

ANGLO-PORTUGUESE TRADE AND MONETARY TRANSMISSION DURING THE EIGHTEENTH CENTURY

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Current draft (incomplete, not for circulation): October 21, 2012

Abstract

I investigate the effects of Brazilian gold imports in England's economy during the 18th century. By the early 18th century, Portugal was importing from Brazilian mines annual quantities of gold which were higher than those Spain had ever received from the Spanish American colonies. Brazilian gold inflows increased as the century advanced, peaking around mid-century and then slowly declining, as shown by recent archival research. Two-thirds of Brazilian gold, a significant windfall, ended up in English hands.

In this paper, I make two main arguments. First, I argue that the monetary injection from Portugal into England was of significant size, as can be seen through a variety of primary source documentation. The size of the total injection from 1700 to 1790 was about £45 million. English coin output increased significantly as a consequence, and Portuguese coin also circulated widely in England.

Second, I argue that this injection contributed significantly to the monetization of the English economy, which in turn supported increased market participation and avoided deflationary forces resulting from economic growth. It may have also stimulated economic growth directly, through increased demand for manufactured goods, and possibly a political economy effect.

*I am grateful to J. L. Cardoso, Leonor Costa, Pedro Lains, Nick Mayhew and Jaime Reis for discussions. I additionally thank Rita Sousa for sharing data and useful information with me. Carina Fernandes provided efficient help in organizing the Portuguese balance of commerce dataset. ICS, University of Lisbon provided financial assistance and wonderful hospitality during the initial stage of this project. In a later stage I have been fortunate to receive research grants from the Winton Institute for Monetary History, Ashmolean Museum, Oxford University and from the History Project (funded by the Institute for New Economic Thinking) of the Joint Centre for History and Economics, Cambridge University and Harvard University. I thank Rui Pedro Esteves for encouraging me to apply to these grants.

1 Introduction

Almost all our gold, it is said, comes from Portugal (Smith 1776)

Two-thirds of Brazilian gold production, a significant windfall, was imported by England during the 18th century¹. Largely as a consequence, gold circulation in England went from £9.25 million in 1701 to £26 million in 1780 (Craig 1953, p.214)². These are nominal amounts, but there wasn't much inflation until the last two decades of the century. Consequently the English economy experienced a large monetary increase in real terms.

There are occasional references in the historical literature to the monetary injections which followed the discovery of rich gold mines in Brazil having had important macroeconomic effects on the European economy during the eighteenth century. What exactly these effects may have been is usually left vague. Tim Blanning, for instance, writes that "the rapidly expanding output of Brazilian mines helped alleviate the chronic shortage of coin and, among other things, allowed the stabilization of European currencies" (Blanning 2008). Characteristically, what these "other things" might have been is not subsequently specified, and the size of the monetary injection is not discussed. Another summary is provided by Greene and Morgan (2009), who write that "the imports of Brazilian gold presumably helped to fuel the expansion of European production and trade in the eighteenth century". Is there a foundation for these claims?

More specific statements have been made in regards to the English economy. Fisher (1971) claims the Brazilian gold in connection with Anglo-Portuguese trade was critical in increasing gold circulation in England, the later establishment of the gold standard, and that it aided London's rise to financial center of Europe. Because of the order of magnitude of the monetary injection others have gone so far as claiming these injections were an important factor in causing or at least supporting the British Industrial Revolution (Sideri 1970, Vilar 1969, Kidelberger's citation). These were not new claims. Fisher (1971) cites one of several possible contemporary examples, who claims that "Everyone knows that this noble province [Brazil] has proved an almost inexhaustible fund of riches to Portugal; and that all parts of Europe, who have any commerce with that Kingdom, do, in some measure, reap the benefits" (Anderson 1764).

Today researchers tend to be more cautious before concluding causality follows from correlation in time, and perhaps because of this since the early 1970's no more studies have appeared which focus on the effects of these monetary injections on the European and in particular English economy. But while there is an important identification problem here which needs to be recognized and addressed, this does not mean the injections to development direction of causation can be dismissed off hand.

In this paper, I summarize what is known empirically about this monetary injection, and I use a model to interpret its effects on the English economy³. I also bring in new data when none is available for the purpose of interest. For this I explore two sources: the Portuguese balance of trade which exists in primary form for certain years between 1776 and 1798, and the English balance of commerce 1697-1780, which exists in primary form at the UK National Archives. The latter is of course more well known to an English language audience and is in addition currently being treated by Kevin O'Rourke, David Jacks and Alan Taylor; for this reason I describe the Portuguese source in somewhat more detail, but the English source is also critical since it is much longer and in particular starts much earlier.

Specific questions I address include the contribution of the gold injections to the monetization of the English economy, ways in which they could have influenced development, in particular by stimulating industry and

¹Fisher (1971), Sideri (1969), Greene and Morgan (2009). Russell-Wood gives a similar figure of between half and three-quarters of all gold entering the Tagus having gone to England (Russell-Wood 1998, p.144)

²Silver circulation, by contrast, decreased.

³I remain agnostic over the issue of Portuguese Dutch disease, which is not my focus here.

structural change through increased demand or a political economy effect. In order to access these possibilities I consider which goods was the gold traded for (hence benefiting which sectors and social groups). I make two main arguments. First, I argue that the monetary injection from Portugal into England was of significant size. Second, I argue that this injection had several effects on the English economy. These effects were related but it is useful to isolate them: increased monetization, which in turn supported increased market participation (by lowering transaction costs)⁴; and avoidance of deflationary forces resulting from (mainly extensive) economic growth. It may have also stimulated economic growth directly, both through increased demand for manufactured goods and possibly a political economy channel.

2 Historical background

Because Portugal was an open economy, Brazilian gold and associated monetary injections had an impact on foreign economies, in particular England. London newspapers regularly announced the arrival of Brazilian gold shipments (Boxer 1969, p. 468)⁵. The way Portugal financed the trade deficit was through direct specie as well as minted coin payment⁶. Portugal minted coins specifically for export, with a standardized value that could easily be verified.

Figure 1 here

In figure 2, I show the temporal correlation between Portuguese currency creation and export.

Figure 2 here

Two-thirds of Brazilian gold, a significant windfall, ended up in English hands. English coin output increased significantly as a consequence, and Portuguese coin circulated widely in England and Ireland⁷. Portugal was the main source of gold entering England during the 18th century (Fisher 1971). Fisher writes that gold imports were up to £25 million, but while this figure is mentioned three times, it is never well documented (Alden 1971). Below I show £45 million is a more accurate estimate.

Some of the gold imported went directly into circulation and much was melted to be minted as English coinage. The circulation of gold in England increased from about £9.5 million in 1701 to £22.5 million in 1773 (Craig 1953). In figure 3, taken from a combination of data from Fisher and Sousa, I show the association between Portuguese currency issue and Portugal's commercial balance deficit with England, and with all other countries bundled together. In figure 4, I show the cumulative values, which are a measure of the total monetary injection into each area.

⁴Increased liquidity and market participation may themselves have contributed to horizontal growth (allowing increased division of labor).

⁵These are perhaps an additional source to be explored by some future historian along the lines of Morineau (1985).

⁶Boxer (1969, p.464) quotes an English consul who writes, in 1721, "For as the British manufactures imported for the consumption of this kingdom [Portugal] and of its colonies amount to more than five times the value of all the commodities exported from hence, it is evident that the overplus must be remitted in specie".

⁷In England and even Ireland, special scales existed which were designed specifically for Portuguese gold. These have survived in far greater number than for other nations which trades with England. I thank Nick Mayew for this information and for showing me some of these at the Ashmolean. Often, these have the conversion written into it, for instance 1 moidore = 26 shillings. Moidore is an English contraction of the Portuguese expression "moeda de ouro", meaning literally gold coin. This continued the tradition of adapting gold-based currency names for their Portuguese origin which started with Guinea, from the Portuguese name for their African source: "Guiné".

Figure 3 here

Figure 4 here

From figure 4 we can conclude that the total monetary injection into England was on the order of £40 million for the 1700-1770 period, and £45 million up to 1785. These are nominal figures, however as the following figure shows there wasn't much inflation in England until the final decades of the century.

Figure 5 here

2.1 Anglo-Portuguese trade

David Ricardo was not the first economist to use Anglo-Portuguese trade patterns to illustrate economic principles. Almost a century earlier, Richard Cantillon wished to demonstrate that exchange rates are equilibrium phenomena, and in an effort to do so he wrote

Assume that Portugal annually consumes considerable quantities of woolen and other manufactured goods from England, for its own people as well as for those of Brazil. It pays for them partly in wine, oils, etc., but for the surplus payment, there is a regular balance of trade sent from Lisbon to London (Cantillon, 1730)

The countries and commodities Cantillon mentions were no accident: the above quote is an accurate short summary of Anglo-Portuguese trade relations for much of the 18th century⁸. In the next few paragraphs I provide some historical background.

