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Abstract

As late as 1750, Portugal had a high output per head by Western European standards. Yet just a century later, Portugal was this region's poorest country. In this paper we show that the discovery of massive quantities of gold in Brazil over the eighteenth century played a key role in the long-run development of Portugal. The country suffered from an economic and political resource curse. A counterfactual based on synthetic control methods suggests that by 1800 Portugal's GDP per capita was 40 percent lower than it would have been without its endowment of Brazilian gold.

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JEL Codes: N10, N13, N50, N53, N73.

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Introduction

The Little Divergence in early modern Europe is well documented, yet the underlying causes of Northwestern Europe's economic lead remain a subject of debate (Broadberry, 2021a, b). An influential tradition, dating back to the work of North and Weingast (1989), attributes English success to institutional change: the development of a semi-representative democracy and constrained executive. Acemoglu et al. (2005) also foreground the state, arguing that pre–1500 political institutions interacted with the rise of Atlantic trade to produce a pro-growth political environment in England and the Netherlands, but not Spain and Portugal. Limited Anglo-Dutch polities are contrasted with the "absolutist states" of Iberia, whose despotic rulers purportedly intervened arbitrarily in commercial activity. Recent research by Henriques and Palma (2023), however, casts doubt on the start-date of the institutional divergence: until the mid-seventeenth century, Spain and Portugal both compare favorably with England in the frequency of their Parliamentary meetings, currency debasements, extraordinary taxes, and in their sovereign risk. Reconstruction of Portugal's national accounts, moreover, reveals a dynamic early modern economy. The period of Portuguese reversal, in both absolute and relative terms, only began in the second half of the 1700s (Palma and Reis, 2019).

In this paper, we show that eighteenth-century Portugal was beset by a resource curse because of gold inflows from Brazil, whose outer provinces were remitting over 70 percent of global output to Lisbon by 1730 in a continued process that would last decades. Treasure imports, which were mainly private, were a sudden addition to real incomes, which were then spent on domestic products, driving up prices and wages in

the non-traded sector, as had previously happened in Spain (Charotti et al., 2022).[4] This led to an appreciation of the real exchange rate and attracted productive factors from the increasingly uncompetitive traded sector, lowering output and raising costs. Portuguese consumers found imports cheaper and began to substitute these for home goods. The Dutch disease thus manifested itself in relative price movements: traded prices were internationally determined and remained stagnant by comparison with inflation in the non-traded sector. By constructing relative price indices for four Portuguese regions using archival data, we show that such movements did, in fact, take place during and in the wake of the gold shock. We further explore the temporal relationship between persistent real exchange[5] rate fluctuations and various indicators of economic development—real GDP and wages, the non-agricultural population share, and trade balance statistics—to test for long-term structural consequences. Our price data for the period between 1650 and 1800 shows that a real exchange rate appreciation of about 30 percent occurred during the eighteenth century, leading to a loss of competitiveness of national industry. Following this evidence for the economic aspects of the resource curse, we move to an overall assessment of the resource curse. The latter also includes a political component which resulted from the additional revenues due to the gold reducing the rulers' incentives to negotiate and leading to a complementary process of state capture. We document these events and compute a counterfactual using a synthetic control method. This suggests that the price level in Portugal rose relative to other countries, and by 1800, Portugal's GDP per capita was over 40 percent lower than it would have been if Portugal had not been the first-stage receiver of Brazilian gold.[6]

[4] See our Online Appendix for a detailed discussion of Portugal's resource curse in Spain's mirror.
[5] The *real exchange rate* here can be taken to mean the relative price of non-traded to traded goods (Corden 1984).
[6] For our data and replication package, see Kedrosky and Palma (2024).

Our results are related to but contrast with much of the existing literature. As early as 1701, the colonial administrator D. João de Lencastre raised concerns that Brazilian gold would not benefit Portugal in the long run, but instead England or the Netherlands, just as had happened with Spain's silver (Boxer, 1962, p. 42). A decade later, an Italian Jesuit living in Brazil also expressed his opinion that the gold mines were harmful to the development of Portugal, despite being sparse on details (Antonil, 2011, p. 266). In the twentieth century, Vitorino M. Godinho argued that commercial crises related to poorer export-sector performance led to surges of successful industrial policy. In contrast, when colonial booms returned, the former was abandoned (Godinho, 1955, p. 258, 292). Relatedly, Macedo (1982a, p. 200) argued that once the gold inflows diminished in the last quarter of the eighteenth century, the economy largely recovered.[7] However, this viewpoint is not confirmed by the most recent data on structural change and growth: Portugal's economy never recovered from the industrial decline which took place over the eighteenth century (Palma and Reis, 2019; Palma, 2020).

Contrary to views foregrounding the supposed long-run neutrality of money, the resource curse can have persistently negative effects on developing economies.[8]In the case of eighteenth-century Portugal, the gold inflows encouraged the substitution of foreign imports, and caused a severe contraction of the export sector, diminishing employment across a range of critical industries. These included both manufacturing and agriculture (Fisher, 1963; Costa and Reis, 2017). When technological progress (or the potential thereof) depends on the lagging traded sector—which, given the scalability of newly industrialized textiles, was the case in early modern European economies—

[7] For related arguments, see Macedo (1982b, pp. 122, 125, 127).
[8] The empirical evidence on resource curse is sometimes focused on short time horizons, which is not ideal. Here, we use more than a century of data and in addition to Dutch disease we emphasize a complementary political curse, which is always conditional in nature: initial political institutions matter (Robinson et al., 2006; Caselli and Tesei, 2016; Badia-Miró et al., 2015, p. 3).

