1790.<sup>3</sup> The decrease in transaction costs also encouraged people who were not already involved in the formal market economy – or were only marginally so in rural areas – to become involved, both while staying in the countryside, and, importantly, by moving to cities, hence contributing to rapid structural change and agglomeration returns.

In England only about 40 percent of households lived mainly on wages in 1524-5, a ratio which had been approximately constant since the thirteenth century (Dyer 2002, p. 364).<sup>4</sup> But by the early 1780s few people were not directly involved in the cash economy (Porter 1990, p. 187), an experience at odds with that of continental economies. It is difficult to imagine how this might have been possible without the enormous increase in money supply. In this paper I document the large-scale increase in the availability of precious metals which followed from the discovery of America, and consider its effects for the English economy. I discuss a variety of channels through which it affected growth. Finally, I present some comparative remarks on the effects on the continental economies.

## **2. Historical background**

I first discuss what we know about the discovery and production of American precious metals, and then focus specifically on the impact on the English economy.

### **2.1. American precious metals**

According to Barret (1990), from about 1500 to 1800, 85% of the world's silver and over 70% of the world's gold came from America (see also TePaske 2010, p. 111, for similar figures). Japan was also a major producer in the 1500s, and it is safe to say the 1500-1800 period was one of unprecedented injections at the global level. The following tables provide some perspective. Table 1 considers bounds for total American production of precious metals in the early modern period, and Table 2 compares arrivals into Europe in comparison with the initial (c. 1500) stock of precious metals. For similar figures see the discussion of Jacob's estimates in Braudel and Spooner (1969, p. p. 444), endorsed by Velde and Webber (2000, p.1230) who also quote other scholars who arrived at similar figures for 1500.<sup>5</sup> These figures are immediately suggestive of the substantial magnitude of the resulting injections.<sup>6</sup>

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<sup>3</sup> Indeed, those higher forms of money would have decreased. This is because, for practical purposes the relationship between them and coin was analogous to a traditional multiplier effect on base or high-powered money (M0). I discuss the reasons in detail below.

<sup>4</sup> The situation in the early sixteenth century corresponded to a long-term stagnation which only American precious metals would break. Indeed, “[i]n 1300 ... wage labour may have accounted for about a fifth to a quarter of the total labour expended in producing goods and services. In this respect, however, the world did not change in the direction of capitalism between 1300 and 1525” (Britnell 1993, p. 364; see also Britnell 2009)

<sup>5</sup> Braudel and Spooner (1967, p. p. 445) also give estimates for stocks of precious metals in Europe during the early modern period; these are however unusable as they rely on implausible assumptions, in particular they assume that all production of American precious metals came to – and stayed – in Europe, thus ignoring the fact that some stayed in America, much went to Asia directly through the Pacific, or, having come to Europe, was subsequently exported to Asia or the Middle East. Also, notice that gold needs to be accounted for because even if it was silver that mattered directly for trade with Asia, the availability of gold as a substitute in Europe meant that more silver was available to be shipped to Asia. The case of 18th century England is illustrative in this respect (Palma 2015c).

<sup>6</sup> Comparative figures are given by Hamilton (1970) for 1503-1660 outflows from the Spanish empire to Spain of 16,886 tons of fine silver, tones, plus 181 tons of gold. Of course, because of the possibility of smuggling, all of the the import figures need to be interpreted as lower bounds.



	lower bound estimate	higher bound estimate
16th c.	17,500	21,000
17th c.	33,800	42,500
18th c.	74,000	84,400
Total	125,300	147,900

**Table 1.** American production of precious metals (Barret 1990, p. 228). Unit: Silver equivalent tones

	Fine silver, tones	Gold, tones	Total, silver equivalent tones
Initial stock, Europe (1492)	3 600	297	6913
Imports to Europe			
1500-1600	7 500	150	9173
1601-1700	26 168	158	27891
1701-1800	39 157	1 400	60255
Total imports	72 825	1 708	97320

**Table 2.** Specie stocks and flows. Sources: Initial stock: Velde and Webber (2000, p. 1230), which rely on Braudel and Spooner (1969, p. p. 444); flows: Morineau (2009), bimetallic ratios and conversion at the London rates from Neal (1990) and McCusker (1978).

Turning briefly to a discussion of the timing of production flows, I now provide a more extensive discussion of transmission flows. There exists complementary information about the timing of production and shipping flows (Hamilton 1970, Morineau 2009, Attman 1986, Phillips 1990, p.84, deVries 2003). These estimates differ in many respects: there is disagreement over the amount of arrivals as well as their timing. While Hamilton presents declining production during the seventeenth century, Barret's European arrivals data, based on Morineau, show no decline during the seventeenth century (Morineau 2009).<sup>7</sup> I take Barret's (1990) estimates as the benchmark (Table 3).

	European aggregate stock + exports	European per capita stock + exports	European aggregate stock	European per capita stock
1492			6914.5	132.3
1500-1549	14164.5	271. 0	11747.5	224. 8
1550-1599	34664.5	550. 0	27831.5	441. 6
1600-1649	61414.5	832. 4	50164.5	1113. 7
1650-1699	96414.5	1242. 2	82164.5	1058. 6
1700-1749	142164.5	1745. 2	122164.5	1499. 7

**Table 3.** Europe's holdings of precious metals. Lowercase variables denote per capita values. Sources: see text. The population methodology is the same as in Table 4, but notice Table 4 concerns flows, while here we are concerned with stocks. Population for 1500 used in 1492. Units: Columns one and three in tones, and columns two and four in grams of silver per person.

<sup>7</sup> Morineau argues there was no decline during the 17th century as the officially reported decline is cancelled by increased contraband.

The Spanish silver debate figures mentioned so far are well known to an audience of economic historians. Less well known is the case of Brazilian gold during the eighteenth century, a case that was of major importance for English monetary developments during that century, despite its comparative neglect in the modern literature. Between 1720 and 1807 alone, about 556 tons of gold were imported, about two thirds of which ended up in England (see Palma 2016c for a systematic study of this episode). Costa, Sousa and Rocha (2013) complement previous sources with information from on-board tax records, *livros do manifesto*. The main reason previous estimates are underestimates is that much currency was minted directly in Brazil (especially during the later periods), so evidence from the Lisbon mint house is incomplete. Their estimates suggest Brazilian gold shipments to Portugal were about 30% higher than the numbers presented by Morineau, having lasted, in decreasing but still significant quantities, into the early nineteenth century.

In a final exercise, I compare per capita American precious metals imports with the wage of Western European laborers (Table 4).<sup>8</sup> All in all, the evidence suggests specie injections were of very considerable real magnitude.

	<i>New World production</i> <i>European population</i>	<i>Imports to Europe</i> <i>European population</i>	European wage, unskilled	European wage, skilled
1500-1549	3. 2	2. 8	2.1-4.2	2.8-6.8
1550-1559	8. 4	6. 5	1.9-6.6	3.3-12.5
1600-1649	9. 9	7. 2	3.2.-8.8	5.2-20.1
1650-1699	12. 2	9. 0	2.7-9.7	3.9-15.1
1700-1749	14. 7	11. 2	1.9-10.5	3.0-11.7
1750-1799	16. 4	11. 1	2.9-11.5	3.2-17.8

**Table 4.** Yearly New World production of precious metals and imports per European person, compared with the range of nominal wages. Sources: Precious metals as above, wages from Allen (2001, p. 416) and population from Maddison (2006, p.636 and 639). Figures are presented after rounding to the nearest decimal.

American precious metals were directly received by two countries only: Spain and – after about 1690 – Portugal. But the Iberian economies would not be the ultimate beneficiaries. Instead, Northwestern European countries were: the additional purchasing power of the Iberian economies created demand for the merchandise of the Netherlands and England, and it had a variety of other effects as well.<sup>9</sup> The accumulation of precious metals in other countries usually proceeded through trade with Spain – or with regions corresponding to the modern areas of Belgium and the Netherlands, which in turn obtained them through interactions with Spain. In the case of the eighteenth century, England received large quantities of gold from Portugal (Palma 2016c).

## 2.2. *English real wages and GDP*

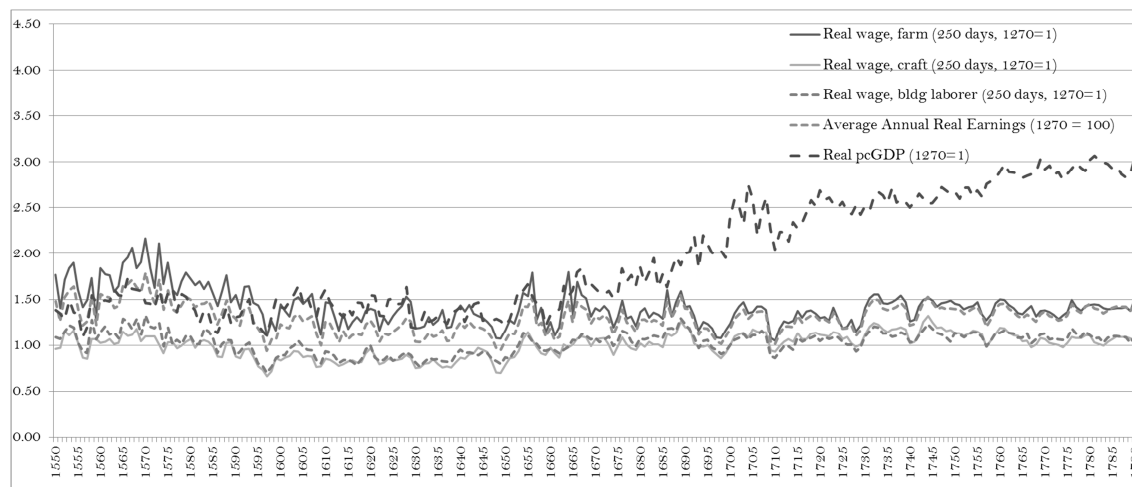
Real wage data for England collected over the last two decades suggests that there was no sustained growth until the nineteenth century (Clark 2007).<sup>10</sup> However, there is a conflict between this view and that which emerges from the supply-side GDP data recently put forward by Broadberry et al (2015). GDP shows slow but sustained economic growth from the mid-seventeenth century onward (Figure 2). Additionally, it is difficult to square the no-growth view with the evidence put forward by historians of material culture, which strongly suggests that from the mid-seventeenth century onwards there was a significant increase in the consumption of clothing and household goods, not just by the

<sup>8</sup> In fact if one sees Europe as "Europe proper plus empire", the exercise surely underestimates the magnitude of the per capita injection because of the amounts of precious metals which never left America or went directly to Asia, compared with Europe's tiny population there.