In 1654 Portugal signed treaty with England with the intent of securing Britain's support in the ongoing independence war against Spain. This treaty secured religious and political rights to English merchants in Portugal and promised English goods would never pay over 23% of import duty. In 1660, a petition presented by English merchants and a Portuguese delegate to Charles II claimed that trade with Portugal was worth in the region of £200,000 a year (Shaw 1998). Notice in 1654 it was £120,000 per year (Shaw, 1998 p. 33, all nominal values). Following Conde de Ericeira's Colbert-style import substitution reforms (Macedo 1963), during the last quarter of the 17th century Anglo-Portuguese trade was in decline (Shaw 1998, p.18). Since gold inflows started in the late 1680s and were already substantial in the turn of the century, the timing of the Methuen treaty in 1703 could be associated with such inflows, but as with the 1654 treaty its commercial component cannot be divorced from its military one (Cardoso et al 2003).

Still, "Before 1700, the Iberian Peninsula was England's best textile market" (Shaw 1998, p.34). There could have been a Portuguese resource curse (also know as Dutch disease) but this is not certain. In any case, pro-growth policy measures were relaxed during John V's reign. Following more than 30 years of crown support of New Christian interests against the inquisition, John V's reign marked a high point of persecution. Historians often explicitly link this to gold inflows (Shaw 1998, p.26). Shaw says persecution policies tended to be pro-cyclical, giving as another instance increased persecution in the last two decades of the 17th century, when the outcome of Ericeira's policies would have been at their peak. Shaw claims Anglo-Portuguese trade greatly increased in absolute and relative terms following Methuen: "the period 1703-40 can be said to have been the hay-day of British commerce in Portugal" (Shaw 1998, p. 19, see also p.35).

⁸Incidentally, Adam Smith too mentions Anglo-Portuguese trade in the *Wealth of Nations*, where he discusses the 1703 Methuen Treaty. In doing this he contributing to a debate about this treaty which had started with Mercantilist writers. That each of the three major economists of this period chose to participate in this debate is in itself suggestive of the perceived relative importance of AngloPortuguese trade at the time.

Pombal's strategy of diversification away from English interests and trade is well known. Shaw (1998, p.122) argues that "Pombal was using his great power to bring about what he had always intended, i.e., to get Portuguese trade back into the hands of the Portuguese as it had been until the mid-sixteenth century".

So in 1776, the year the Portuguese database begins, Pombal had been in power for over 20 years, and as England was still Portugal's number one trade partner, we can see those commodities Pombal was unable to diversify away from. They are also an indicator of England's comparative advantages vis a vis other nations. Still, England's position as Portugal's main trade partner was less dominant than it had been. The value of Britain's textile exports to Portugal, for instance, was about 70% of total exports, worth about £1 million per year in the 1750's, were reduced to half as much in 1760-70 (Schumpeter 1960, p. 17). On the exports side, there is a lot of exports from Portugal to England, especially of cotton (hence a colonial re-export), but there is an additional complication with American independence in 1776 England was cut off from such source (notice only in 1783 do we see this new country in the database).

The success of national import substitution policies under Pombal probably needs to be added to the combination of decreased gold and increased export of colonial goods in order to justify the fact that in 1789-90 the balance of payments between England and Portugal was positive for the latter for the first time in 200 years. Some Portuguese historians point out Portugal's commercial advantage trend was reversed by Napoleonic invasion and the royal family's flight to Brazil (Shaw 1998, p. 23), but it seems unlikely Portuguese industry would have been able to withstand international competition. Brazil saw subsequent development with the presence of central power. The fact that the late century commercial advantage rested on the back of colonial products such as cotton (Brazil was one of the main of cotton suppliers to England) further casts doubt on whether such invasions would have been the cause of decline. Finally, Brazilian ports opened to all interested trading nations in 1810. In practice this meant they were open to England, thus ending Portuguese mercantilist practices.

2.2 Brazilian findings

In 1703 alone, imports of Brazilian gold surpassed the total that the Portuguese had ever obtained in Mina and Guinea in West Africa, or that Spain had obtained annually from its American colonies in the sixteenth century. By the second decade of the eighteenth century, Brazilian gold far surpassed all of those sources combined. Green and Morgan (2009).

Rich gold mines were discovered in Brazil prior to 1688, probably 1687 or 1686. The date for the gold findings often appears incorrectly in the literature and elsewhere. The British Museum claims next to its copy of a 1726 John V coin that "The discovery of rich gold mines ... [happened] at Minas Gerais ('General Mines') in 1692-4"⁹. Some have claimed an endogenous component to the gold findings (see Vilar 1969). There does not seem exist documentary support for this assertion, and in addition, considering the possibility to find or not a mountain of gold, relative spot prices should matter little.

By the early eighteenth century, Portugal was importing from Brazilian mines annual quantities of gold which were higher than those Spain had ever received from the Spanish American colonies. Brazilian gold inflows increased as the century advanced, peaking around mid century and then slowly declining but continuing into the 19th century, as shown by recent archival research (Costa, Rocha and Sousa, 2011).

⁹http://www.britishmuseum.org/explore/highlights/highlight_objects/cm/g/gold_20,000_reis_of_jo%C3%A3o_v.aspx

It also repeats Vilar's claim that "In a couple of decades the world's supplies may have been doubled", which is impossible, and places the peak of Brazilian gold production in the 1920's, although it was really two decades later. Finally, it claims the English were free to trade with Brazil, which is also not true. All trade had to go through Portugal, and this mercantilist practice, which was enforced, continued until 1810.

The most often cited numbers on the quantity of Brazilian gold continue to be from a 19th century work (Soetbeer 1879)¹⁰. Much better estimates exist. In the table below I consider Sousa's, the most recent and authoritative¹¹.

	Soetbeer (1879)	Sousa (2006)
1701-1710	19400	92882
1711-1720	53600	108721
1721-1730	47400	124491
1731-1740	75300	150702
1741-1750	125200	228760
Total	320,900	705,556

Table 1. Portuguese coinage of gold, in marks. Source: Sousa 2006, p. 99.

2.3 Relation of precious metals to monetary injections

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)

In a commodity money system, the government only has two ways to expand the money supply. One is to debase the currency. The other is to have direct access to specie, either through mining or trade. In the first policy tool the government is constrained by competition with foreign mints. If the currency is much debased, people will start to use foreign currency, and the government's seigniorage revenues may actually diminish. For this reason, and since Europe's mines were much exhausted, trade was the main remaining option.

3 England's stock of money and size of the monetary injection

From the moment when Elizabeth I ascended to the throne in 1558 to the foundation of the Bank of England in 1694, a period of 136 years, the Mint had issued no more than £15 million in gold coinage, of which half was in guineas that appeared after 1663. During the 45 years from 1695 to 1740, the Mint produced £17 million gold coins. Bernstein (2000)

Around 1700 Europe had already experienced a century and a half of large scale monetary injections. The traditional dating of the Spanish America-origin injections is roughly 1540-1660, as well as that of the associated price revolution, and it is contested if they slowed down at all in the last half of the 17th century (Morineau 1985)¹². In any case after 1700 the Mexican mines increased production.

While these were large monetary injections, they were mostly made of silver¹³. Much silver left for Asia, and as the American economy developed increasing amounts stayed there as well. But while silver was in high

¹⁰Recent well-known works that use Soetbeer's numbers include Sargent and Velde, Velde and Weber.

¹¹Sousa's numbers are essentially a careful update of those of Godinho (1955).

¹²This is part of a debate on the existence of a "17th century crisis" which is not my focus here.

¹³Some gold also came in, but while of possible significance at the time (Vilar 1969) it was minimal compared with what was to come: by the early 18th century, Portugal was importing from Brazilian mines annual quantities of gold which were higher than those Spain had ever received from the Spanish American colonies (Green and Morgan 2009).

demand in Asia¹⁴, gold actually flowed the other way around. Gold is the precious metal that contributed the most to European, and in particular English, monetization.

Mayhew (1995) provides an useful summary of estimate on England's monetary variables up to 1700

	1300	1470	1526	1546	1561	1600	1643	1670	1700
M	£0.9m	£0.9m	£1.4m	£1.45m	£1.45m	£3.5m	£10m	£12m	£14.5m
Price Level	104.8	104.6	135.1	172.3	289.3	478.3	597.8	635.7	662.6
Velocity	5.178	3.889	3.571	5.517	9.310	6.286	3.5	3.407	3.448

Table 2. Aggregate statistics: England. Source: Mayhew (1995)

Although Mayhew's last data point is 1700, some information is known the 18th century. Due to Brazilian gold inflows, Portugal was the main source of gold entering England during 1700-1770, and bullion imports were up to £25 million.

According to traditional estimates, between 1700 and 1770, Portugal shipped to England about 25 million pound sterling in bullion (Fisher 1971, p. 20). I show below the true number for 1700-1770 is about 40 million pound sterling, and 45 million up to 1790. By comparison, English national income was about 40 million pounds in 1700 (Mayhew 1995). Not all the bullion was minted into English currency, and not all stayed in the English economy. In any case, the numbers show the monetary injection was very large.