the contraction of these industries slows per capita income growth (Van Wijnbergen, 1984). Matsuyama (1992) similarly suggests that the reorientation of activity away from a manufacturing sector characterized by externalities in production could have negative growth effects in a dual-sector open economy. The effects of Dutch disease on economic dynamism can hence be deep and persistent.[9]

In Portugal, a significant real exchange rate appreciation occurred during the first half of the eighteenth century.[10] The price of non-traded goods in terms of traded goods rose precipitously in all the regions of Portugal after around 1700, exceeding the pre-gold era level by over 30 percent after the 1720s. This coincided with the peak of gold output, which exceeded 140,000 kilograms in the decade 1741–1751 (TePaske, 2010). Notably, the price movements coincided with a period of general price inflation and were driven primarily by accelerated increases in the non-traded sector. These developments are as predicted by the standard Dutch disease model, and diminished output of traded goods as imports increased and factors of production flowed into the non-traded sector.

As real exchange rates turned against Portuguese exports, the burgeoning expansion of the late seventeenth century stalled. Urbanization fell from 17.3 to 16.2 percent between 1750 and 1800, while the rural non-agricultural share—representing much of the nation's handicrafts—remained static at around 29 percent; further falls would continue into the nineteenth century (Palma and Reis, 2019, p. 485). Real GDP and wages stagnated and then declined during the same period, only starting to recover more than a century later.[11] At a time when urbanization and per capita output was rising across a fast-

[9] Sachs and Warner (1995), generalize Matsuyama's framework, and document depressed growth rates in countries for two decades after a year of elevated natural resource exports.
[10] The four regions which our data covers correspond to the hinterland areas around Porto, Coimbra, Lisbon, and Évora, following Palma and Reis (2019). These cover much of the country.
[11] Portugal's economy, measured by output per capita, had been in decline from decades earlier than the Napoleonic invasions (Palma and Reis, 2019). This fact contradicts much Portuguese-language literature claiming that the invasions were the main culprit of Portugal's decline, for example Cordeiro (2017, p. 44).

commercializing Western Europe, Portugal's decades of outright depression from the 1770s stand out in stark relief.

This paper contributes to literatures in both economics and economic history. Corden and Neary (1982) and Corden (1984) present the basic formulation of Dutch disease theory, but the model is limited by the fact that the distortion ends with the monetary stimulus; in Portugal, GDP per head continued to decline after gold imports had ended. Van Wijnbergen (1984), Krugman (1987), Matsuyama (1992), and Sachs and Warner (1995) to varying degrees link resource abundance with reduced economic growth through a decline in the size of the traded sector, and Gylfason et al. (1999) explicitly tie real exchange rate appreciation to a contraction of skill-intensive manufacturing. Asea and Lahiri (1999) show that the increased marginal product of unskilled labor slows human capital accumulation by making education costlier. Among others, Forsyth and Nicholas (1983) applied the Dutch disease model to early modern Spain, while Stein and Stein (2000) considered a political channel. Palma (2020) and Charotti et al. (2022) emphasize both channels and review the literature concerned with early modern Spain. Our resource curse interpretation of the economic and political history of eighteenth-century Portugal suggests a path that largely repeated the earlier story of Spain.[12]

Historical background

It is well known that countries with abundant natural resources often experience negative economic and political consequences. A resource curse has both an economic manifestation (Dutch disease) and a political one (known as the political or institutional

[12] Two recent studies find a positive effect of colonial trade on the Portuguese economy, but the authors point out that their results abstract from the possibility of resource curse; see Costa et al. (2015, p. 18) and Palma (2016, pp. 145-46). By contrast, in the present paper we consider the unintended structural consequences of gold production and imports, which are outside the ambit of their econometric approach, as was previously pointed out by the authors themselves as well as by Abad and Palma (2021).

resource curse), manifesting itself in reduced checks on executive power, poor governance, and weak rule of law.[13] In this section, we provide the historical context of Portugal's experience, including a description of the gold arrivals, and a narrative concerning the evolution of the industrial sector over the eighteenth century. The most striking fact of early modern Portuguese economic history is that real GDP per capita fell by one-third between 1750 and 1800, and it stagnated during the first half of the nineteenth century, just as other parts of Western Europe were industrializing and entering modern economic growth (Table 1). Around 1800, Portugal had endured a century which left it with a barely existing industrial sector and inadequate political institutions. As Figure 1 shows, Portugal saw a *decrease* in the size of its non-agricultural sector just as each of its European rivals were either flattening (Italy) or experiencing structural transformation out of agriculture. The consequences of the status quo around 1800 would continue to be felt into the future, but they are the result of earlier economic and political developments, as we document in this paper.

Table 1: GDP per capita of selected Western European countries in constant prices ("international" Geary-Khamis dollars of 1990).

	England	Holland	Italy	France	Germany	Sweden	Spain	Portugal
1500	1041	1454	1367	1048	1102	1195	701	-
1550	1014	1798	1278	898	941	1125	1018	836
1600	1037	2662	1216	989	936	853	812	790
1650	887	2691	1247	978	961	941	632	830
1700	1513	2105	1317	1103	948	1357	802	830
1750	1694	2355	1367	1094	1105	1061	812	1372
1800	2097	2609	1216	1041	1121	930	826	916
1850	2718	2355	1321	1597	1428	1171	1067	923

[13] In Online Appendix A, we provide a detailed summary of the Dutch disease theory its associated literature.