<sup>9</sup> Although direct evidence is not always available, it is clear other countries also benefited, if indirectly; for the case of France, see Morrisson et al (1999).

<sup>10</sup> Using the earlier data of Allen (2001) would lead to the same substantive conclusions.

elite but by all except the poorest (e.g. McCants 2007); and the increased variety of available goods must have also had positive welfare consequences (Hersh and Voth 2009).



**Figure 2.** English income and real wages over the long run (1700=1). Sources: Clark (2014), Broadberry et al (2015)

It is in fact possible to conciliate the fact that real wages stagnated with the existence of per capita growth (as emphasized by Broadberry et al (2015) among others). The key is to realize that the nominal wage available from most sources is the day wage, and the annual “real wage” has been computed assuming a fixed working year.<sup>11</sup> But at least from the mid-seventeenth century onwards, people were working more days and hence earning more income<sup>12</sup> (Table 5). The remaining question is: why?

Period	Blanchard/Allen and Weisdorf	Clark and van der Werf	Voth
1433	165	-	-
1536	180	-	-
1560-1599	-	257	-
1578-1598	259-260	-	-
1600-1649	-	266	-
1650-1699	-	276	-
1685	-	312	-
1700-1732	-	286	-
1733-1736	-	295	-
1760	-	-	258
1771	-	280	-
1800	-	-	333

**Table 5.** Days worked per year. Sources: see Broadberry (2013)

<sup>11</sup> Other assumptions are implicitly made, including that the annual contract is a multiple of the number of days and that the composition of consumption baskets stayed constant in time – which directly contradicts what optimizing behavior in response to changes in relative prices would suggest.

<sup>12</sup> Angeles (2008) shows about two thirds of the divergence is due to an increase in per capita labour input.

### **2.3. Increase in work time: understanding the industrious revolution**

While in traditional economies people enjoy plenty of leisure (perhaps in association with substantial levels of underemployment), the process of economic development initially leads to an increase in working hours as division of labor and structural change take place. Both in cities and in the countryside, more people participate in the market economy for a wage, and those that had already done so did so more intensively, working more days of the year.

Late medieval Europe was already distinguished by its comparatively well-developed factor markets, and in particular, a high level of market participation and a low level of interest rates (Van Zanden 2009). But days worked would increase considerably in the early modern period (de Vries 1993, 2008). In the case of England, which has been studied in detail, traditionally people did not work on Mondays – the so-called St Monday was a day on which to recover from the drunkenness of the weekend – and a typical year included about 250 days of work (Allen 2001). During the early modern period days worked progressively increased to the “longest years”, which happened around the end of the eighteenth century (Voth 1998, 2001), before declining again in more recent times.<sup>13</sup> Further, there is now substantial evidence that in several other parts of Europe working days also increased during the early modern period (Álvarez-Nogal and Prados de la Escosura 2012, Palma and Reis 2014), though not as much, and with much more limited accompanying structural change.

Two questions can be asked about the industrious revolution. The first is, why does it matter? The second is, why did it happen? With regards to the first question, despite the industrious revolution’s prominent center stage in the economic history literature, it really would not have mattered that much if it was just a “one-time” level effect – though even then, as it shifts the timing of the emergence of modern economic growth, it can change our interpretation of what mattered. However, I argue here that there is indeed a relation between the increase in working hours and subsequent continued growth. Second, why did it happen? Why were people working more days? So far, the main candidate seems to have been the increased demand for the “new goods” (deVries 2008, Voth and Hersh 2009). But this was not independent of the availability of silver, which was used to trade with the East, and of gold, which, by allowing for an expansion of the means of payment in Europe, also freed more silver for trade with the East, allowing for those “new goods” to be imported.

### **3. Why was expanding money supply difficult?**

The early modern monetary system was a commodity money system.<sup>14</sup> In this system, the government had only two ways to expand the official (legal tender) money supply. The first was to have access to new sources of specie, either through mining or trade.<sup>15</sup> The second policy option was to debase the currency. Yet in using this policy tool governments were constrained by competition with foreign mints. If the currency was much debased, people would start to use foreign currency, and governments' seigniorage revenue could actually diminish in absolute terms. In addition, systematic debasements could lead to a denominational problem related to the physical property of currency as an object intended to serve as an object to facilitate exchange and liquidity.

The very large monetary injections that were the result of the discovery of America, I argue, mattered a great deal in making the English industrious and industrial revolutions possible. In order for this to be the case, two conditions were necessary: First, it must be that money (or its substitutes) would not have expanded anyway, even if precious metals in America were not available. Second, it

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<sup>13</sup> Narrative evidence from travelers to Britain suggests a systematic recording about intensification of work over the eighteenth century, “from a ‘merry England’ of frequent feasts, St. Mondays and plenty of time spent drinking [to] the reality and metaphors for lack of leisure and oblivious drinking [which] became established clichés by the early nineteenth century” (Riello and O’Brien 2004, p. 21)

<sup>14</sup> Other assets which functioned as means of exchange (“inside money”) did at times develop. I argue that the two forms were more complementary than substitutes. The discussion in the present section is initially restricted to “outside” money, but higher forms of money will be considered below.

<sup>15</sup> British currency was convertible at fixed rates into silver and gold. It exchanged at virtually fixed rates for other currencies similarly convertible. Hence the value of money in England must have been largely determined by the supply of the precious metals, and the demand for these, in the whole group of nations linked in this way” (Ashton 1972, p.196)

must be the case that modernization would not have happened anyway, had the money supply not expanded. I now consider the first of these conditions, and in Section 5 I address the second.

### **3.1. *Coin supply***

As I mentioned, monetary authorities had only two ways of increasing coin supply, which during the early modern period was by far the most important component of high-powered money supply (M0). The first was to debase currency.<sup>16</sup> This policy tool was constrained by the equilibrium responses of private agents to mint policy, as well as competition with foreign mints (Sargent and Velde 2002). The only remaining possibility was to have access to additional precious specie, the critical input in the production of coin. A state could obtain specie either by direct production or on a secondary market. Monetary policy was conducted by means of the monetary authority setting the mint price at which private agents could coin currency from specie, after payment of a seigniorage fee. So specie needed to be available; all in all the options monetary authorities had for monetary expansion were quite limited.

As the major input in the production of money was bullion, and bullion was in inelastic supply during most of the Middle Ages, we would expect money supply to be as well. The limited availability of coinage metals (alloys) meant that governments' monetary policies were restricted by the equilibrium in the specie market. Furthermore, each coin's denominational value had a smaller equilibrium value than that of its metal content, because of the extra exchange service that each coin provided. This restriction, together with the indivisibility problem generated by the physical properties of commodity money (discussed in the next subsection), constrained the issue of low denomination coin made of specie (silver and gold).

Taken together, these restrictions lead to a higher bound in the effective money that can be supplied by a monetary authority at a given moment, a bound that is indexed by the availability of precious metal. From the mid-15th century to about 1520, the exploration of the West African coast by the Portuguese brought to Europe larger quantities of gold at a lower cost than had been previously possible with the trans-Saharan caravan trade. This can reasonably be described as an endogenous development and it is hard to say if the increase in supply through this means was not offset by relative decline in the North African caravan route previously used to transport the gold to Europe (increased cost efficiency and possibly lower mark-ups due to increased competition notwithstanding).

These gold injections were of moderate quantities when measured at a Europe-wide and certainly world-wide level. During the early fifteenth century there was also increasing production of silver in Burgundy, Saxony and Bohemia and associated technical change made silver available at a lower cost than had been previously possible (Munro 2003; Cipolla 1993, p.174-5). Then between 1492 and the early nineteenth century, Europe experienced monetary injections of unprecedented magnitude.

### **3.2. *Physical constraints and denominations***

Irrespective of the matters of strategic considerations related to competition with foreign mints, debasements had limits. If economic growth was taking place but the supply of precious metals was not increasing, the only way to keep a given denomination proportional to other denominations in weight of precious metal content – than by keeping the percentage of non-precious alloy component constant – was to make the smaller denominations quite small in physical size.<sup>17</sup> Doing so had obvious disadvantages to trade, and further made verifying the content harder, amplifying the uncertainty of accepting any given coin

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<sup>16</sup> Munro (2011) makes a helpful distinction between aggressive and defensive coinage debasements. The first were undertaken to increase mint profits, both through increased mint output and seigniorage rates, usually to finance warfare, and defensive debasements, made as a response to the aggressive debasements of neighborhood lands, but also as a necessary outcome of the fact that where coins circulated by tale, long-term “wear and tear”, clipping, sweating, and counterfeiting diminished the content of precious metals in the coinage, hence legal-tender coins gradually lost their agio over bullion.