Much of the gold imported went directly into circulation and much was minted too, increasing the circulation of gold in England from about £9.5 million in 1701 to £22.5 million in 1773 (Craig 1953). Notice all of these are nominal figures, but compared with Mayhew's 1700 figure, unadjusted for inflation they suggest a monetary injection largest than initial money supply, in other words the money stock would have more than doubled, albeit in nominal terms, in a period of 70 years. While these are nominal figures we know from English price history that there was little inflation until the second half of the 18th century and even then it was mostly consigned to agricultural goods (Allen-Unger Global Commodity Prices Database, Clark 2001, Capie 2004, figure 5). For this reason, the monetary injection must have been very large in real terms. In fact one set of estimates exists (Capie 2004, p. 222):

	1700 _{LB}	1700	1700 _{HB}	1750 _{LB}	1750 _{HB}	1790 _{LB}	1790 _{HB}	1870
M (£m)	12	15	20	22.5	30	63	76	540
V	5	4	3	4	3		2.5	1.75
P		100			92		116	
PQ (£m)		60			90		190	950

Table 3.

Capie's numbers also show that the monetary expansion was based on coin. Capie (2004, p. 224) provides a breakdown of England's monetary base during the 18th century and beyond:

¹⁴ "[It] was much cheaper to pay with silver than with gold for goods from India and the Far East" Craig (2011 [1953], p. 215).

	1700	1750	1790	1870
Coin	7	18	44	95
Bank of England notes	1.5	4	8	35
Other notes	0	1	4	4.9
Bank balances at the Bank of England	-	-	-	6.5
Total	8.5	23	56	141.4

Table 4. English monetary base. Unit: Millions of £.

We can see that while money supply expanded significantly during the 18th century, not much of this was achieved through increases in fiat money or bank balances¹⁵. Something must have allowed the rapid expansion of English money supply during this period: I argue the answer is imports of Portuguese gold of Brazilian origin.

Figure 6 here

In the following sections I consider the effect the monetary injection had on the monetization of English economy, and associated channels of transmission to economic growth.

4 Increased monetization

In this section I consider how monetization increased both through increasing circulation of Portuguese currency and through additional minting of English coinage. In the next section I consider other ways it affected the English economy, namely by providing additional bullion for trade, stimulating demand for manufactures, and possibly affecting growth through a political economy effect.

Brazilian gold was sent both to Lisbon and (increasingly) to Rio de Janeiro for minting. It was sent to England in minted form (figure 1). This was a guarantee of the weight and value of the shipments (Sousa 2006). Much was sent through Falmouth packed-boats. For instance, in 1757, 1.5 million pound sterling were sent in this way (Fisher 1971). Some must have come in bullion too.

4.1 Portuguese currency in direct circulation

You can see none [other foreign coin among us] in any payments, unless it be Portugal money”

(Draper of London, The consequences of trade as to the wealth and strength of any nation, p.14)

Macedo

Portuguese currency was free to circulate in England and of general acceptance. It could be used as money, and was particularly common in West England. Fisher (1971) cites a man from Exeter who in 1713 claims almost all money in circulation is Portuguese gold coins. This was also likely to be true of 1737 in Cornwall : Practically all payments of taxes in money received by Cornwall’s receiver general were made in Portuguese gold (Fisher 1871, p.153, who cites Cal. Treas. Books and Papers 1735-38, p. 315). Still according to Fisher,

¹⁵Velocity also increase through usage of new securities, both public and private. But at the same time, there was a fall in hoarding for precautionary reasons (Ashton 1972 p.198)

the circulation of Portuguese gold coins was still more vast. In 1742, the more common coins in circulation were Portuguese, as in 1750 (de Pinto 1774), and 1757 (Craig 1953). Portuguese coin circulated until the end of the century (Craig 1953, p. 215).

Most of the money which came into England from Portugal was put in circulation directly by the merchants on whose behalf the

transportation was made and by the private banks who bought from them and used it as money. These banks used Portuguese coins directly in daily activities, unlike the Bank of England, which would either pass over any currency to the Mint House to be melted and recoinced, or saved it for usage in international transactions (Fisher 1971, p. 154).

4.2 Additional minting

The London mint coined "above a million [pound sterling] of Portugal gold" into English currency during 1710-1714 alone. Luso-Brazilian gold coins enjoyed wide circulation in many parts of Great Britain and Ireland. Boxer cites an Exeter man who claims in 1713 that hardly any money is current other than Portuguese gold, a complaint echoed by the Cornwall Receiver-General in 1737 (Boxer 1969, p. 469).

In figure 5, we can compare Portuguese and English gold coinage. We see that up to about 1736 the series move closely together. During the following 20 years they diverge, and after that they seem to move together again (with the exception of England's mid 1770's peak). In order to understand the divergence, we need to take a closer look at history.

4.3 Money and growth: The quantity theory mechanism in a dynamic model

In the mercantilist literature and other contemporary primary sources we can often hear complaints about lack of currency, in particular it is said it is an obstacle to commerce (in the mercantilist literature often this is given as one underlying reason why the export of bullion should be prohibited). Is this just rethoric? In this section I consider two models which suggest there are reasons why lack of monetization can strangle economic growth. If there is an exogenous component to money supply the monetary authorities may have no credible way to expand the money supply.

Consider the equation of exchange: $MV = PY$. As written this equation is an accounting identity with no theoretical content. A log-difference transformation leads to:

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

Simple arithmetic suggests that if economic growth is to happen, a fixed money stock implies either continued increases in the velocity of circulation or deflation. In other words, for M constant, economic growth implies either Δ^+V , or Δ^-P , or both.

While technological change usually leads to moderate increases in velocity over time, these could not have been of the magnitude of eighteenth century British economic growth, which while slower than once thought, was still unusually fast for the time (Crafts-Harley). Most importantly, population expanded rapidly so there was a lot of growth on the extensive margin. With a fixed supply of money and at most only moderate increases in V the only way Y can grow fast and consistently is through continued deflation, Δ^-P . This is especially true in periods of population growth.

There is evidence that continued deflation does not provide a good basis for growth (below I discuss why). For this reason it is likely that falling prices would have been an obstacle for growth take-off. For sure modern economic growth did not happen in a period of deflation, though this is only suggestive as evidence.

If sustained growth cannot happen under continued deflationary conditions then continued increases in the money supply are necessary for the possibility of growth take-off. 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. In addition, the denominational problem described by Sargent and Velde (2002) becomes worse under deflation¹⁶.

But, so far I have described a "black box". Through which means are monetary increases associated with growth? Below, I show that if agents are subject to a simple transactions friction, in the absence of continued monetary increases a balanced growth path cannot exist.

I now use a model to argue that nondeflationary economic growth requires continued expansion of the money supply. I argue in light of this that Brazilian gold had positive effects on the English economy, and I interpret the subsequent adoption of the gold standard, in conjunction with expansion of fiat money, in light of this. As we will see, the model also provides as a corollary a prediction about the evolution of working hours. Here I am interested in understanding the effects of monetary injection into England, so I take international trade as given and analyse the effects of differing monetary injections in a single agent. The framework could be easily extended to one with multilateral trade without change in the conclusions (which are qualitative in nature). Consider a nonstochastic economy comprised of a single representative agent model which faces a shopping friction, interpreted as reduced form for search costs¹⁷. Households can issue and trade bonds, but cannot issue money. The representative agent owns a representative firm and solves the problem:

$$\begin{aligned} \max \sum_{t=0}^{+\infty} \beta^t u(c_t, 1 - l_t - s_t) \\ \text{s.t.} \\ m_{t+1} + p_t c_t + b_{t+1} &\leq \omega_t l_t + m_t + (1 + r_t) b_t \\ s_t &\geq \frac{\varphi c_t}{m_{t+1}/p_t} \end{aligned}$$

The household also owns a representative firm which faces the technology $y_t = A_t l_t$. In order to permit the existence of a balanced growth path (BGP), I assume BGP-consistent preferences: $u(c, l) = \frac{[c^\psi (1-l-s)^{1-\psi}]^{1-\sigma} - 1}{1-\sigma}$. Since these preferences exhibit local nonsatiation, the setting is deterministic, and money is dominated in return, it follows that the problem can be solved with binding constraints, without lack of generality. Total factor productivity (TFP) growth is exogenous $A_t = \gamma^t A_0$. There is a law of transition for money: $M_{t+1} = (1 + \mu) M_t$. The parameter μ is exogenous.

Definition 1 *A steady state is a situation where y_t and c_t are growing at the same rate.*

Definition 2 *A BGP is a steady state with a constant stable labor share (l constant in this section), and where $R_t, R_{mt} \equiv \frac{p_t}{p_{t+1}}$ are constant across time (but possibly different from each other).*

Definition 3 *An equilibrium is a sequence of prices $\{R_t, p_t\}_{t=0}^{+\infty}$, allocations $\{c_t, l_t\}_{t=0}^{+\infty}$ and a positive sequence for the money supply $\{M_t\}$ such that given the price sequence the household optimizes and all markets clear: $b_t = B_t$, $m_t = M_t$ and $c_t + g_t = y_t$.*

¹⁶The denominational problem is essentially that if coins of different denominations are minted in proportion to their specie content, the lower denomination coins have a higher-than-face real value since besides store of value they have additional utility as change.