Sources: Data for England from Broadberry et al. (2015). This corresponds to Britain from 1700. In the case of Holland, borders correspond to Holland until 1800 and the Netherlands for 1850; a benchmark for 1807 was used for the data prior to 1800 (van Zanden and van Leeuwen, 2012, p. 121), and the 1850 level is from Smits et al. (2000). Data for France from Ridolfi and Nuvolari (2021, p. 419). Germany corresponds to the 1871 borders and the data comes from Pfister (2022); Spain, from Prados de la Escosura et al. (2022). Portuguese data is from Palma and Reis (2019). 'Italy' corresponds to north and central Italy and comes from Malanima (2013). Swedish data is from Krantz (2017) for 1500–1560 and Schön and Krantz (2015) for 1560–1850.

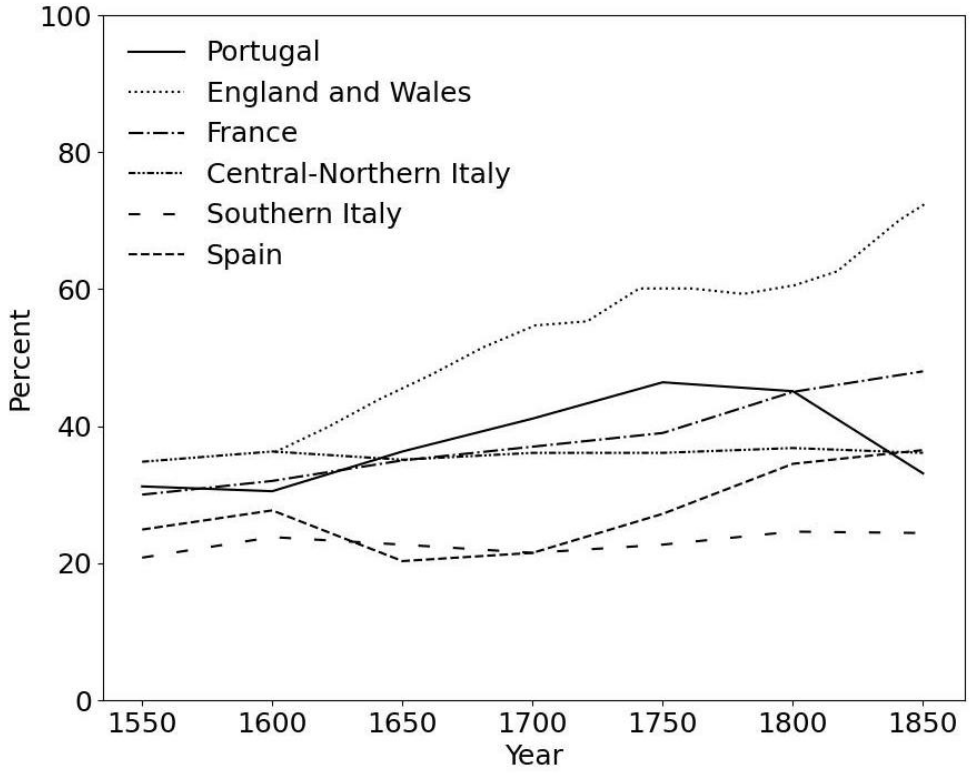
The discovery and import of gold from Brazil

Around 1694, alluvial gold was discovered in a province of Portuguese Brazil which is today called Minas Gerais. The original explorers were adventurers searching for native slaves and silver, and they sought for a time to keep the finding a secret. By 1697, however, the word was out, and an unprecedented gold-rush wave of internal and external migration eventually swept the region (Magalhães, 2005). Gold was found in other surrounding regions of Brazil as well. As many as fifty thousand prospectors and their slaves may have inhabited the mining towns as early as 1705 (Boxer, 1969, pp. 455-57). Gold-hunters arrived *en masse* from Portugal.[14] Before long, gold was flowing back to Europe in vast quantities, some in the form of taxes – usually the "royal fifth" (*quinto*) levied on domestic production – but mostly through remittances by the private contractors who predominated in the mines, which were privately owned.[15] The quantities produced were extraordinary, peaking at around 14,000 kg per year around 1750.[16] While local governors strove to regulate exports, smuggling was sometimes successful, especially prior to 1720; powerful merchants in the annual Lisbon fleets hid treasure in barrels, chests, and sugar bags, while informants were discouraged (Boxer, 1969, pp. 459-61). TePaske (2010), estimating aggregate Brazilian production from 1690 to 1810, suggests that output stood at 40,000 kilograms during each of the first two decades of the eighteenth century, before exploding to 100,000 kilograms in the

[14] Estimates of yearly emigration range from 3,000–4,000 to 8,000–10,000, stalling population growth in Portugal during the first half of the eighteenth century (Palma et al., 2020; Costa et al., 2016, p. 166).
[15] Upon new gold discoveries, the Crown had the right to a small part of the land which it then sold (Antonil, 2011, pp. 226-27).
[16] For details, see Figure B.1 in Online Appendix B.

1720s and over 140,000 in the 1730s. Of this total, more than 80 percent returned to Portugal (Costa et al., 2016, p. 204). Three annual fleets shipped an average of 3 billion reis apiece, the proceeds of which were distributed to around 2,300 private individuals (Costa et al., 2013, p. 1148; 2018).

Figure 1: Shares of Population Outside Agriculture for European Countries



Sources: Keibek (2017) for England; Palma and Reis (2019) for Portugal; Ridolfi and Nuvolari (2021) for France; Chilosi and Ciccarelli (2022) for Italy. Figures for Spain derived by back projecting from urban population shares adjusted to net out urban dwellers living on agriculture, using the average of the labor share in 1787 and 1797 as a benchmark, according to the population census for these two years (66.1%) (Prados de la Escosura et al., 2022). We thank Leandro Prados de la Escosura for this suggestion.