<sup>17</sup> This problem is even more serious for gold than silver, yet silver suffered from the opposite problem; valued by weight coins were too large and cumbersome to carry (Redish 1990, p.792). This is what disqualified copper altogether from serving as anything other than a token currency. (Though in some societies it did so, as in China in during much of the nineteenth century, with enormous transaction costs)

in a random and non-repeatable transaction where reputation was not an issue.<sup>18</sup> It also amplified the “big problem of small change” (Sargent and Velde 2002), since smaller denominations became even more liquid relative to their value.

Despite these disadvantages, the pressure to introduce currency that could support economic growth in the early modern period was such that this policy was nevertheless sometimes attempted. For instance, a quarter-guinea coin weighing 2.09 grams was launched in 1718, but failed: “A piece so tiny, and so readily lost, was entirely unacceptable to the British public” (Craig 2011, p.21). Nevertheless, the need for credible small change to support trade was such that essayists in mid-eighteenth century England continued to recommend the minting of this coin (Redish 1990).

The inherent trade-off of bimetallism was resolved in England in the eighteenth century by adopting gold and accepting that this meant there would be a lack of small change available (see Seglin 2008 for the role of private provision in trying to deal with this shortage). It also meant, however, that the deflationary tendencies were compounded. As Redish (1990, p. 795) writes, “The political unpopularity of calling down the money and the costs of reminting meant that the adjustment was most frequently made by calling up the undervalued coin. If this were done on an annual basis to correct the coin ratings, however, the currency would have a persistent tendency to depreciate – that is, for the amount of specie per unit of account to decrease”.

Constrained by the limits of debasement as a policy tool, a government was then limited to finding new sources of precious metals if it wished to expand money supply while maintaining convertibility. Yet the need to provide liquidity to support monetary expansion was such that it was nevertheless discussed in policy circles in the early century. The good fortune of the early modern precious metals discoveries is that they prevented these problems, as well as deflation – and may have encouraged growth in the first place.

### 3.3. Higher forms of money supply

Fiat money became prevalent in Europe only in the nineteenth century.<sup>19</sup> In England, as late as 1790, the monetary base was composed of £44 million of commodity-based coin and only £12 million in notes (£8 million Bank of England notes and £4 million all other; Capie 2004; Table 6).

	1600 (Mayhew)	1688 (Cameron)	1700 (Capie)	1750 (Cameron)	1750 (Capie)	1790 (Capie)	1870 (Capie)
Coin	3.5	10	7	15	18	44	95
Bank of England notes	-	-	1.5	4.3	4	8	35
Other notes (country banknotes)	-	-	0	0.7	1	4	4.9
Bank balances at the bank of England	-	-	-	1.9	-	-	6.5
Other means of payment	1	10	n/a	18.1	n/a	n/a	n/a
Total (M2)	4.5	20	>8.5	40	>23	>56	>141.4

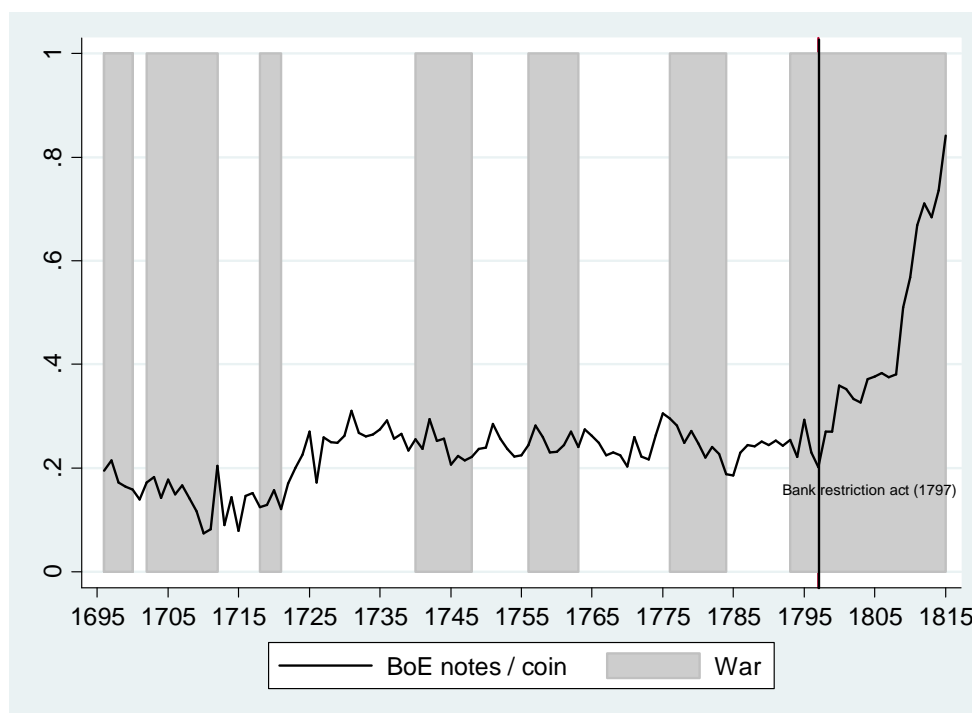
**Table 6.** Estimates for the components of English nominal money supply. Unit: millions of £. Sources: Mayhew (2013), Capie (2004) and Cameron (1967). The category “other means of payment” includes Cameron’s £6m in government tallies and £2 m in inland bills in 1688 and £ 3.1m in deposits in private banks in 1750.

<sup>18</sup> These information problems presented a clear limit to debasements – the relative weight of precious metals could not get too small as a percentage of the overall weight of the coin, otherwise it would become difficult to verify. So the only way would be to decrease the overall size of the coin, but then policymakers would run up against the previous problem.

<sup>19</sup> Scotland (and North America) did use fiat more regularly than England, but under high transaction costs.

The timing of the growth of fiat and other means of payment can be contrasted with that for the size of government. One of the most remarkable aspects of the evolution of the English economy since the mid-seventeenth century is the persistent growth of the government sector, which accelerated during the eighteenth century, more than quadrupling between 1700 and 1790.<sup>20</sup> The growth of government happened through a ratchet effect, with expansion during times of war not fully reversed when peace came along (Brewer 1989, O'Brien 1988).

This ratchet effect was absent in the case of money supply. This is true for both coin supply and higher forms of money supply, either measured by notes of the bank of England or broader measures that include bills of exchange and notes of provincial banks (Figure 3). The fact that until the last decade of the eighteenth century government expanded in tandem with warfare, but money supply did not, tells us much about the fact that in earlier periods, the expansion of coin supply was conditional on the availability of precious metals. The bank of England and other financial intermediaries had the capacity to expand higher forms of money, but, concerned with their reputation and solvability, did not do so (O'Brien and Palma 2016).



**Figure 3.** The ratio between Bank of England notes and coin supply, 1694-1815. Sources: Bank of England (1967), O'Brien and Palma (2016)

Indeed, all notes of the Bank of England (and of provincial banks) were fully convertible until the Act of 1797. Only after that period was it possible for the Bank of England to expand notes significantly without running into credibility problems (Figure 4; O'Brien and Palma 2016). The same is true for provincial banks: "the arrival of country banking, combined with the note issues of the Bank of England, was not an answer to the shortage of silver in England and Wales even by the end of the eighteenth century" (Clancy 1999, p.30); it is hard to conceive how in its absence it would have been.

Of course another option would be to drop convertibility altogether; but considering that John Law's fiasco in France was very present in people's memory this would have been difficult. It was only under the exceptional threat of a financial panic triggered by imminent French invasion that the Restriction

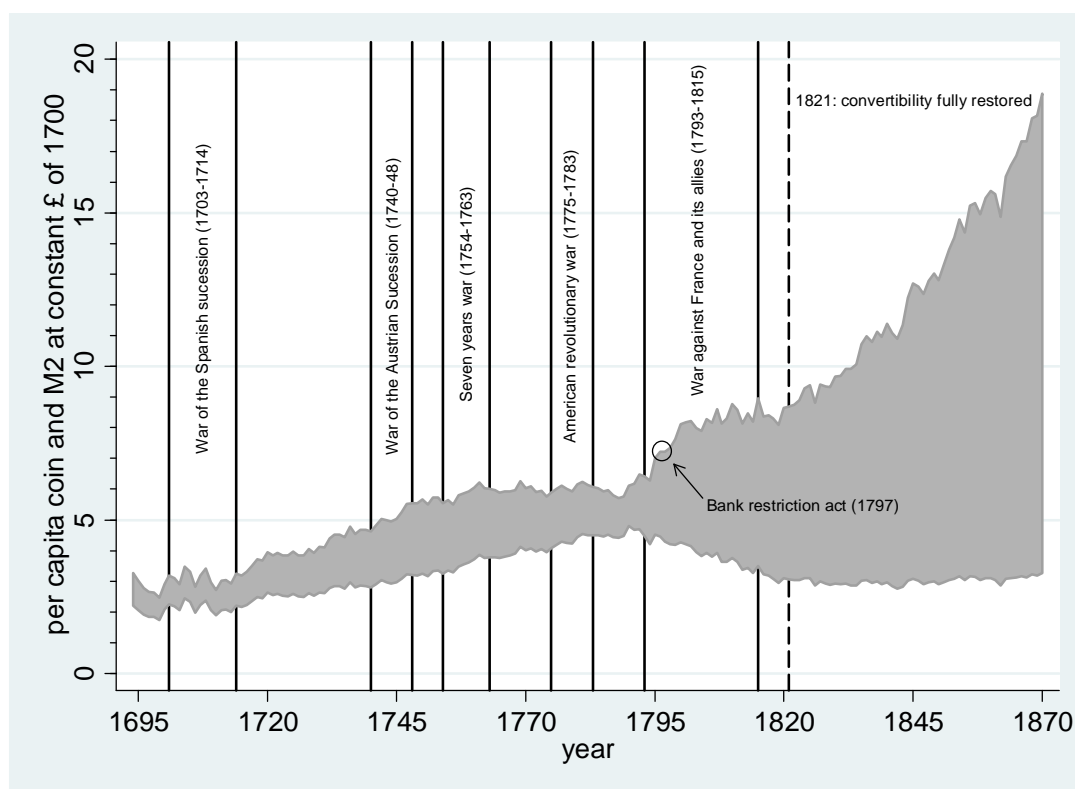
<sup>20</sup> For a recent review, see Broadberry et al (2015).