¹⁷This permits a parsimonious description of the underlying search problem, which in the present context is without lack of generality since the model is not intended to be calibrated or estimated, but simply to qualitatively illustrate the quantity theory mechanism for a growing economy.

Definition 4 A steady equilibrium is a an equilibrium which is simultaneously a steady state. Likewise, a BGP equilibrium is an equilibrium which is simultaneously a balanced growth path.

Proposition 5 In the absence of monetary injections ($\mu = 0$), an equilibrium BGP with positive growth implies a falling price level, $\frac{p_{t+1}}{p_t} = \mu$.

Proof. Towards a contradiction, suppose an equilibrium BGP with positive growth exists. Then for any initial conditions shopping time must be always increasing, $s_t \rightarrow 1$ as $t \rightarrow +\infty$. Then the household time budget constraint and the fact that $l_t \geq 0$ imply that $l_t \rightarrow 0$. Thus a positive growth BGP cannot exist. ■

The intuition for this result is that the lack of nominal money is strangling growth: since more consumption implies more transactions, a non-deflationary growth equilibrium requires either continued monetary growth or a continued increase in velocity, i.e. fall in interest rate (or a combination of both).

This is the microfoundation of the $MV = PY$ story above: more output and consumption growth imply more money in order to keep the shopping time constant. In order to support non-deflationary positive growth, either money supply needs to keep increasing or velocity will keep rising. The representative agent formulation presented here can be interpreted as holding both for a context of national output growth, where more money is necessary for more transactions, and at the individual level, where more per capita consumption needs to be accompanied with real balances in order to avoid the need for continued time spend searching.

The purpose has been to show that in the presence of a shopping friction, nominal money growth is necessary to support continued economic growth (and that in such instance monetary injections do not need to generate inflation since they are canceled by additional transactions; see Manuelli 1998). The simple example introduced here shows that in a commodity money setting there is a knife-edge money growth rate consistent with balanced growth. Thus unless prices can fall freely without consequences for economic growth, continued growth actually requires continued expansion of the money supply (since velocity cannot fall sufficiently fast). Note this result emerges as a direct consequence of commodity money, as opposed to the modern fiat money system we are used to thinking about, which is also the one analyzed by Manuelli.

Corollary 6 Following a monetary injection, work hours l_t increase

Proof. The preferences exhibit DMU with respect to leisure, $1 - l_t - s_t$. So following a fall in s_t both leisure and work hours increase. ■

It follows as a corollary of this model that after a monetary injection, hours worked increase. Voth (2001, 2002) has argued that there was an increase in work hours during the eighteenth century, and that this is to be attributed to the desire to purchase new goods (in line with de Vries 1999), and associated increase in market participation. My model provides an alternative but also complementary (certainly not mutually exclusive) viewpoint. One way to view this is to realize that increased monetization, by significantly lowering transaction costs, was an important incentive to increased market participation.

Notice that in order to best connect this to the data this interpretation requires that we define actual work as $l_t + s_t$. That is time spent "transacting" is part of the observable we call work hours. Otherwise the model would actually imply that leisure $1 - l_t - s_t$, as well as l_t , would increase following a fall in s_t . But we should keep in mind s_t is not directly observable. What is likely to have happened is that at increased levels of monetization, transaction costs were lowered, or the wheels of commerce were "better greased", so it was simply easier to join market activity.

4.4 Contribution towards monetary stability

[The eighteenth century] stability of the standard of value is ... one of the reasons for the stability of the institutions and social relations of the period (Ashton 1972, p.199)

There was little inflation in 18th century England (figure 5), despite economic and populational growth, and the large monetary injection under consideration here. Both classical and modern monetary theory suggest all else constant deflation should have followed economic growth. My proposed solution to this puzzle is that the monetary injections that I consider in this paper were what prevented deflation, in accordance to the model I developed above. Perhaps they helped growth too, but this is outside the scope of that model.

There are two reasons why the monetary injections here considered are likely to have been critical to England's monetary stability during the Eighteenth century. The first is that on the eve of the industrial revolution, economic and populational growth generated additional demand for money, and this would have led to deflation on the absence of increased monetization – which under a commodity money system would have been difficult to implement without a fresh supply of bullion¹⁸. The second reason is that it permitted a smooth transition into the gold standard. Silver was highly valued in the East, and for this reason in early modern Europe, England included, there was always insufficient amounts for proper monetization. With gold the matter was different. Bernstein (2000, p.16) attributes the increasing popularity of the guinea to consistent weight and finesse. Sargent and Velde study the endogenous transition from bimetallism to the gold standard.

The model from the previous section suggests that in the absence of Brazilian gold imports England, would have either suffered severe deflationary forces during the eighteenth century. What real consequences would have followed it is hard to say. Perhaps it would not have been able to experience economic and populational growth on the eve of the industrial revolution, but this model is silent about such channel.

In a chapter entitled "English expansion and Brazilian gold", Pierre Vilar writes "The constant surplus on England's trading balance with Portugal and Brazil drained away gold; and since this was in exchange for actual products it gave a greater stimulus to the English economy than if it had been obtained directly from mining. This is why England ... minted approximately £15 million of gold coin in the 136 years from 1558 to 1694 [and] was able to mint almost as much again, about £14 million in the 33 years from 1694 to 1727 ... this influx of gold explains why, once the wars were over, the various forms of paper money could be fairly easily reabsorbed, and why the currency was stabilized". (Vilar 1984, p.230 [1969]).

Impact on financial markets: [discuss interest rates, possible evidence of a liquidity effect. To be written...]

5 Additional demand and political economy

I now consider a second set of effects of the monetary injection on the English economy. Boxer (1969, p. 459) quotes one English envoy writing to Lord Dartmouth in 1710 that "The securing of the Brazil Fleet is certainly of the utmost importance to this kingdom and to our trade, the payment of all that is due to our traders depending on the safe return of the fleets", and another about the same time assuring that the Portuguese gold is the return to English manufactures¹⁹.

¹⁸In response to the deflationary forces, an earlier move towards a fiat money system (as well as further diffusion of credit) could have been attempted, but in light of the John Law fiasco which was still in recent memory a credible system of expectations equilibrium might have been difficult to implement.

¹⁹Sutherland, L. (1933, p. 17-40) describes the Brazilian gold related activities of an English businessman.

Indeed as the money flowed in, the Portuguese spent more and more in English manufactures. By the 1740's Portugal was England's second largest export market.

Figure 7 here

As we can see in the figure Portugal shows preeminently as a major export market for the whole of the 18th century – even though it was a small, peripheral, and quite poor country.

Fisher (1971) concludes the Portugal-England trade was 10 to 15% of English foreign trade during much of the 18th century (up to 25% in some manufacture industries, namely textiles)²⁰. This may not look like much. How much is a lot? Mokyr (1980) has argued that foreign trade could hardly have been of prime importance for the industrial revolution since it was just 10% of GDP during the 18th century (McCloskey 1985 even makes a stronger argument). Yet, as Findlay and O'Rourke (2007) have argued, such static calculations may be wholly inappropriate to access a phenomena which is dynamic in nature. I argue this is the case here. The importance of this monetary injection – in itself of considerable size, even measured in static terms – is beyond what a static look at the Anglo-Portuguese balance of trade would suggest. For instance, Fisher (1971, p. 155) argues London markets were stimulated by trading in gold and silver during the first half of the 18th century. Further, due to England's prominent role as a maritime power, some of the bullion was reexported to other countries, and this helped English commercial interests. For instance, English gold merchants and intermediaries re-exported much gold to Holland (Fisher 1971, p.156). This benefitted the shipping and mercantile industries. Hencey more than the amount in terms of GDP it is important who gains from a windfall. 15% spent in goods that benefit merchant interests may have quite different dynamic effects than 15% that benefit landowning interests.

5.1 Incentive to industrialization

Economic historians [including recently Allen (2003)] have emphasized the role of "new draperies" as a major source of TFP growth in early modern England. Demand for these provided a boost to urbanization and agriculture, through greater demand for food, wool and labor. So while more information is needed on this it is likely the monetary injections caused by Brazilian gold inflows had a "inverse Dutch disease" beneficial effect on England's economy.

According to François Crouzet (1981, p.66), "Special attention was paid to the Portuguese trade ... [Many] documents stress the large markets in Portugal for British manufactures ... and the 'prodigious' quantities of English goods which were re-exported to Brazil; still more valuable was the very large favorable balance of trade which England enjoyed and which was settled with gold from Brazil". Crouzet further mentions several memorandum which attribute to Brazilian gold in varying degrees of importance in supporting English prosperity. It is interesting to notice that commercial connections related to Brazil, for instance, are mentioned far more often those related to the Spanish empire (and incomparably more so than Britain's trade with its own colonies, which comparatively were of minor importance around 1700 (Crouzet 1981, p. 67).

Having gone through the primary sources, I find this unsurprising. Portugal was England's second largest commercial partner around the middle fo the 18th century. Indeed in 1736-40 Portugal consumed more than half of English exports of woolen bays, socks, and hats (Fisher 1971, p. 144-145). Total English capital in

²⁰Notice further that since export of precious metals was formally forbidden in Portugal, some counterpart imports may appear in the Ledgers as exports to other nations. There is evidence that some exports to Holland and France were actually exports to Portugal (Shaw 1998).