Most treasure was private.[17] It generally arrived already minted and about 72 percent was eventually re-exported (Sousa, 2006, p. 244). The arrivals directly raised incomes considerably in the short term. The gold inflows lasted for around a century, however, and there were net negative effects still during this time frame. After of a boom of around

[17] See our Online Appendix, Table B.1.

four decades in the first half of the eighteenth century, Portugal's economy stagnated for around two decades, and then began a process of absolute and relative economic decline from the 1770s (Palma and Reis, 2019)—at a time when important gold inflows were still taking place (Costa et al., 2013).

Portugal ran current account deficits (paid for in gold) with all of its major trading partners during the eighteenth century, and in particular with England (Costa et al., 2016; Fisher, 1971, p. 197).[18] The deficit increased steadily throughout the first half of the eighteenth century, stabilizing at around 4,000 million reis per annum by the 1750s. Portuguese annual imports from England rose from 355,000 pounds in 1699–1702 to 1,300,000 pounds in 1756–60, while exports fell from a peak of 387,000 pounds in 1720 to 257,000 pounds over 1756–60.

The bulk of English goods imported to Portugal consisted of woolen textiles—never falling under 70 percent in any year before 1760, and at one stage reaching 84 percent—most of which were then re-exported to Brazil, whose demand for durable goods had exploded with the expansion of mineral wealth.[19] In 40 of the 60 years between 1700 and 1760, the yearly London rate of exchange was at or below the gold export point of 5/5.75d (Fisher, 1963, p. 223). A staggering 90 percent of exported gold went to financing the trade deficit with England and France, leaving regularly for Plymouth in packet boats, which carried diplomatic immunity and were thus able to escape prohibitions set on metallic outflows (Francis, 1966, pp. 216–17). As Figure 2 illustrates, for decades gold corresponded to 70 percent of the value of Portuguese exports—thus

[18] Portuguese gold became increasingly crucial to the English economy (Palma, 2018, 2020). In exchange for the gold, England sent 18 percent of its manufactured exports and 23 percent of woolens by 1741–5, and well over half of its production of certain manufactured products, especially textiles, for most of the eighteenth century: the textile share in English exports to Portugal hovered between 75 and 85 percent from 1715 to at least 1770 (Fisher, 1971, pp. 144–45).

[19] Note that by the time the Methuen Treaty was signed in late December 1703, it was known that large quantities of gold likely lasting for decades would be arriving to Portugal from Brazil.

playing a crucial role in balancing the distorted current account.[20] The peak of gold remittances and the trough of the trade deficit essentially coincide during the early 1750s. By then, all Portuguese factories had failed except for a few highly subsidized cases (Pedreira, 2005, p. 196).

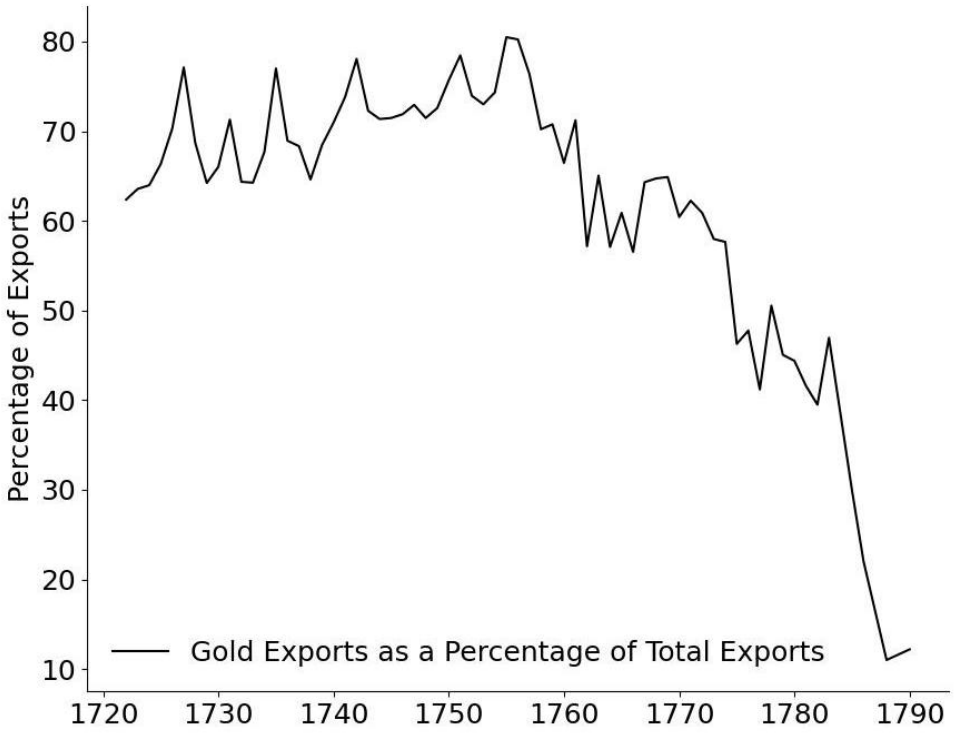
Portugal's increasing deficits with England must be seen in the context of the Methuen Treaty of 1703, which exchanged preferential rates on English textiles (23 percent) for a reduction on wine tariffs to one-third below that allotted to France.[21] While it is tempting to see the agreement as a codification of core-periphery relations between the two countries, establishing the former as a manufacturer and the latter as a primary product exporter, to do so would be anachronistic. Tariffs on English textile imports were not reduced but instead an official restatement of a secret clause in a 1654 treaty peace treaty that guaranteed these same rates, which had not previously been enforced by customs officials. The new article introduced in the Methuen Treaty of December 1703 corresponded to the opening of the English market to Portuguese wines, and the whole treaty always had a military component to it; most immediately, it concerned Portugal's participation in the Grand Alliance during the War of the Spanish Succession (Costa et al., 2016, p. 140). The Treaty hence had military as well as economic implications, and it held political conditions between the two powers stable, such that the effects of gold imports on the balance of trade could play out according to largely economic factors. The signing of the Methuen Treaty in late 1703 hence mattered, but it was endogenous to the gold inflows which by then were arriving and were expected to continue to arrive in increasing quantities to Portugal (Macedo, 1982a, p.