Act was passed in 1797, only for convertibility to be restored as soon as conditions normalized (de facto, 1816, and officially, 1821; see O'Brien and Palma 2016 for details).

Indeed, Angela Redish plainly states that "it was not possible to establish a stable token coinage prior to the nineteenth century" (Redish 1990). Notes both of the Bank of England and of provincial banks enjoyed limited circulation before the last decade of the century; people did not use these for retail purchases or other regular transactions (Clancy 1999, p. 28-9, Feavearyear 1944, Clapham 1944). According to one estimate by The Board of Stamps, as late as 1812-16 the value of country banknotes annually in circulation was under £16 million" (Clancy 1999, p. 29) Finally, it was also the case that until the 1793 the lowest denomination for a banknote was £10, and until 1797 it was £5, both of which were well above the unskilled wage. Only in 1797 were £2 and £1 notes issued by the Bank, which could be used as a means of exchange at the retail level. As for other English banks, until 1797 all were prohibited from issuing bearer notes of less than £5 (Feavearyear 1944).

### 3.4. *Currency and credit: substitutes or complements?*

It has long been argued that an English "financial revolution" had been in operation at least since the 1660s (Dickson 1993). This consisted of the increased usage of credit instruments such as bills of exchange and promissory notes<sup>21</sup>, as well as privately issued tokens (Whiting 1971), and after 1694, bank notes of the Bank of England (O'Brien and Palma 2016) and of provincial banks (Presnell 1956).



**Figure 4.** British per capita coin supply and M2 at constant prices of 1700. The area in grey can be interpreted as the approximate size of fiat in circulation and held as store of value. Sources: this figure is derived using the indirect method described in Palma (2016), which in terms of data relies on Broadberry et al (2015), Capie (2004) and Mayhew (2013).

<sup>21</sup> The Promissory Notes Act of 1704 made all debt instruments negotiable by allowing not just the initial creditor but the holder of any bill to sue the initial debtor (Richards 2012, p. 23)



It is a fact that in the second half of the seventeenth century, the expansion of the English economy was supported by an expansion of credit. As Table 6 and Figure 4 suggest, however, by the late seventeenth century M2 was still quite close to coin supply. This shows that the seventeenth century's expansion of credit was not sufficient to compensate for the economic growth which was also occurring – at both the extensive (based on population growth) and intensive (per capita) margins – and indeed in the second half of the seventeenth century both measures of per capita money supply actually fell. This trend was only reversed in the eighteenth century – in tandem with an increase in the availability of precious metals, largely due to the discovery of gold in Brazil and to the shifting of mining priorities in the Spanish empire from Peru to Mexico. Further, the conditions of the second half of the seventeenth century in England may have been special, as they corresponded to what can essentially be described as financial sector catch-up with the best practices of the continent (Coffman, Leonard and Neal 2013).

While forms of exchange based on informal credit had been developing as a substitute for currency since the sixteenth century, this was inadequate: "the primary hindrance was that personal credit instruments did not circulate, at least not nearly enough to make a real difference. For commerce, agriculture and manufacturing to flourish, new sources of money had to be discovered" (Wennerlind 2011, p. 19).<sup>22</sup> In itself this suggests that under the prevalent system of expectations, commodity-based currency and paper money were complementary as much as substitutes.<sup>23</sup> Credit was, additionally, subject to usury restrictions that were binding, and may have prevented access to credit, especially for those without access to significant amounts of collateral (Temin and Voth 2008).

The perceived need for means to expand currency is reflected in several contemporaneous intellectual and political debates revolving around the fact that the commercial expansion of the economy required an accompanying expansion of the money supply. Conventionally classified under the "mercantilist" umbrella, contemporary intellectual thinkers, including authors such as Malynes, Miselden and Mun and their disciples, were unanimous that the scarcity of bullion was a problem, hence the emphasis on access to bullion under a favorable trade balance.<sup>24</sup> In the case of Paterson, Godfrey and Mackworth, paper money was advocated as a solution, but always making clear that the extent of expansion was indirectly constrained by access to bullion.<sup>25</sup>

In fact, the common denominator of the "mercantilist" literature seems to have been the preoccupation with the capacity of money to encourage economic growth. I agree with Wennerlind that Adam Smith (and, it could be added, much of modern economic theory which postulates that money must be neutral over the long run) was mistaken in accusing these mercantilists in confusing money with wealth, because in fact the limitations of credit expansion meant that "there was no other

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<sup>22</sup> As Wennerlind (2011, p. 110) himself recognizes, William Paterson, the intellectual influence behind the creation of the Bank of England, felt that "Credit not founded on the Universal Species of Gold and Silver, is ... impracticable", and that a minimum reserve of 15-25 percent was necessary to make the system secure (Patterson 1694); Godfrey advocated a similar position (Wennerlind 2011, p. 112).

<sup>23</sup> Further, the expansion of paper credit was considered by contemporaries complementary to having a positive trade balance and hence access to foreign precious metals (Wennerlind 2011, p. 282 endnote 95).

<sup>24</sup> The state indeed often took action: legislation prohibited the export of bullion. In the non-cooperative world of medieval and early modern Europe, perhaps there was some rationale to these policies which were castigated by Adam Smith and other classical writers. Indeed, it is noticeable that "such bullionist legislation was a constant feature of the work of late medieval parliaments" Mayhew (1974, p. 62)

<sup>25</sup> Other writers such as Hugh Chamberlen and John Briscoe advocated a national land bank, which would expand money based on the security of land, not bullion. The utter failure of the Land Bank United, launched in 1696, to attract capital (in sharp contrast to the Bank of England's oversubscribed issue two years earlier) suggests this foundation was not possible. Only around the time of the restriction act (1797) was it really possible to have monetary expansion independent of bullion (O'Brien and Palma 2015), and as the establishment of the gold standard in 1821 suggests, even those measures were, for the time being, temporary.

way to expand the money stock than to attract silver and gold from abroad" (Wennerlind 2011, p. 40).<sup>26</sup>

Wennerlind subsequently argues that the restriction on endogenous money creation was over once the law allowed the current holder of the debt instrument to sue the initial debtor. This is where my position differs. Perhaps that eased the constraint a bit, but it would have been unable to support the subsequent eighteenth-century growth. As the end of the seventeenth century approached, the fall of the average silver content of coin to 50% of the official weight meant a serious monetary crisis, in part because silver coin served as security for the notes of the Bank of England (Wennerlind 2011, p.11). This itself suggests that, later on, the lack of gold would have presented an obstacle.<sup>27</sup>

As contemporaries recognized, the feasibility of taking credit was all about reputation. Even though the lack of currency in the face of expanding commerce provided an incentive for the development of forms of "endogenous money", these could only be sustained as long as merchants were convinced of the buyer's "Integrity and Ability for Payment", and more generally, the "honourable Performance of contracts and Covenants" (Defoe 1709).<sup>28</sup> This was, in fact, representative of the position of the intellectual elite of the time. As even Wennerlind (2011, p. 241) recognizes, David Hume, for instance, while open to the notion that under appropriate levels of trust credit could flourish, insisted that currency based on silver and gold was "more practical". Adam Smith advocated a similar position. The situation is analogous to the well-known Magribi traders' case for which reliance on informal networks rather than the legal system to enforce contracts presented limits to commercial expansion (Greif 2006). It was equally so with credit vis-à-vis the much lower transaction costs of using currency at any non-local level (with the possible exception of richer merchants who had the reputation to use bills internationally).<sup>29</sup>

Finally, another argument supports the idea that money and credit were complements. The decision to issue credit was often based on people's anticipation of whether they would be able to have the liquidity to honor the bill, and that in turn depended on the overall availability of money (Nightingale 2010; see also the discussion of "Mayhew's law" in Allen and Coffman 2014).

In sum, there were only two ways in which people could issue credit, and both critically depended on reputation in the face of repeated relationships. First, richer merchants with established businesses could write bills of exchange, even internationally.<sup>30</sup> Second, at the local village level, people could and did at times informally borrow small amounts from each other (Muldrew 1998).<sup>31</sup> But this required personal and repeated relationships that necessarily limited the scope of credit – it created complications for the advancement of structural change and division of labor, which require the availability of an anonymous and liquid means of exchange for one-off transactions in cities. The lack of an easily accessible liquid means of payment meant that in medieval economies payments

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<sup>26</sup> With regard to the issue of trade competitiveness in connection with deflation, it is noticeable that, at times, it was explicitly recognized that in order for trade to remain complete, the right amount of money was needed to maintain the price level (Wennerlind 2011, p. 40).