Portugal was in 1759 from 3 to 4 million pound sterling (Fisher 1971). Gold and silver sent to England: 25 million pounds between 1700 and 1760 (Fisher 1971, p.40)²¹.

But it is reasonable to say that such stimulus was of critical importance to British industry? Did it promote a "reverse Dutch disease" situation, how Vilar and others and suggested? In order to study this possibility, I provide in the next section a micro-level analysis of the Anglo-Portuguese trade. Doing this permits answering questions a macro analysis cannot, such as, what particular industries were stimulated by increased demand, and hence what groups benefited.

5.2 Anglo-Portuguese trade

In the early 1720s, an average of 609 [English] ships a year visited the [Lisbon] port. In the early 1730s, an average of 945 ships sailed in and out of Lisbon each year ... In a typical year, at least half of the ships frequenting Lisbon were English, and English merchants acquired an estimated two thirds of the gold that arrived in Portugal, in exchange for cloth and other trade goods... Brazilian gold also flowed into Amsterdam and Seville to finance trade, and from there to the rest of Europe, altering the relative value of gold and silver in the process. Green and Morgan (2009)

I explore two sources. On the English side, the Ledgers of Imports and Exports, PRO Customs 3 at the UK National Archives (which also contain official figures on the amount of foreign gold and silver coin and bullion exported each year). The Ledgers need to be used with caution both due to the need for a real adjustment and because nominal prices weren't always updated after a certain period. The full series is currently being treated by Kevin O'Rourke, David Jacks and Alan Taylor but the result will only be available in a few years. Here I focus only on trade between Portugal and England and on a few key commodities which are sufficient for my present purposes.

The second source I use is the converse Portuguese figures, which exist for 1776-1777, 1783, and for some later years as well. I study this source in somewhat more detail, due to its comparative lack of accessibility for English language researchers. It provides both a comparison and check on the English converse figures. For the years for which it is available the Portuguese source in fact provides a much richer description than the English counterpart. Unfortunately, Anglo-Portuguese trade was past its peak when it starts, but is still quite significant²².

This micro, bilateral study of the Anglo-Portuguese balance of commerce contributes towards the assessment of the thesis that the "Portugal trade" was an important contributor to the English "commercial revolution". Both databases help clarify which groups benefited in England. The use of disaggregated data helps identify the particular foreign industries and interests that benefited from the association of the monetary injections in a much more precise way than is possible by looking at aggregate trade data only.

5.2.1 Anglo-Portuguese trade seen from Portugal: The "balana do comrcio"

I now describe and interpret the contents of the contents of the Portuguese balance of commerce for the late 18th century, with special reference to Anglo-Portuguese trade. The balance of commerce provides a detailed

²¹Notice however Fisher does not specify the base year, so he is summing nominal amounts over time. This is a reasonable first order approximation because there was little inflation in England during that period. However the nominal figure needs to be raised in accordance to my previous discussion.

²²(Costa 2004). According to Fisher (1971), there was a clear change in the pattern of imports from Britain after the 1755 earthquake. Textiles imports dropped sharply from an average of about 1 million in the 1750s to 709,000 in 1761–1765 and about 460,000 in 1766–1770.

description of all officially registered commodity imports and exports of Portugal for six years: 1776-1777, 1783, 1796-1798. Bullion and coin do not show up in the 1776-1783 years, as their export was formally prohibited, but show up in the later set of years. The six available years can be found in primary form at the "Arquivo Histórico do Ministério das Obras Públicas, Transportes e Comunicações" (historical archive of the public works department of state). In my website, I also provide them in easily accessible excel form, for the benefit of other researchers.

The broad patterns of Portuguese trade during the 18th century, in particular the connection with England as a privileged trade partner are known (Costa 2005). But some questions remain unanswered. Existing published research focuses on aggregates, so beyond broad generalization it is so far impossible to know the breakdown of commodities in value or volume. While the peak of gold imports was in the 1740's, as far as 1776-1777 remittances were still significant, and while diminishing, they continued into the early 19th century [Sousa (2006), Costa, Rocha and Sousa (2001)]. This database provides a check on the converse English numbers I discuss below, but it is also a lot more detailed. While the "Ledgers" accounting data provides very general classes of goods such as "woolen goods" and under this just a few general groups, the Portuguese counterpart goes into considerable detail such as ". For 1776, the Portuguese balance imports from England provides information on 226 goods, while the English source provides information about 76 exports to Portugal²³. For this reason, the Portuguese source should be of more interest to social historians. The Portuguese source provides useful information on how the Portuguese were spending the final phase of the Brazilian gold and diamonds windfall, and the pattern of consumption and investment goods imports are indirect information on the development of the Portuguese economy of the time. The database also provides rich information on prices. It also permits a comparison with the English side numbers, described below.

The Portuguese balance of commerce contains a detailed description of many thousands of commodities, often differentiated in detail by characteristics such as quality, color and construction material. Intermediate inputs for production are usually described as such. For each good, information is also provided on its price, measurement unit, and official quantities bought and sold. A typical page looks just like an 18th century spreadsheet:

Figure 8 here

The last quarter of the 18th century was not the high point of Anglo-Portuguese trade. In 1769-1773 the percentage of English ships in Lisbon was 55% and in Porto 72%. These percentages fell to 19% and 47% in 1779-83. A similar trend is visible in English-origin imports, which in 1781-90 were only 60% of what they had been in 1756-60 (Pedreira 1994, p. 51).

The 1776-1783 data set, however, is completely disaggregated in primary form. From 1796 onwards, the balance of commerce series is continuous (with one partially missing observation in 1798) and goes up to 1831 and beyond. Alexandre (1993) provides an in-depth review of the 1796-1831 period. For 1796-1831, the primary source itself presents the data under some very broad aggregation. Alexandre (1993) notices this had led some historians to draw wrong conclusions, because the way the data is aggregated is not consistent through time, and it is also the case that not everything counted as "industrial goods": only those with special privileges. However, Alexandre himself tends to treat nominal values without consideration to possible changes in the aggregate price level. Since the later observations are during the frankly declining phase of gold imports and consequently also well past the peak of Anglo-Portuguese trade, in this version of this paper I focus on the 1776-1783 data.

²³As well as 72 imports. Imports from Madeira, and to out Port import goods are a subgroup of those, the exception being Madeira wine.

Figure 9 here

A curious illustration regarding production specialization is given by sugar. Sugar cane was a major export of Brazil. Under mercantilist trading arrangements, it was to be re-exported by Portugal. Much of that went to England, and it would come back to Portugal in the form of sugar candy - a processed, ready to consume product. It appears that for some reason it wasn't optimal for production to occur in Portugal. Was the reason lack of capital - physical, entrepreneurial or otherwise - or some other reason such as increasing returns at the industry level? Portuguese wages were low, even if they spiked in the middle of the 18th century (Reis, forthcoming), and low wages contrasted with England's high wage economy (Allen 2003). Whatever the reason, sugar was transported back and forth in this age of relatively expensive transport costs, due to the lack of Portuguese productive capacity. After 1764 Portuguese imports from England diminished (Fisher 1971).

Worsted fabrics and other textiles form the largest fraction of Portuguese imports. Of these, woolen bays varieties are prominent: they correspond to 44% to total imports in 1776. According to Raphael Bluteau, a "Baeta" is a "woolen fabric, whose hair is risen through use or manufacturing" Bluteau (1728, p.21).

With the possible exception of wrought iron on certain periods, there is little imports of capital goods suited to large scale industry. This is not surprising in light of the observation that the bulk of Portugal's industry was small scale and decentralized (Pedreira 1994).

5.2.2 Anglo-Portuguese trade seen from England: The Ledgers of imports and exports

While no full Portuguese source for the full period is known to exist, a converse English panel exists at the UK National Archives (PRO Customs 3, ledgers of imports and exports). These are currently being treated by Kevin O'Rourke, David Jacks and Alan Taylor. My study of this source is consigned to five year intervals for the period 1701-1776, and concentrating on the main products traded between Portugal and England (over 85% of value).

In the introduction to Elizabeth Schumpeter's book, T. A. Ashton remarks that in this source the official prices of some goods sometimes varied with the destination. The examples given are Venice and Portugal, to which prices were three or four times those of the same goods shipped to the colonies. As Ashton notices, some of this difference was justified in terms of differences of quality (Schumpeter 1954, p.4). It is also noted that one of the custom officials in charge, Martin, at time revised the price of woollen goods down suspiciously. At this time, woolens were about half of the exports of England and Wales combined. Schumpeter ignores this problem, and while aware of it, I have no other present option other than doing so as well, and hoping this won't lead the analysis too astray. This is something for which the Portuguese database counterpart should prove useful, at least for the years for which it is available.

Another issue is the incentive of bureaucrats to overstate exports and understate imports, a practice which could make sense under the mercantilist tone of the day.

What were the Portuguese buying with their windfall?