[20] In Online Appendix Figure B.2, we show that gold imports as a share of nominal GDP peaked at around 7% in the late 1720s and mid-1740s, while generally running at around 5% until 1770. These percentages are in the same order of magnitude of those which applied to Spain over the early modern period. For comparative details, see page 24 of the Appendix to Palma (2022) and Chen et al. (2021, pp. 3-4).
[21] Similar conditions were later offered to the Netherlands (Pedreira, 2005, p. 194).

45). Indeed, when gold inflows shrunk and trade accounts partially rebalanced from the early 1770s, the agreement was still legally binding (Costa et al., 2016, p. 200). The Methuen Treaty thus contributed to the de-industrialization of Portugal's economy, but it was only a mechanism, not the ultimate cause.

A substantial share of the extracted treasure was retained within Portugal. Costa et al. (2018, p. 1153) show that the domestic gold stock rose from 1.149 billion reis in 1720 (or 1.4 percent of nominal GDP) to more than 58 billion reis by mid-century (56.4 percent) (Palma and Reis, 2019; Reis, 2002). The growth rate of the money supply, 2.5 percent per annum, substantially exceeded output growth over the course of the eighteenth century. 80 percent of this total consisted of coins, most of which were private and many of which were invested in land—a fundamental factor in the non-traded sector (Costa et al., 2018, p. 1153). Growing demand for land led the Pombal administration, once the gold inflows began to shrink, to eventually restrict property transfers to the Church and suppress entailments to improve market liquidity, measures which, though unsuccessful, reflect the rising value of a static resource. In the southern Alentejo region, rising meat prices—a non-traded good—led to wholesale conversion to husbandry from cereal cultivation, which remained comparatively inefficient (yield ratios for wheat and rye were below 1:4). Overall agricultural production, which had risen steadily since 1660 (at .72 percent per annum according to one estimate), declined from 1750 until the Napoleonic Wars. Olive oil and wine exports both flourished, but these were products with no ready substitutes and whose producers had gained access to foreign consumers by diplomatic means, including the 1703 Methuen Treaty (Costa et al., 2016, pp. 172–73). These sectors did little to arrest the steady decline of Portuguese shipments abroad.

Figure 2: Gold exports as a percentage of total exports (including gold)



Source: Figures for gold derived from Costa et al. (2013), cited with export figures in Costa et al. (2016, p. 205).

As expected, the real wage rose during the gold boom period.[22] Data is scarce on manufactures, but even with state industrial policy intervention during the second half of the eighteenth century, industrial development was sluggish at best. By 1769, only four textile factories were operating in the entirety of Portugal, and outside the royal factories, the scale of production remained desperately small (Pedreira, 1994, p. 59). Even the larger, state-run institutions were in fact glorified systems of organizing and subcontracting to existing networks of cottage production. Faced with daunting initial investment costs and insufficient capital, the only sizeable enterprises to be established were erected behind heavy tariffs and import bans. Pombal's "industrial policy" did not change the previous structure of production; of 200 "program" facilities reported in 1777, the majority were small-scale workshops (Macedo, 1982a, pp. 155-60). Indeed, the

[22] We show the real wage for Portugal in the Online Appendix, Figure B.3.

proliferation starting after 1777 (jumping from 55 to 235 factories) was associated with a liberalization of the import-licensing system to allow minor firms to set up. And of 180 applications for licenses between 1757 and 1832, 114 (63 percent) were by foreigners, bespeaking the absence of domestic industrial entrepreneurship and capital (Pedreira, 1994, p. 59). The small scale of these undertakings, many of which located in the interior of the country where transport costs shielded them from international competition, slowed the adoption of mechanized technologies, a further contributing factor delaying the arrival of the Industrial Revolution.[23]

Portuguese industry prior to 1700

Assessing the true costs of Portugal's contraction requires a plausible counterfactual for the evolution of the eighteenth-century economy in the absence of the discovery of gold in Brazil. The starting point for such a scenario is the expansion of the Portuguese economy in the second half of the seventeenth century, following the end of the Iberian Union with the restoration of a Portuguese dynasty in 1640 and the end of hostilities in 1668. At this stage, Portugal was on the cusp of a strong advance in per capita income and structural transformation out of agriculture. From 1650 to 1700, the percentage of the population employed in agriculture shrank from 63.7 percent to 58.9 percent, while the rural non-agricultural share rose from 23.9 percent to 28.6 percent. Per capita incomes grew once hostilities ended, from around 900 "international" G-K dollars of 1990 in the 1640–1660s to more than more than 1200 by the early 1690s (Palma and Reis, 2019, pp. 485, 497).

[23] Porto and its hinterland, a region which would gradually become a manufacturing cluster from the late nineteenth century, was as late as the 1820s still unable to compete with imports and not more developed than it had been half a century earlier, in the 1780s, when it was by no means advanced for its time (Cordeiro, 2017, p. 12, 56–7).