<sup>27</sup> Furthermore, in England the reformation created a huge concentration of wealth in England and hindered the development of a credit sector. That is why money may have been a greater bottleneck in England than in Southern Europe, and not only in Italy. In other Protestant countries such as the Netherlands, Italian banking and urban institutions were at times used to finance the gap. Thanks to Regina Grafe for help in clarifying this point.

<sup>28</sup> In an attempt to popularize the notion of credit (and defend his increasingly pro-Tory political position), Defoe used the rhetorical figure of "Lady credit", the younger sister of money, who could take her sister's role in trade, but only as long as "her Sister constantly and punctually relieves her" (Defoe 1706). For a recent review of Defoe's role in popularizing the policies of Harley, see Wennerlind (2011, p. 181-189).

<sup>29</sup> In the American colonies, in particular Virginia, in Barbados and even in Scotland, paper money was often used, but it only had the ability to circulate locally and under high transaction costs. Finally, one additional reason change to a fiat system did not happen earlier may have been related to the limited political influence of the groups that would gain from inconvertibility and depreciation (Eichengreen 1992).

<sup>30</sup> In the case of at least one important sovereign borrower, the reputation of the lenders, rather than that of the borrower, determined that the lending could keep happening (Drelichman and Voth 2011).

<sup>31</sup> In Catholic countries the monasteries (or other religious institutions with charitable purposes) filled the function of monitoring borrowers. In Islamic countries, the Waqf had a similar role.

often had to be made on a quarterly basis or through the “chalking up by local tradesmen of small debts for later settlement” (Mayhew 1995, p. 239), which surely increased credit risks and transaction costs, leading to a reduced number of equilibrium transactions.

The conclusion is clear: in the middle ages and early modern period, coinage complemented rather than substituted for banking, as emphasized by the following quote by Spufford, who by “money supply” here simply means coin supply: “[B]ank money and other additions to the money supply did not develop where the money supply was generally poor, but, on the contrary, in some of the places where the money supply was already most abundant ... [C]ommercial interest rates dropped ... in those places where the money supply was most plentiful” (Spufford 2002, p. 42 and p. 44).<sup>32</sup>

## 4. On the macroeconomics of money and growth

### 4.1. *The doctrine of long-run neutrality*

The “long-run neutrality” (Taylor 1999, McCallum 2004) doctrine is one of the cornerstones of modern macroeconomics, and it largely justifies the separation of the field into the study of business cycle fluctuations (a.k.a. “the short run”) and economic growth (the “long run”). Indeed, this theoretical prior is taken as a given to the extent that it often leads economists to impose, as a maintained exclusion assumption in VAR models, that this long-run exclusion restriction must be true (e.g. Blanchard and Quah 1989).

However, the idea that money must be neutral over growth frequencies is usually justified on theoretical grounds and there is very little empirical work testing it. In fairness, the relationship is very hard to test using modern data.<sup>33</sup> First, there are severe identification problems caused by the fact that in modern economies the quantity of money in circulation is endogenous – monetary authorities respond and try to influence the state of the economy. So while some high-frequency identification may be at times possible (e.g. Nakamura and Steinsson 2013), that presumably misses most of the action (as only a small fraction of variation will be exogenous). Furthermore, given the focus on the short run, this, by definition, is unable to capture growth effects.

These identification problems are further amplified by the insufficient frequency of time-series observations and the lack of variation in monetary institutions and policies themselves during the historically short period for which economists have data. In other words, the standard datasets used by macroeconomists, almost always dating from the post-World War II era, and often from the post-Bretton Woods period, do not work both because they are too short and because monetary policy reacts to the state of the economy, which renders regression analysis uninformative about the causal effects of money in the absence of a source of exogenous variation in money supply.

In an Arrow-Debreu world of complete markets, money is not required, and fiat cash would be worthless. Specifying details about the nature of incompleteness is important in order to understand why and how money matters. In this paper I concentrate on the matter of reduction in the costs of participating in market activity, in association with money’s role as a unit of account and means of exchange.

### 4.2. *Some monetary and growth accounting*

Consider the familiar equation of exchange:  $MV=PY$ , where  $M$  stands for aggregate money supply,  $V$  is velocity,  $P$  is the aggregate price level and  $Y$  is aggregate nominal income. As written, this equation is an accounting identity with no theoretical content. (This differs from the quantity theory of money, which corresponds to placing specific assumptions on the behavior of some of these variables.) A log-difference transformation leads to:

$$\Delta M + \Delta V = \Delta P + \Delta Y$$

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<sup>32</sup> Evidently, these patters correspond to correlations, which do not necessarily imply causality.

<sup>33</sup> One related influential, but controversial, strand of literature argues that financial development has a causal effect for economic growth (see Levine 2005 for a literature review and Buera et al 2011, Buera and Shin 2013 for recent papers.)

It immediately follows that for  $M$  constant,  $\Delta Y$  implies either  $\Delta^+V$ , or  $\Delta^-P$ , or both: if economic growth is to happen, a fixed money stock implies either continued increases in the velocity of circulation or deflation. While at a secular level velocity could in theory trend a little over a long period of time this would necessarily be second-order in comparison with changes in money, income and prices. Indeed, there is strong empirical evidence that velocity showed no long term trend during the eighteenth century (Palma 2016a, Table 1 and Figure 4).<sup>34</sup>

Hence with a fixed supply of money and at most only moderate increases in  $V$  the only way  $Y$  could grow fast and consistently – irrespective of the effect it had on the population -- is through continued deflation,  $\Delta^-P$ . This much was already recognized by Braudel and Spooner (1967, p.384), who wrote that “the stock of metal has to be increased regularly for the price level merely to be maintained”.

While there was no way that credit could have substituted for coin (Section 4.4., Nightingale 2012), a persistent rise in velocity could not have been a solution either, because transaction costs would have risen prohibitively. As Mayhew (2013) has recently written, summarizing both these points:

it is the rise of  $M$ , not  $V$ , that is characteristic of growing or modernizing economies. Indeed the historical evidence shows that there are real limits to how large  $V$  can become without impacting seriously on the economy. The eleventh-century  $V$  of around 10 in fact required a large amount of business to be carried out by non-monetary expedients, such as labour services or payments in kind instead of money rents or wages ... more through monetization required a growth in  $M$ , which thus reduces  $V$  ... credit cannot grow by an increase in the available money supply.

Indeed, at the aggregate level credit could not at this time grow without an increase in the availability of a complementary means of payment that was both liquid and credible. At the same time, continued deflation does not provide a good foundation for economic growth. But then, since velocity is fixed over long periods of time and continued deflation has negative effects on growth, it follows that continued expansion of the money supply is necessary for economic growth to occur. This should not be too surprising once the role of money is understood: money reduces transaction costs and its availability is required for the possibility of a larger market that permits the continued division of labor.

### **4.3. *Incomplete nominal adjustment***

If the price level could adjust immediately to changes in money supply or real economic activity, then any change of unit of account or the overall quantity of money would not matter. As it was, whether due to social norms, menu costs, or other factors, price and wage rigidity was a reality.<sup>35</sup> In early modern England, despite the ongoing “price revolution” which occurred prior to the eighteenth century, customary rents were normally fixed in nominal terms, with contracts often covering a number of generations, and there were substantial benefits to be had for tenants who were able to defeat their lords attempts to raise rents (Holt 2013). Indeed, not only was price adjustment persistently absent or incomplete for long periods of time (Palma 2016b), but it was also the case that it was asymmetric – in eighteenth-century France, for instance, upward adjustments were much faster and less penalizing than downward adjustments (Velde 2009).

Several recessionary mechanisms associated with deflation can be posited. Despite the relatively small size of financial intermediation, debt-deflation might have been a serious concern in

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<sup>34</sup> While technological change may lead to moderate increases in velocity over time, this could not have been of the magnitude of British economic growth from the mid-seventeenth century onwards, which was considerable on the extensive margin (ie accompanied by population expansion), and, while slower in this period relative to what was once thought, was still high by previous historical standards even on a per-capita basis (Crafts and Harley 1992, Broadberry et al 2011).

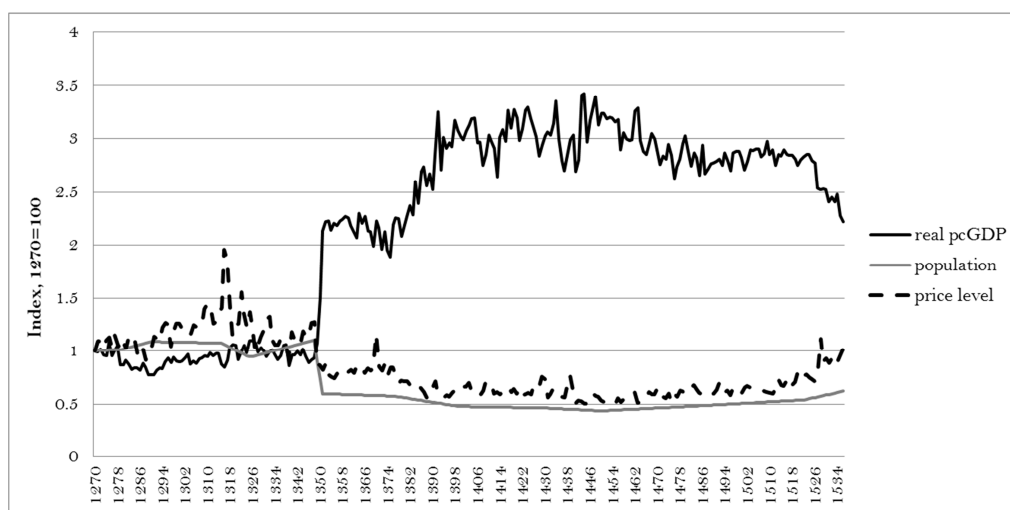
<sup>35</sup> For a recent review of menu cost models, see Nakamura and Steinsson (2008). Even in modern economies, labor markets often do not clear as nominal wages adjust slowly to changes in economic activity (and do so asymmetrically: they are especially difficult to adjust downwards; see Bewey 2002).

the absence of the monetary injections.<sup>36</sup> As the internal price level falls, the real exchange rate will tend to appreciate and a given economy will tend to become less competitive. Further, even if deflation was avoided for a group of countries as a whole, it may have nonetheless been beneficial for all (Eichengreen and Sachs 1985). Expectations about continued falling prices may also lead people to delay consumption expenditures. More micro-level studies are required for us to conclude which were quantitatively more important.