Figure 10 here

And how does this compare with what the Spanish were buying?

Figure 11 here

5.3 Political economy

There is a long literature, most recently revived by Acemoglu, Johnson and Robinson (2001), which suggests that the industrial revolution was made possible by the improvement in institutions which followed from the rise of England's merchant class. As I have just show the great immediate beneficiary of the injection was the English textile industry, as well as for sure the shipping industry. However, it was mostly the producers and merchants of the woollen industry which benefitted the most: while cotton clothing articles do show up in the Ledgers, relevant quantities only appear late, and always much behind woollen exports. This is, in any case, what we would expect from what we know from the history of the industrial revolution: the woollen industry was the great laggard²⁴. Woollen exports formed a large percentage of English exports, but they were in decline. In 1772, woolens comprised 42.2% of English exports (Schumpeter 1954, p. 12). As late as 1790, cotton fabric were only 10% (up from 2.3% of 1772), and woolens were still 34.8%. Their decline corresponded not to an absolute decline but to diminishing importance relative to the rise of cotton. The reason was that cotton input was available more elastically, production was more prone to technical change, and demand was more elastic as well. Wool was always more of a luxury good.

Taken all into consideration it seems to be the evidence for the existence of a political economy effect is mixed: The injection did directly benefit the merchant class, as opposed to landowners; however it benefited the most the woollen industry. Perhaps what mattered the most was to create opportunities for enrichment which were alternative to landowning, but we cannot discard the possibility that in fact it also contributed to delaying change by stimulating the industry where technological change was least possible.

6 Concluding remarks

In this paper I have provided an investigation on the effects of Brazilian gold on the English economy during the eighteenth century. I have attempted to make sense of widely dispersed information from several sources and organize it around a single, coherent whole.

Following the discovery of rich gold mines in Brazil, the bulk of the Portuguese money was spent on English consumption goods, in particular woollen clothing items. As the consequence, I conclude, the size of the monetary injection into England was on the order of £45 million. Not all of this stayed in circulation, as much was re-exported to Holland and elsewhere, despite frequent legal prohibitions; further, some Portuguese currency circulated directly as such. Still, Brazilian gold is likely to be the main cause permitting the expansion of English money supply from £9.5 million in 1701 to £22.5 million in 1773 .

[to be concluded....]

²⁴And in fact at times their representatives tried to block technological change which benefited its competitor the cotton industry.

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Appendix.



Figure 1. Portuguese John V gold coin. Minted at Minas Gerais, Brazil, AD 1726. This particular coin was worth 24000 reis (despite the nominal 20000 marking). This was about £6.73. Source for the image: The British Museum.

Note: in the following figures, all values are nominal; in lieu of figure 5 below, which shows there wasn't much inflation in 18th century England until final decade, this is valid as a first approximation; in a future version of this paper I will present deflated figures.

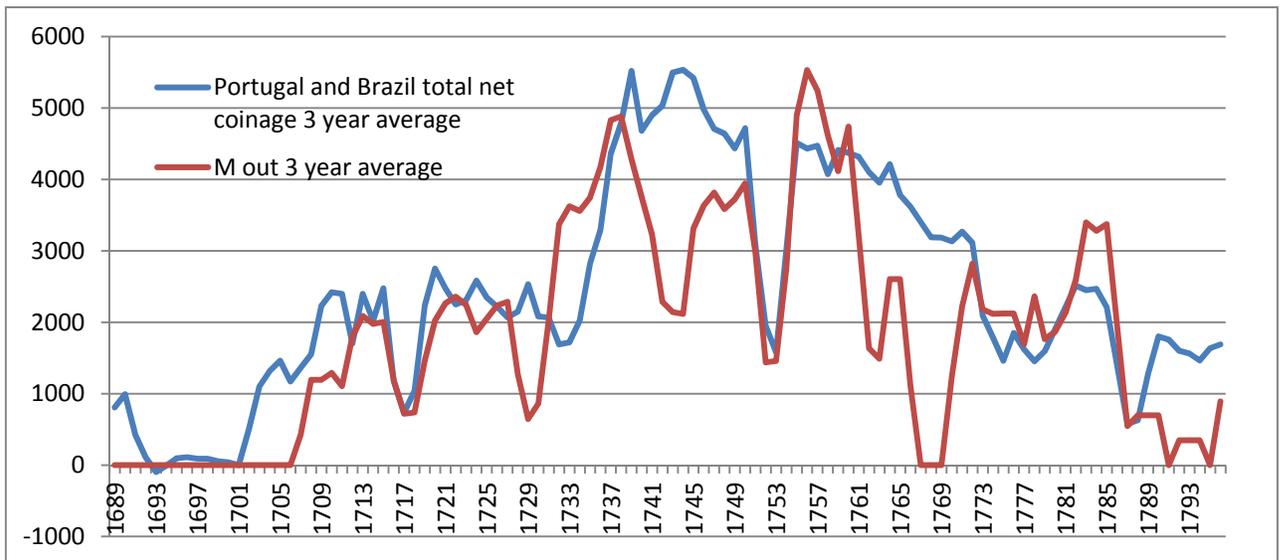


Figure 2. There was a close temporal relationship between gold coin issuing in Portugal and gold export. About 2/3 of this went to England. Unit: contos. Source for the data: Sousa (2006).

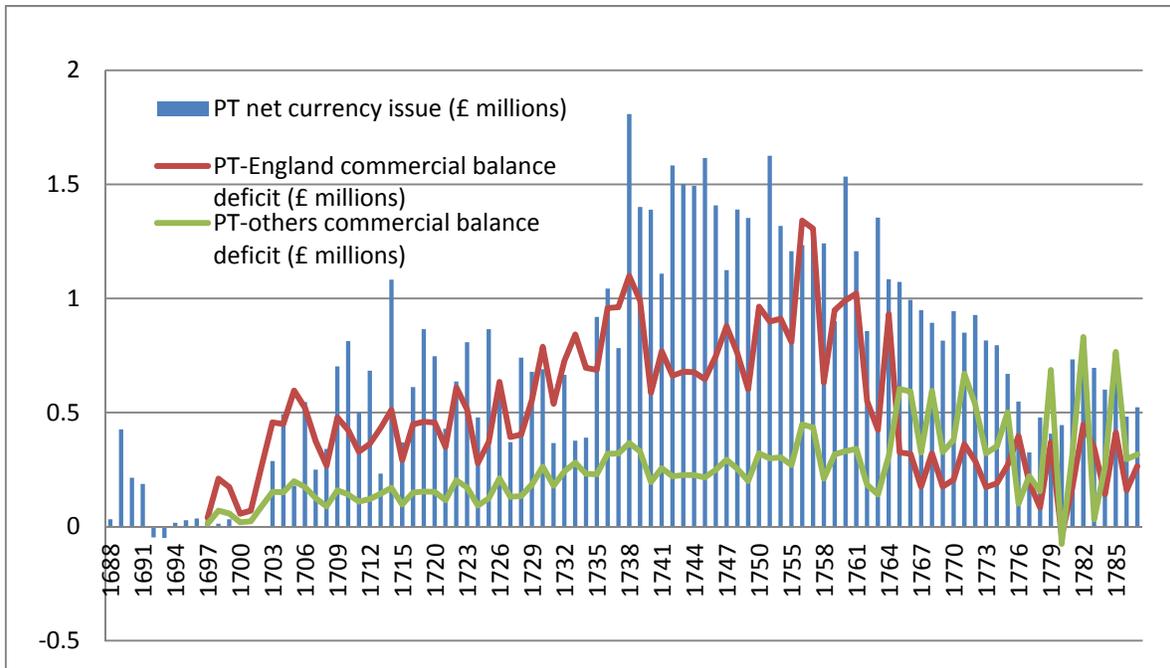


Figure 3. Portuguese net currency issue (includes issues in Brazil and net of re-coinage), and commercial deficit, with England and with all other countries bundled together. All nominal and all in millions of pound sterling, at the exchange rate of £1 million = 3600 contos (Sousa 2006, p.208). The two commercial balance series are represented continuously for clarity though they are yearly series. Source: Sousa (2006)