Portugal had a venerable tradition in rural manufacturing.[24] By the late seventeenth century the country had a growing industrial sector that included clusters of textile, soap, iron, glass, and silk manufacturing, among others (Macedo, 1982a, pp. 25, 28). By 1680, Portugal's textile industry not only supplied the needs of Portugal and its colonies, but also exported valuable textiles to Castile (Pedreira, 2005, 1994, p. 26). Industrialization progressed steadily during the 1680s (Dias, 1954). A successful industrialization effort, promoted by Luís de Menezes, the Count of Ericeira, was in place for more than a decade, having started shortly after the end of hostilities with Spain in the late 1660s and being abandoned only after 1700 (Macedo, 1982a, pp. 25, 29). [25] The industrialization effort had an associated vertical integration at the retail level and was located in many of the same regions which industrialized on a larger scale more than two centuries later (Macedo, 1982a, p. 32). In addition to an import-substitution policy, prior to 1700 there was also much investment in increasing the efficiency of the manufacturing process, including through the construction of new factories in Covilhã, Manteigas, Estremoz, Vila Melo, Fundão, and Lisbon – with other factories having been planned, but never been constructed, in Porto and Portalegre (Meneses, 2001; Macedo, 1982a, p. 36).[26]

Portugal had the advantage of Brazil as both an export market and supplier of agricultural raw materials and other inputs, as well as tropical products for re-export (including sugar).[27] Until the 1690s, the political will existed to make Portugal a mercantilist exporting power. The industrial development of the last three decades of the seventeenth century was simultaneous with an industrial policy based on import

[24] We give details in the Online Appendix A.
[25] Friedrich List argued that Portugal underwent a period of industrial development between c.1680 and 1700, with manufacturing being destroyed by the Methuen Treaty of 1703 (List, 1841).
[26] It seems reasonable to assume that had the resource curse associated with Brazilian gold never happened, these would have been constructed.
[27] See our Online Appendix A for details.

substitution.[28] This was implemented through a sequence of laws between 1672 and 1698. They were known as *leis pragmaticas* and backed by the writings of individuals such as Duarte Ribeiro de Macedo, who from the 1670s strongly advocated for industrialization, influenced by Colbertism and the writings of English mercantilists. Ericeira became a key politician who from 1675 targeted woolens, silks, glass, and iron-working, and granted large production units monopoly status as "royal factories" in order to reap the potential gains of concentration and protection.[29] In 1677, Covilhã was the site of a new public-private partnership for textile production. A plant was established on the bank of a stream, weavers were contracted, and English technicians were imported.[30] Rural putting-out handled the spinning, while the dyeing and carding occurred in-house. Three years in, 17 looms were operated by 23 weavers apiece, and the contractors employed 415 people in total. The success of the enterprise led to expansion into the neighboring town of Manteigas and plans for its replication in Estremoz.[31] From the 1770s, the Crown encouraged the development of the silk industry, with thousands of mulberry trees planted in different areas of the country (Lourenço, 2007, p. 308). Silk factories opened in Lisbon and elsewhere. There were also important advances in metallurgy, and in particular nails production (Hanson, 1981). Vertical integration with respect to iron production was encouraged, even after the death of Ericeira (Hanson, 1981).

[28] We note in passing that there has been a resurgence of studies suggesting that industrial policy can work, under certain conditions (Juhász et al., 2023; Juhász and Steinwender, 2023).
[29] Menezes had been a supporter of the 1667 coup which put the reformist King Pedro II to power, initially as a regent (Lourenço, 2007, p. 124).
[30] In the late 1670s, Venetian glass-making craftsmen were brought in to share their knowledge regarding the production of glass and crystal products (Hanson, 1981).
[31] In 1671, textile craftsmen were brought from Rouen in France to work in Estremoz (Hanson, 1981). In 1680, the 17 looms produced 3,000 bolts of cloth, equal to half of the country's total consumption of baizes and serges; per worker productivity was 5.7 meters per week, exceeding that in the linen sector (4.2 meters). The variable cost of production was 15,000 reis per bolt, each of which could be sold in Lisbon for up to 21,000–22,000 reis. English cloth cost 27,000 reis after shipping and taxes. The program was ultimately abandoned amid political pressure from parties affected by the monopoly, but it had demonstrated the potential viability of scaled-up production (Costa et al., 2016, p. 141).

By the late seventeenth century, then, Portugal had the rudiments of a successful industrial take-off. This fact was noticed by international observers, such as the French Ambassador in Portugal who commented on the successful industrialization effort that was happening (Lourenço, 2007, p. 306). Several "rural industrial districts" built on sophisticated putting-out networks existed, there was a large, mercantile capital city stimulating demand for manufactures, and Brazil provided a potentially enormous export market and supplier of raw materials. By 1680, Portugal's textile industry was, in fact, not only supplying the needs of the internal market including Brazil but it was also exporting to Castile. Portugal never became an industrial, exporting power at this time—but if the 1670s–1690s trends had continued, this could have happened over the eighteenth century. Instead, in the first half of the eighteenth century Portugal's industry lost its competitiveness and experienced serious difficulties (Pedreira, 2005, p. 194). The source of such difficulties has been debated, with some claiming them to be related to the indiscipline of its workers or actions of the Inquisition, and others claiming it to be related to the import of the gold coins (Pedreira, 2005, p. 194). We provide evidence for the latter as the fundamental cause. In its absence, Portugal could have used import-substitution on the motherland to combine proto-industrial networks with urban manufacturing, importing inputs and exporting manufactures from and to its privileged market of Brazil.[32] As it was, however, agglomeration economies with long-term consequences did not occur, and Portugal's backward industrial structure persisted into the nineteenth century and beyond (Pedreira, 2005, pp. 205-06). Additionally, the worsening quality of political institutions had negative consequences for human capital accumulation, we will explain below. Portugal would only industrialize and enter a

[32] Industrial development and its associated externalities would have created agglomeration economies likely to survive the later loss of Brazil as a privileged market, according to standard path dependence or infant industry arguments (Krugman, 1987; Melitz, 2005).

process of modern economic growth from the mid-twentieth century – extraordinarily late by Western European standards.