#### 4.4. *Why did the early modern monetary injections matter? A narrative*

The discovery of large quantities of specie allowed for systematic increases in the availability of money because specie was the critical input in its production. Europe experienced major monetary injections as a consequence: in the case of England, where minting flows are well known (Challis 1992, Palma 2016a), it is clear that they increased dramatically.

Monetary injections mattered because the additional liquidity avoided persistent deflation and lowered transaction costs, encouraging market participation and structural change.<sup>37</sup> In the Middle Ages, supply of precious metals was quasi-fixed and hence deflation was a persistent phenomenon. It took until the 1530s for the price level to recover to the pre-Black Death level (Figure 6). Indeed, this episode of persistent deflation from the fifteenth century onwards is associated with the late medieval bullion famine (Day 1956; Spufford 1988; see also Dyer 2002, p. 266 and the literature cited there and in p. 384.) Although some elements of the original story were subsequently criticized (Sussman 1998), the lack in the availability of precious metals was in fact at this time an important element in preventing growth (Miskimin 1964, Nightingale 1990, 1997, 2012; Desdan 2014).



**Figure 6.** The price level, real GDP, and population, 1270-1540. Source: Broadberry et al (2015).

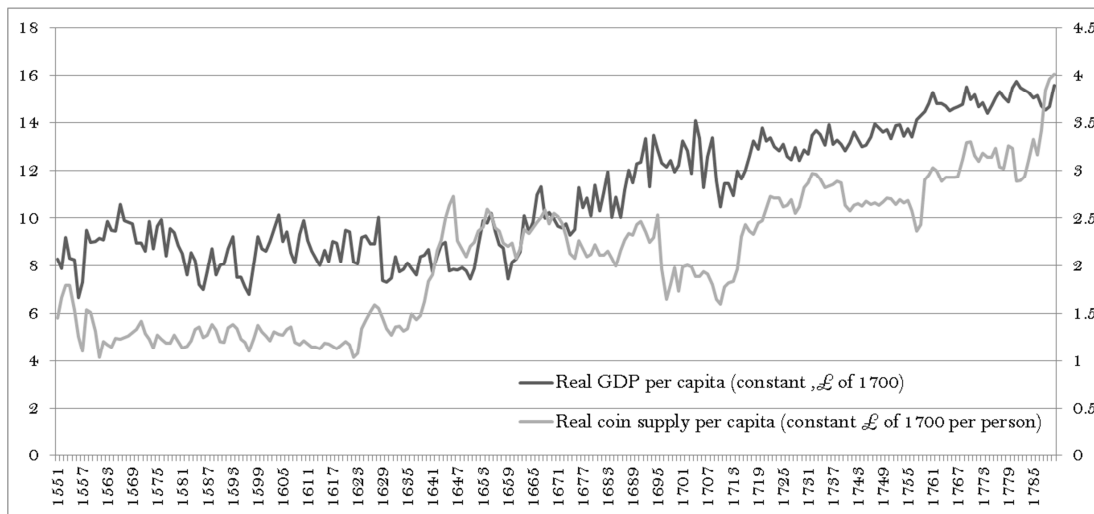
The role of precious metals as a binding constraint for growth in late medieval Europe has been emphasized by generations of medieval historians. The period 100-1300, when silver was still available in sufficient quantities, was a period of increased commercialization, which included the establishment of active factor markets for labor, land, and capital (Cambpell 2009). Spufford (2002, p. 12 and 59) considers that the growth in the money supply was a necessary precondition for the thirteenth century European commercial revolution. But it could not last. Indeed, Jaques le Goff writes:

<sup>36</sup> Debt-deflation is the fall in the prices of assets, goods or services that raises the real value of debt, which is written down nominally. In turn, this may lead to a negative cycle.

<sup>37</sup> These are the reasons I emphasize in this paper; others may have been at play. In particular, I have here left out associated distributional implications.

What are for me the essential components of capitalism which were not present in medieval Europe? The first is a sufficient and regular supply of either precious metals, making it possible to mint coins, or paper money ... [T]he Middle Ages was several times on the brink of monetary famine, and this was still the case at the end of the fifteenth century ... The discovery of America meant the regular transfer to Europe of large quantities of precious metals, gold and silver ... It was only then that the first demand of capitalism was met. Goff (2012, p. 143)

Different elements associated with the Black Death have been pointed out as an important element to explain not only the evident one-time income increase associated with a rise in the land-labor ratio but also, according to some authors, subsequent economic growth much later – during the early modern period (see, for instance, Pamuk 2007 or Voigtlander and Voth 2012). One element which has not been emphasized is that (as with land or other assets) people died, but money did not. The Black Death also functioned, for practical purposes, as a major per capita injection of liquidity (in addition to other less liquid assets). In my view this complements Engel’s law and associated demand-side explanations as to why specialization and urbanization subsequently increased. Suddenly, it was easier to conduct trade and specialize since at the prevailing price level it was easier to make and receive payments, more collateral was available, and credit was more likely to be paid in time with reduced risk of running into liquidity problems and having to engage in fire sales. But once a new steady-state was eventually reached, from the late Middle Ages and until to the 1520s the economy ran into persistent deflation – though as always (unlike the converse case which often happens with inflation), prices never decreased too fast. Recent aggregate data suggests that England suffered from persistent secular deflation from the early-fourteenth century to the first decade of the 1530s (Figure 6).<sup>38</sup>



**Figure 7.** Real GDP (left scale), and per capita coin supply (right scale), at constant prices of 1700. Source: coin supply from Palma (2016a), and the price level is the GDP deflator of Broadberry et al (2015).

As is well-known, the English population took longer to react to higher levels of income than we would expect under simple-minded Malthusian logic, and by the mid-fifteenth century demographic growth had stopped, though the per capita income level was considerably higher than it had been just before the Black Death. Then the sixteenth century was essentially a century of stagnation, both in terms of per capita real GDP and money supply. John Munro (2003) has emphasized that silver mines from Saxony may have had some effect in the first half of the century, and while silver was arriving from South America into Spain in significant quantities (and by extension, certainly the modern

<sup>38</sup> Indeed according to some authors, by comparison with both 1000-1300, and much of the early modern period, 1300-1525 was instead a period of arrested development (Britnell, 1993, 2009).

territories of Belgium and the Netherlands, as well as much of modern Italy), it is worthwhile pointing out that it took until the early-seventeenth century for precious metals from America to start having a significant effect on England's money supply. Interestingly, this effect slightly predates the very significant (for the standards of the time) growth which then occurs (Figure 7).<sup>39</sup>

In turn, Figure 7 contrasts per capita coin supply and real income, focusing on the period after the Great Debasement of 1542-1552. As we can see, in the second half of the sixteenth century, real per capita coin supply is essentially flat, then steadily rises in the period 1620-40, hence before the Civil War, and then slowly decreases (in per capita terms) but always stays well above the pre-1620 level. Finally, in the eighteenth century, in association with the discovery of Brazilian gold (Palma 2016c) and the Spanish Bourbon shift of the American empire towards the Mexican mines, there was a steady rise once more.

A short macroeconomic history of early modern England in relation to monetary history can be told as follows. During the sixteenth century, nominal coin supply increased, but these increases were more or less cancelled by increases in population and the price level. The increase in coin supply did lead to inflation, which is what eventually terminated the previous status-quo of stagnated nominal wages.<sup>40</sup> Inflation may have encouraged wage-labor share growth, and may have had distributional consequences<sup>41</sup>, but did not lead to per capita income growth.<sup>42</sup> It was only after the early-sixteenth century that the gradual increase in availability of real coin supply per capita allowed for structural change to begin (Broadberry et al 2013)<sup>43</sup>, and for income growth to occur. Finally, in the eighteenth century income growth continued, caused factors such as urban agglomeration economies (as illustrated by the rise of London) and related spillovers in the countryside, as well as a continued increase in market participation, especially along the intensive margin<sup>44</sup> and in the cities (Allen and Weisdorf 2011).

## 5. From St. Monday to the long haul

In the interests of breaking down this complex matter, I first consider "level effects" and only next move to "growth effects". In light of standard growth theory, one might expect a one-time decrease in transaction costs to lead to a higher level of commercial transactions, but not to a higher growth rate. The same is true for an increase in labor supply. As I argue in the next section, however, the separation of level and growth effects is to some extent artificial, because certain level effects can generate growth effects. Still, it is nonetheless a useful starting point to discuss "level effects" to break this down.

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<sup>39</sup> Notice, however, that the 1600-1643 growth in money supply is conditional on the relatively high figure of £10 for 1643, which is based on a relatively uncertain guesstimate based on civil war coin hoards (Mayhew 1995). If the 1643 figure was lower (see Palma 2015a for details), the rise in per capita money supply would be more contemporaneous to that of per capita GDP.