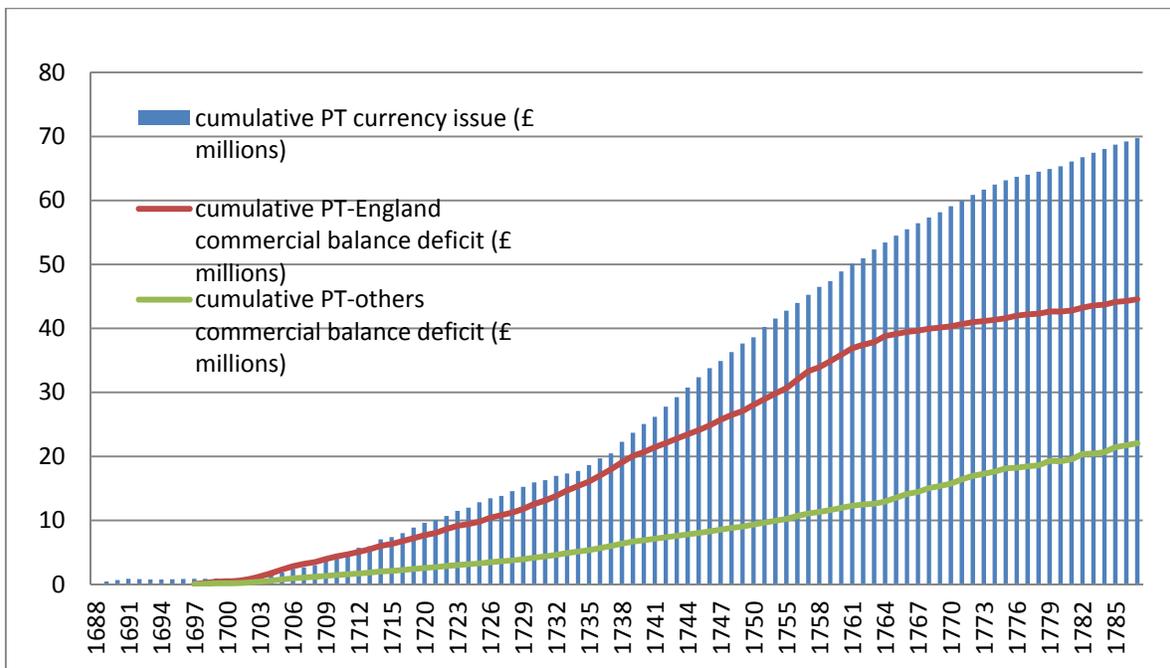


Figure 4. Cumulative values. The red line gives the total size of the monetary injection into the English economy (though not all this was minted into English currency: see text).

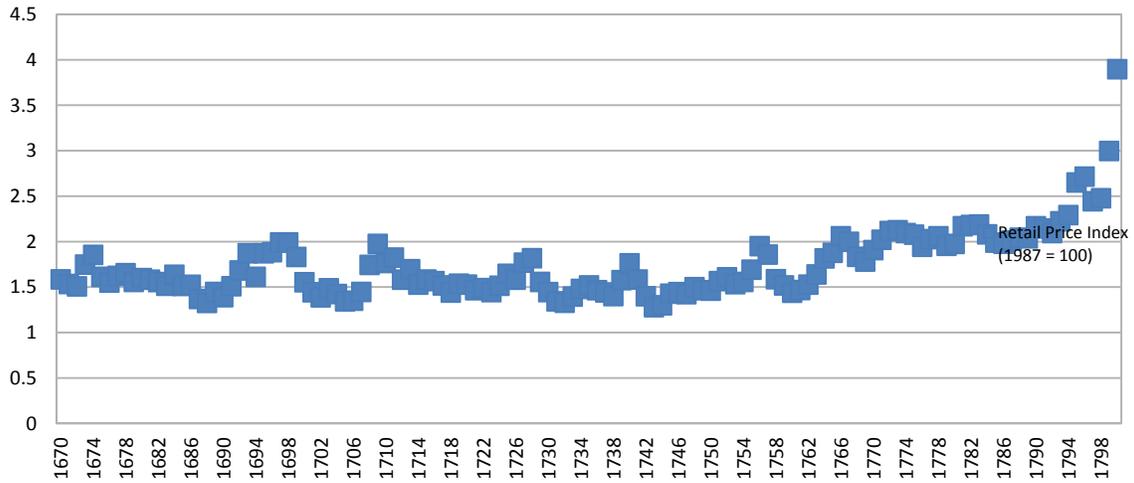


Figure 5. English inflation during the 18th century. From “How much is that?” website. Basis year: 1987=100. Source: Lawrence H. Officer and Samuel H. Williamson, "Purchasing Power of British Pounds from 1245 to Present," www.measuringworth.com/ppoweruk/

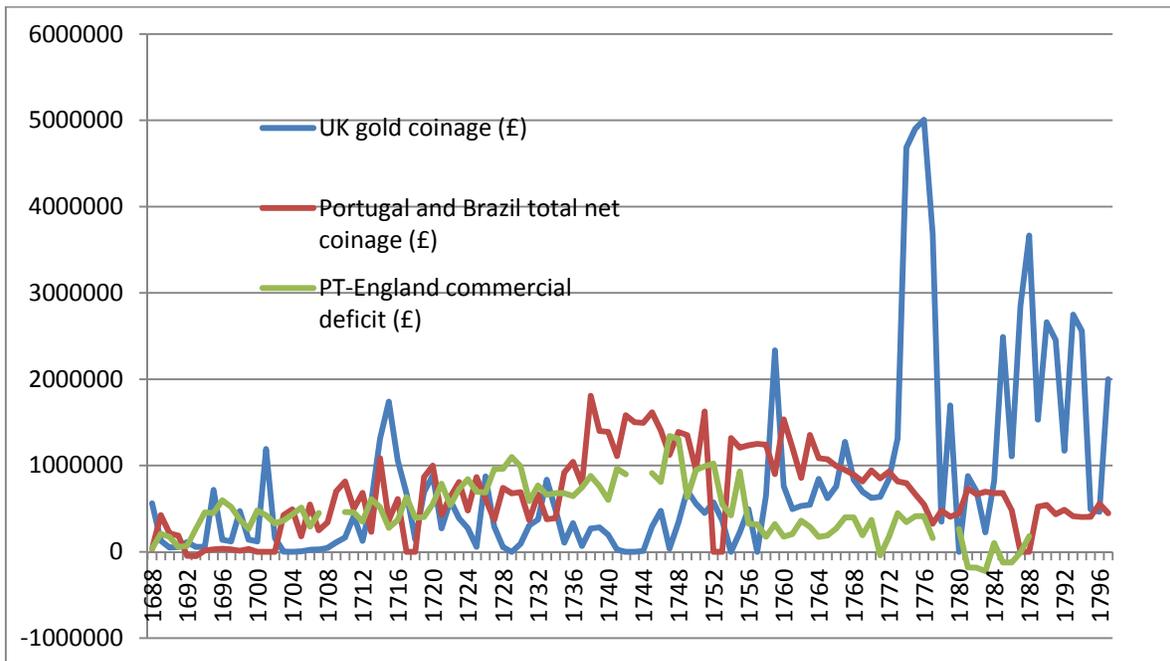


Figure 6. Portuguese gold coinage (including Brazil) and UK gold coinage. The English peak in the 1770's corresponds to a re-coinage. Sources: for Portugal, Sousa (2006) and for UK, Challis (1992).

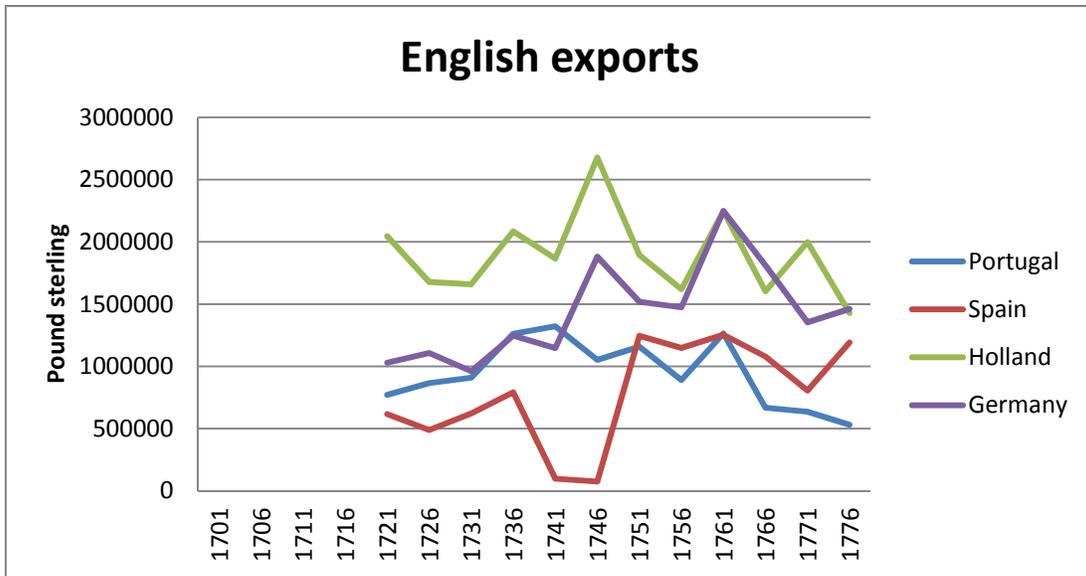


Figure 7. English exports. Source: Ledgers of imports and exports (CUST 3), UK National Archives.