Data and Results

In this section, we give details about our data construction, methodology, and empirical results. Testing for Dutch disease requires detailed information on the prices of a range of traded and non-traded goods, so as to establish whether an appreciation in the real exchange rate occurred. We make use of data from the Price, Wages, and Rents in Portugal 1310–1900 (henceforth PWR) project, which collects long-run data of the aforementioned variables from primary sources available in archives in Portugal.[33] The database relies on a variety of primary record sources, including hospitals, charitable institutions (*Misericórdias*), convents and monasteries, royal palaces, municipal bodies, and the University of Coimbra. The price indices to be discussed below are constructed by us from numbers converted from their original values in geographically varying Portuguese measures to a metric standard.[34] Our selected time ranges from 1650 to 1825. We construct indexes as follows:

$$index_{i,t} = \frac{\sum q_k \times p_{k,t}}{\sum q_k \times p_{k,1700}}$$

where q_k corresponds to the quantity purchased of good k, $p_{k,t}$ is the nominal price of good k at time t in monetary units (reis) per metric units, N is the number of goods 1,2,...,N, and i is an indicator concerning whether the good is traded (t) or non-traded (nt).

[33] This database is available at http://pwr-portugal.ics.ul.pt/.
[34] For example, the *almude*, a liquid measure, contained 16.8 liters in Lisbon, 25.4 liters in Porto, 16.7 liters in Coimbra, and 17.4 liters in Évora.

To build the traded and non-traded indices, we first had to choose a relevant set of goods. We use the set of goods and weights employed by Allen (2001), in his respectability consumption basket, as modified for Portugal by Palma and Reis (2019). We then divided these goods into two categories, displayed in Table 2: traded and non-traded. No early modern good was fully traded, except in rare cases, but a range of products have been shown to have been either competitive enough in foreign markets (such as wine) or in domestic port cities (such as wheat). Costa et al. (2016) show that nearly 80 percent of all imports were manufactures as of 1685, and that most of the remainder were cereals, dairy products, and fish. The same source suggests that 914 million reis worth of wine and olive oil combined were exported, along with smaller but still significant quantities of salt. With this in mind, we selected wheat (substituting for maize, as dictated by historical consumption patterns and discussed below), olive oil, wine, linen, and candles

Table 2: Traded and Non-Traded Categories and Weights

Traded	Weight	Non-Traded	Weight
Wheat/Maize	285 liters	Meat	26 kilos
Wine	68.25 liters	Hens	5 units
Olive Oil	7.8 liters	Eggs	52 units
Linen	5 meters	Soap	2.6 kilos
Candles	2.6 kilos	Charcoal	2.0 million BTU

Source: Quantities derived from Palma and Reis (2019), in turn based on the weighting scheme described in Allen (2001), with appropriate adaptions for Portugal.

as traded goods, and meat, hens, eggs, soap, and charcoal as non-traded. Live animals were difficult to move across national borders, and no evidence from the trade accounts suggested that animal products—beyond salted cod—were moved in significant quantities. Eggs and soap[35] were too fragile to be moved, while neither charcoal nor

[35] In the case of soap, low value-to-weight ratios would have hindered the transfer. Neither Fisher (1963) nor Costa et al. (2016) list soap as being traded; in any event, soap was purchased in such small quantities that a change of status would have next-to-no effect for our results.

firewood appear in the lists of traded goods from Fisher (1971) and Costa et al. (2016), presumably because they were too heavy relative to their value.[36]

Finally, we combine the traded and non-traded baskets into separate indices by using the Laspeyres method, following Allen (2001).[37] To smooth out volatile premodern commodity prices and examine long-term trends, we convert the indices into 11-year moving averages. Even so, spikes in the prices of heavily weighted goods are still visible in the overall picture. We follow Palma and Reis (2019) in increasing the fraction of maize in the grain content of flour as wheat becomes more expensive, reflecting production shares derived from tithes.[38] Finally, we construct a whole-Portugal series combining the baskets from the four regions, with the traded and non-traded figures consisting of population-weighted averages of the values for each location. We depict the real exchange rate appreciation as an increase in the price of non-traded relative to traded goods.

Empirical results

Figure 3 plots the ratio between the indexed prices of the traded and nontraded baskets from 1650 to 1825 for the entire country of Portugal. The vertical black line stands at 1694, coincident with the approximate start of gold inflows from Brazil. Several distinct phases are evident: first, a declining real exchange rate during the half-century prior to 1690; second, a steep appreciation (by over 30 percent) from around

[36] There are inevitably some missing values for the prices of some goods in some regions for some years. If a series had too many holes, we substituted it out for a comparable good, for example exchanging charcoal for firewood or wax for candles. We fill any remaining gaps by linear interpolation. Online Appendix Table B.5 shows that interpolation was usually unnecessary.

[37] We show the figures for Portugal and Lisbon in the text, and for Porto in Online Appendix Figure B.4. We replicate this using the geometric index favored by Malanima (2013) and find nearly identical results. See Online Appendix Figures B.5, B.6, and B.7.

[38] See our Online Appendix for methodological details. We also show there that our results still hold even if we do not make the maize partial substitution (see Figure B.8 of the Online Appendix.)