<sup>40</sup> Dyer (2013, p. 22) writes that "The daily wage of building workers reached a plateau during the fifteenth century, which persisted until 1520, of 6d per day for a skilled craftsman and 4d for a labourer".

<sup>41</sup> Landes (2003 [1969], p.18) suggests that the long inflation of the sixteenth century, "which "found many peasants holding long-term leases whose burden diminished" was strongly associated with reducing seigneurial authority and enhancing the personal and economic status of the peasantry. See also Whittle (2013, p. 12).

<sup>42</sup> This may have been for a number of reasons: decreasing real income of landowners, increased supply of labor having a contrary effect on the equilibrium real wage, and/or the increase in the share of pasture to the expense of arable (as suggested by More's "sheep eating men" *Utopia* metaphor) decreasing agricultural labor demand, even if that was itself partly a response to initially "high" real wages. It is also the case that as long as large reserves of nonwage workers still existed, a continued increase the wage-labor force could proceed without and increase in either real wages or per capita GDP, which by definition only measure market compensation.

<sup>43</sup> Notice that from Broadberry et al (2013), we do not know exactly when did structural change start, other than it must have been between the 1520s and 1700.

<sup>44</sup> The eighteenth century increase in market participation was based primarily on an increase in the average number of days people worked per year (intensive margin) rather than a larger share of the labor force participating in the market, in association with structural employment change (extensive margin).

Despite the substantial amount of attention given by economic historians to the industrious revolution concept<sup>45</sup>, it is important to keep in mind that from a growth theory perspective, an increase in labor supply will lead only to a “level” and not a “growth” effect – it can perhaps explain a higher level of income, relative to that which would exist under a lower labor input per capita, but it cannot on its own explain the take-off towards modern economic growth. Unlike TFP, per capita labor supply is by its nature limited by people’s own limited time in life. Furthermore, we know that working time decreased later on, so even that level effect should be reversed (at least for the intensive margin). Hence, while the increased labor input supports the “pessimistic” view of Crafts and Harley (1992) about the eighteenth century (Antras and Voth 2003), it cannot have, on its own, caused the emergence of modern economic growth.

### **5.1. *Monetization and transaction costs***

As discussed in Section 4.4., until late in the early modern period commodity money did not have a viable close substitute in its function of means of exchange for the vast majority of transactions in the economy. An implication is that if availability of precious metals had not been able to expand thanks to the discovery of America, a smaller quantity of money would have been in circulation. In turn, transaction costs would have been higher; it would have been harder to pay and receive wages, both in the cities and in the countryside, but importantly, fewer people would have moved to cities altogether. Without the additional money supply made possible by American precious metals, more transactions would have to have happened through barter, and given the higher cost, fewer transactions would have happened overall.<sup>46</sup>

The extent to which higher labor supply, higher population, and structural change lead to a level effect rather than a growth effect parallels our understanding of how for long Smithian growth may or may not be viable as a means for continued improvement in welfare (Kelly 1998). Nonetheless, it is helpful not to lose track of the fact that growth over the long run consists of a series of a level effects, which implies that in the context of a given historical period, it may not be easy to distinguish between the two. Furthermore, scale effects in the style of Kremer (1993) suggest that the two may be difficult to tell apart, but while with a larger population comes, all else constant, a greater opportunity for scale effects in the style of Kremer (1993), coordination costs are also higher, which makes the need for money to decrease transaction costs greater.

### **5.2. *Increased labor supply***

In understanding the industrious revolution, the literature often mentions the phenomena of increasingly commercialized and specialized economies, as indicated at even the macro level by a declining share of agriculture in employment. While not denying the importance of other complementary factors, my emphasis here is that the increased monetary liquidity available must have helped. First, the increased liquidity made it easier for employers to pay employees, and for employees to spend their money. This led to an expansion of equilibrium labor supply (the mechanism is detailed in Palma 2016c; for a related point, see also Grafe 2012, chapter 7).

For those who were already participating in the market, the increased liquidity led to more intensive participation (in particular a larger number of days worked, as exemplified by the elimination of St. Monday). Market participation also increased at the extensive level: people who lived in rural areas and were not participating in the market (or were only doing so occasionally), started doing so, either by specializing and selling for the market more systematically while staying in rural areas, or, importantly, by moving to cities.

The “new goods” imported from Asia to Europe stimulated people to work more (de Vries 1993, 2008, Hersh and Voth 2009). Many of these “new goods”, including porcelain, silk, and tea, could only be imported to Europe in the quantities which we observed due to the availability of

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<sup>45</sup> For instance, the recent Broadberry et al (2015) volume dedicates a considerable number of pages to the discussion of the concept and its implications for the measurement of GDP, and reviews the literature.

<sup>46</sup> Money reduces coordination costs associated with barter, but more importantly, allows for intertemporal (and non-bilateral) trade in a context of limited contractual enforcement.



American precious metals (Palma and Silva 2015). While this must by itself have been a relatively important effect, around the middle of the eighteenth century, the Cape-route trade provided an average Western and Central European consumer with Asian goods that cost the equivalent of three days wages of a manual worker in Holland or England (deVries 2003, p. 91). Nonetheless, perhaps the most important role the “new goods” played was that of dynamic spillover effects, discussed in the next section in more detail. Finally, tea also joined coffee in helping to impose the discipline, concentration and effort levels that a modernizing economy required, as exemplified by the mechanization and factory system (Ashton 1997/1948).

## **6. From the long haul to modernity**

It may seem that the effects I have so far discussed could not have had more than a level effect on incomes. Even if they generated a growth spurt during transitional dynamics towards some new steady state or balanced growth path, standard growth models would suggest that the effect should have been necessarily temporary (as it happens with an increase in the savings level in the Solow model for instance.)<sup>47</sup> Of course, all depends on what we mean by “long run”.

And yet I argue that instead the fact that market participation and Smithian growth rose before “modern” economic growth took hold does matter to understand why it happened. This in turn increases the importance of understanding why premodern growth took the forms that it did. The point I make here is that, notwithstanding other factors, this was in part a result of the unprecedented increase in money supply that happened in the early modern period.

How should we think about this conditionality? The effects can be broken down as follows. As money supply per person increases, there was, first, a lowering of transaction costs and increasing market thickness effect which led to structural change and consequently agglomeration economies. Second, there were several second-order, indirect effects (which then had a feedback effect on the main effects). These included a long-term “getting used to the market” effect (deVries 2008), learning effects at the firm level, trade and human capital externalities, and importantly, a state-building effect as the collection of taxes became easier (Capie 2004). Naturally, these effects also interacted with each other.

### ***6.1. Division of labor, structural change, and agglomeration economies***

A more monetized economy permitted greater division of labor because it became easier to obtain the means of exchange to purchase essential goods in an urban context. Hence, moving to cities made more sense, and it was less risky in the sense that one could carry savings in a monetized form to survive while looking for a job. For firms, it also became easier to pay wages, and to invest in a greater variety of products (see Kelly 1997 an exposition of Smithian growth). Thicker markets meant that “horizontal” growth resulting from an expansion in the varieties of available products could happen.

Structural change in turn led to economic growth resulting from agglomeration economies due to higher levels of urbanization. The modern view about the first industrial revolution is that fast productivity increases were initially limited to a few manufacturing sectors that were too small as a share of the overall economy to matter a great deal in terms of overall growth, which remained unspectacular until the nineteenth century. The remaining discontinuity associated with the eighteenth century is an unusual degree of relatively fast structural change (Crafts and Harley 1992). The spectacular growth of London from the middle of the seventeenth century mirrors the take-off of sustained economic growth since then – as well as the take-off of per capita money supply.

### ***6.2. Trade, human capital externalities, and the dynamics of a “new goods economy”***

The direct demand for woolen and manufactured goods from Iberian economies – as well as the second-order demand effects, for instance from the Netherlands, which in turn had more silver and gold brought over in the context of war and trade with Spain – must have meant that English industries

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<sup>47</sup> Alternatively but similarly, a decrease of the subjective discount factor in Ramsey model, in which savings are endogenous.

got a boost, as illustrated by the case study discussed in Section 3. Indeed, “Through both legal and smuggled imports, effective Spanish demand, sustained by American silver, promoted the economic development of Holland, England, and other European countries” (Cipolla 1993).

I have already discussed the role of the “new goods” in stimulating labor supply, treated as a static effect. The most important effects, however, were dynamic. For convenience these can be separated into technological, learning externalities and industrial expansion effects, and related demand effects, as opposed to general equilibrium effects, particularly in their high-wage economy dimension.

The “new goods” from Asia, a result of Europe’s availability of silver for exchange, certainly made people want to participate in the market. But they also induced demand towards import substitutes, which spilled-over into industrial development. In England, it is hard to conceive of important porcelain centers such as Worcester or Derby having appeared if the early modern Euro-Asian trade had not happened – elsewhere in the continent important centers also appeared at Delft, Chantilly, or Sèvres, yet in England the industrial effects were stronger than elsewhere.