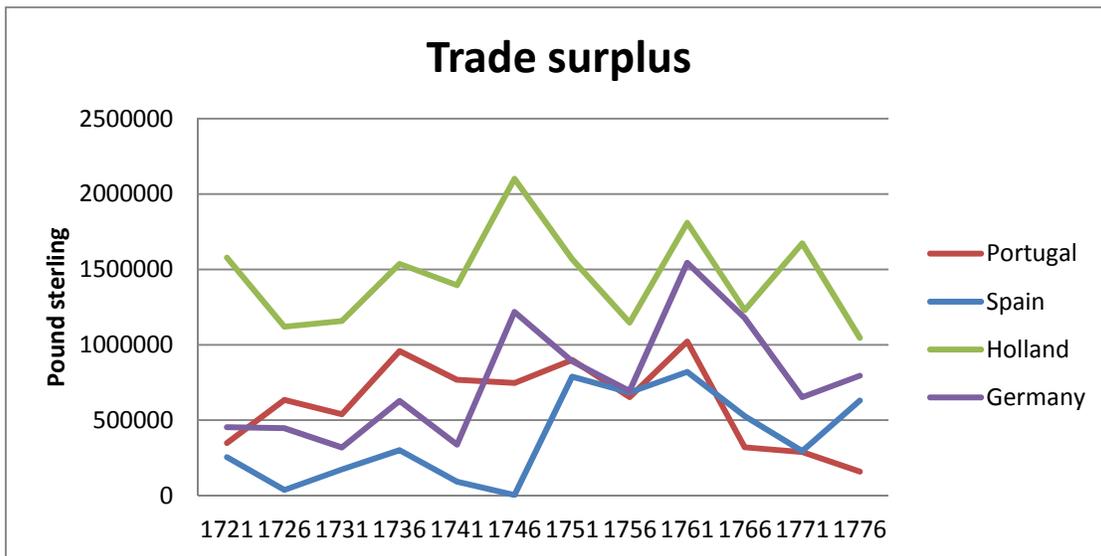


Figure 8. Trade surplus. Source: Ledgers of imports and exports (CUST 3), UK National Archives.

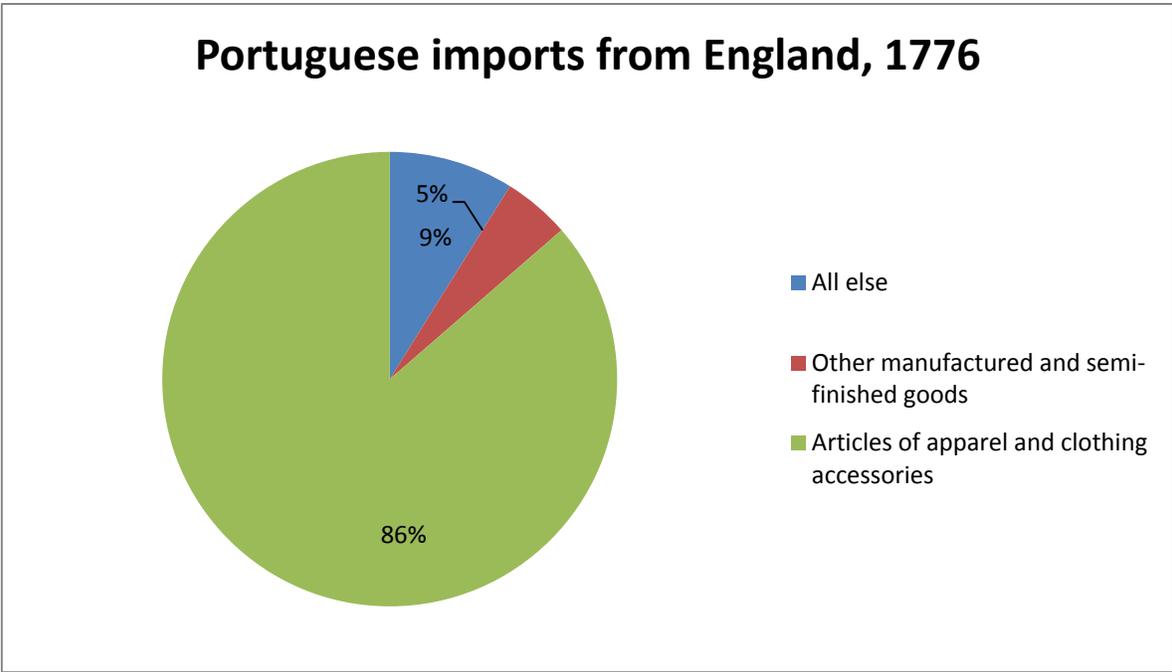


Figure 10. Structure of Portuguese imports from England, 1776. Source: Balanças do comércio, Arquivo do Ministério das Obras Públicas, Lisbon, Portugal.

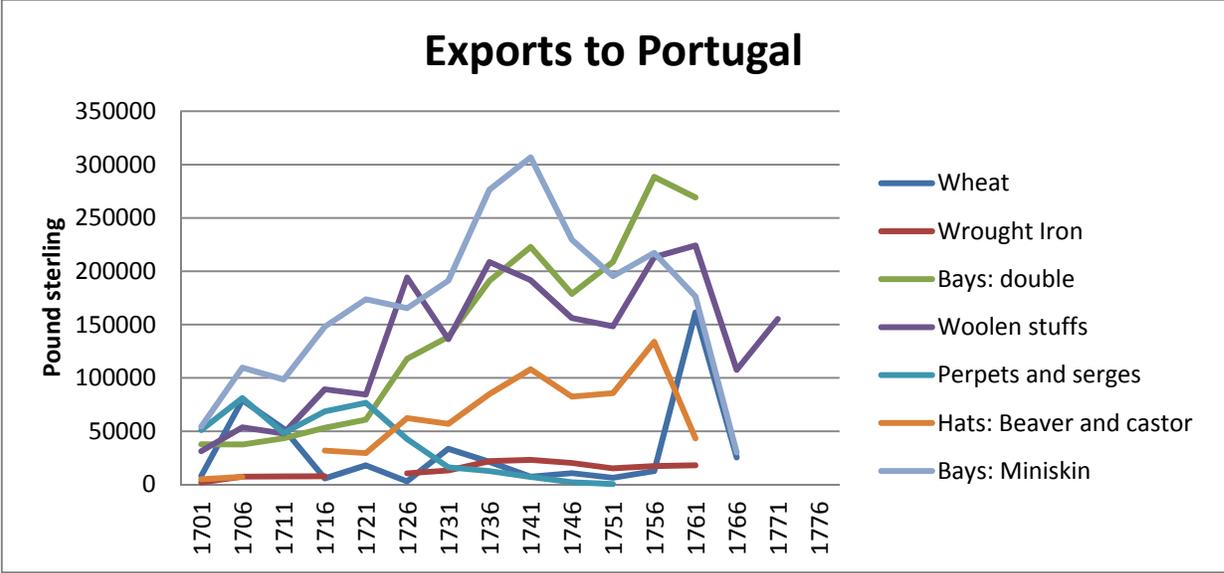


Figure 11. London exports to Portugal. Source: Ledgers of imports and exports (CUST 3), UK National Archives.

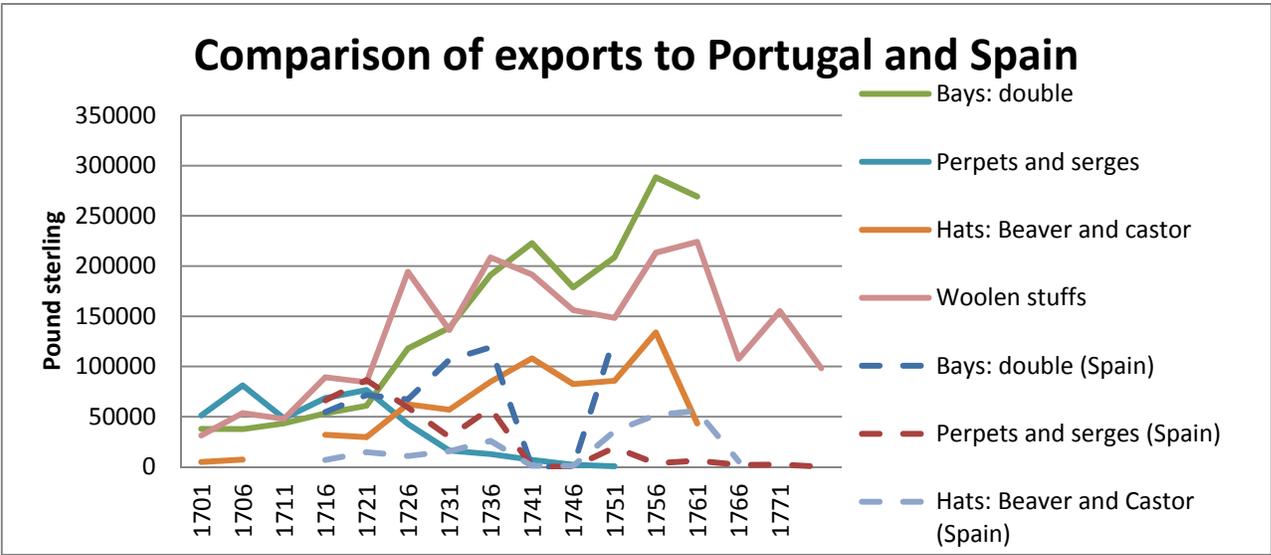


Figure 12. Comparative exports, London to Portugal and Spain. Source: Ledgers of imports and exports (CUST 3), UK National Archives.