Finally, one prominent dynamic consequence of the increased demand for English products was the dynamic general equilibrium effect associated with a high wage economy (Allen 2009). As one early political economist put it:

[I]f the increase of money in the state comes from a balance of foreign trade ... this annual increase of money will enrich a great number of merchants and entrepreneurs in the state, and will give employment to numerous artisans and workmen who provide the goods sent to the foreigner from whom money is drawn. This will gradually increase the consumption of these industrious inhabitants and will raise the price of land and labor (Cantillon 2010, p.148 [1755], p.150)

The exploration of the American continent was a consequence of the search for precious metals.<sup>48</sup> And while the role of the New World as “ghost acreage” or a mass-emigration escape valve, would have to await the nineteenth century, the discovery of the New World mattered in many other ways in addition to the more straightforward trade effects (Palma 2015). It contributed to changing people’s mentalities – especially that of the intellectual elite but also ordinary individuals:

The conclusion is inescapable that the discoveries of America and of the Cape route to the East Indies were highly important factors in the rise of modern capitalism. Changes in trade routes, the widening of markets, contacts with distant lands and strange peoples, and a more perfect knowledge of geography conspired to perturb the minds of men much as does our increasing power over nature to-day. The price revolution set in motion by American gold and silver contributed directly to the progress of capitalism (Hamilton 1929, p. 355)

At the same time, the increase in monetization must also have helped increase people’s basic numeracy skills, as people became more used to handling money and planning as well as performing market transactions. This may have an impact on human capital accumulation. Perhaps as this process proceeded in the more monetized economies people’s culture also evolved in a more market-friendly direction (McCloskey 2010).

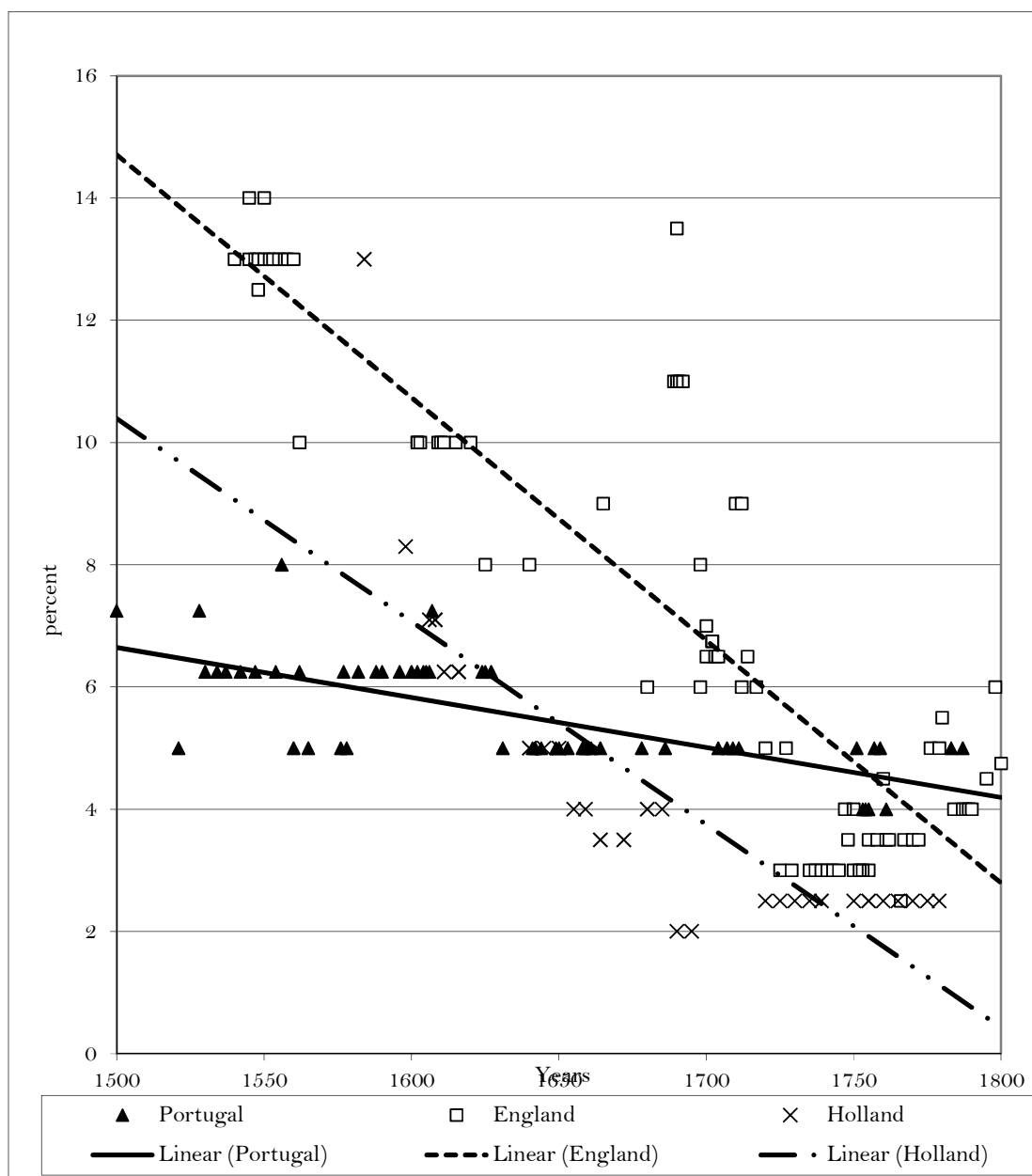
### **6.3. Monetization, taxes, state capacity and finance**

The comparative experience of early modern economies shows that as far as state development is concerned, Britain was well ahead of continental economies – and even more so, other civilizations – as illustrated by the fact that by the eighteenth century Britain had higher state revenues than the Qing dynasty (Brandt et al (2014, p. 69). The monetary injections helped here too as it became much easier for the state to collect taxes in a more monetized economy, and one where an increasingly greater percentage of transactions involved using money (Capie 2004). Under these conditions “funded” taxes

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<sup>48</sup> Conversely it is hard to imagine empire-building in the East without silver. Here is, then, another channel in which silver mattered: it largely made possible the intercontinental trade (both with Asia and America) which had important growth-enhancing effects for the countries which engaged in it more intensively (Palma 2016).

could emerge, which in turn allowed the bank of England to credibly expand paper money gradually, without running into time-inconsistency problems (O'Brien and Palma 2016).<sup>49</sup> Certainly, money was here a necessary but not sufficient condition; there were other (institutional) aspects specific to the English economy which led state capacity to grow faster than elsewhere.



**Figure 7.** Nominal interest rates in Portugal (new issues of *Juros*), England (new issues of various types of royal debt at corresponding maturities) and Holland (new issues of *Losrenten*) 1500-1800. Source: see Henriques and Palma (2015)

Finally, the additional liquidity in circulation contributed to the continued decrease in real interest rates, which, despite having medieval origins (Van Zanden 2009), continued during the early modern

<sup>49</sup> This channel is one of several which illustrates how coin and higher forms of money were complements rather than substitutes.

period, and indeed was particularly strong in Northwestern Europe (Figure 7). In general, we think about an increase in money supply only being able to generate liquidity effects while inflation does not respond. However, as we have seen here, the response of inflation was mild at best (see also Palma 2015b). This is because it was largely real output instead that increased, and it did so permanently. Notice that through arbitrage, the money market could also affect the full term structure of interest rates, and in particular the capital market.<sup>50</sup> For how long, however, is the relevant question; I argue that for this period at least, the answer is: “for much longer than we are used to thinking”.

## 7. Conclusion

American precious metals permitted a dramatic increase in English monetization, which in turn generated Smithian growth, supported state-building, eased the transition to a paper money system (O’Brien and Palma 2016), and facilitated the transition into modern economic growth.<sup>51</sup> From a comparative perspective, one important question is why this did not happen elsewhere, namely in the first-order receiving countries – Spain for the entire early modern period, and Portugal after about 1700. One possibility is that these two countries suffered from the “Dutch disease”, or institutional resource curse.<sup>52</sup> (Hamilton 1936, Drelichman 2005a, 2005b).

Even if that was the case, it should not distract us from the possibility that those monetary injections led to a positive – and not only persistent but indeed permanent – long-run effects for other countries. This has not been emphasized in the recent literature, but it did not go unnoticed by some contemporaries:

[S]ince the discovery of the mines in America, industry has increased in all the nations of Europe, except in the possessors of those mines; and this may justly be ascribed, amongst other reasons, to the increase of gold and silver ... [T]he prices of all things have only risen three, or at most, four times, since the discovery of the West Indies ... But will anyone assert, that there is not much more than four times the coin in Europe, that was in the fifteenth century, and the centuries preceding it? ... And no other satisfactory reason can be given, why all prices have not risen to a much more exorbitant height, except that which is derived from a change of customs and manners. Besides that more commodities are produced by additional industry, the same commodities come more to market, after men depart from their ancient simplicity of manners. (Hume 1987/1742, p. 33)

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<sup>50</sup> On the relationship between the price revolution and the cost of capital, see Gould (1964). While Gould puts emphasis on inflation, my own view is that, due to contemporary growth, the full monetary effect was larger than that suggested by looking at inflation alone. See Homer and Sylla (2005) for evidence that during the early modern period nominal interest rates fell over all maturities.

<sup>51</sup> For sure, the money-growth causality went both ways – the English economy had the right conditions to grow and this in turn demanded means of exchange (McCloskey and Zecher 1974). My emphasis on the role of American precious metals is that at that time they were necessary for monetization to increase, which in turn was necessary (but not sufficient) for economic growth to occur.

<sup>52</sup> In Palma (2015b) I have also documented that liquidity effects were much weaker, or even absent, for first-time receivers, vis-à-vis other European countries for which we have data. It is also useful not to lose the comparative element for other parts of Europe: “[P]eople in central Europe did desire to increase market work and consumption. But elites used the social capital of traditional institutions to oppose new work and consumption practices, especially by women, migrants, and the poor. Although they seldom blocked new practices wholly, they delayed them, limited them socially, and increased their costs” (Ogilvie 2010).

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