1700 until 1720; third, a high plateau peaking after 1750; and fourth, a gradual but muted recovery after 1775. Significantly, the path of gold production in Portuguese Brazil (shown by the dashed gray line) is proportionate to the real exchange rate dynamics. The peak of Figure 3 follows soon after the peak year of output, in which more than 14,000 kilograms were extracted.

Figure 3: Ratio of Non-Traded to Traded Price Indices for Portugal, 1650–1820

Sources: Price data from PWR. Gold Production in Portuguese Brazil from TePaske (2010).
Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal. The price index shown here corresponds to an 11-year moving average.

Two trends stand out: a short, sharp appreciation followed by persistently expensive non-traded goods, which even by 1800—as gold imports were dwindling—remained 20 percent above traded prices relative to 1694 levels. Close examination reveals that the recovery is largely due to the rising price of wheat during the last half of the eighteenth century. Given the high weight placed on cereal grains, despite the partial maize substitution that occurred, the movement of wheat prices lead to an increase in the overall price level. However, this figure will tend to overstate the extent to which the

traded index rose; the price of wheat increased due to the simultaneous growth of population after 1730 and stagnation of agricultural output (concomitant with the transfer of farmland to husbandry discussed above). Gradually substituting maize for wheat as the latter grew increasingly expensive—as is both historically accurate and theoretically plausible—mutes this distortion. Portugal's major exports, wine and olive oil, saw essentially flat nominal prices throughout the eighteenth century. Linens—for which English textiles could be substituted—followed a similar pattern, only appreciating (as most goods did) at the time of the Napoleonic Wars. On the non-traded side, beef, pork, eggs, hens, and charcoal all rose sharply in price in the first decade of the eighteenth century, coincident with the arrival of gold imports.

The slow recovery of the real exchange rate during the second half of the eighteenth century points to a persistent effect of continuous gold imports, and suggests that the Portuguese economy was slow to adjust to this shock. Elevated non-traded prices are a strong inducement for an influx of productive factors out of import-competitive industries, especially as wage and price inflation squeezed profits in the traded sector. This is broadly consistent with the pattern of increasing trade deficits prior to 1750 and the subsequent collapse in product and real wages. Given the extent to which the rising price of wheat drives the recovery of the traded index, imputing the shift to any historical break is hazardous; yet the partial recovery of Portugal's competitive position coincides with the diminution of the country's trade deficit. It remains unclear to which extent this was simply related to lower gold inflows or Pombal's aggressive import-substitution program. In any event, the fact that non-traded industries remained expensive into the nineteenth century accords well with the observed trends of Portugal's economy: by 1850, all early modern per capita income gains were lost, and income per capita was at a level similar to that of 1527 (Palma and Reis, 2019).

Figure 4 shows the real exchange rate for Lisbon over the same period.[39] Unsurprisingly, the trends correspond closely with the national version—weighting by population gives much predominance to the capital and its hinterland. Note that the population of the city of Lisbon in fact even after the 1755 earthquake remained nearly four times that of Porto, the next-largest city.[40] This is fortunate, as the price data for Lisbon is the most complete and least volatile. The Lisbon figure undergoes several distinct phase changes—a falling exchange rate before 1694, a dramatic appreciation after 1710 (by 30–40 percent), and a recovery after 1750. This should be expected of the nation's commercial hub: Lisbon, as the principal site of gold offloading and foreign trade, would have most completely absorbed the monetary shock and had prices that more closely reflected "exogenous" world market values.

[39] In the Online Appendix, we show that the real exchange rate in the Porto hinterland behaves similarly to those of Portugal and Lisbon (Figure B.4). We also show that London's equivalent ratio behaves differently: trending steadily upward trend without any break around 1700 and growingly considerably more weakly during the first half of the eighteenth century (Figure B.9). Finally, in Online Appendix Figure B.10, we show the actual traded and non-traded price indices for Portugal to indicate where the changes in their ratio occur.

[40] It is important not to exaggerate the importance of the 1755 earthquake. The damage was limited to the south of the country, especially Lisbon (only part of which was destroyed). The number of Lisbon inhabitants who either died or left the city due to the earthquake corresponded only to 12 percent of the total, and the city's population was back to the pre-earthquake level 25 years later (Serrão, 2007). Most of Portugal's population in fact lived in the north (Palma et al., 2020). GDP evidence indicates that the earthquake's direct impact on the economy was limited (Palma and Reis, 2019).

Figure 4: Ratio of Non-Traded to Traded Price Indices for Lisbon, 1650–1820

Sources: Price data from PWR. Gold Production in Portuguese Brazil from TePaske (2010).
Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

An Augmented Synthetic Control Approach

To provide empirical evidence for this counterfactual conjecture and establish the viability of the Portuguese economy in the absence of gold, we use the augmented synthetic control method (Ben-Michael et al., 2021). This allows for the construction of a counterfactual, built from a weighted average of control units that match Portugal's pre-treatment outcomes. The estimated impact of the gold is then calculated as the difference in post-treatment outcomes between the Portugal and its synthetic doppelganger. In so doing, we show that Portugal's price level and GDP per capita diverged sharply from its neighbors during the period of the shock and that, more consequentially, this trajectory was inferior to that which would have occurred in its absence.

The synthetic control method takes a two-step approach to comparing a treated unit with a donor pool, from which components are grafted to create a plausible counterfactual. First, the treated unit is compared with the donor pool in a pretreatment period (before 1694 in our case) in order to observe which combination of units from the donor pool best replicates the behavior of the treated unit. In our case, Portugal is compared with other European countries which are used to construct a counterfactual for the post-treatment period. The procedure is made to ensure that the outcome variables imitate both the levels and the trend of the outcome before treatment occurs. Second, after the treatment (the influx of Brazilian gold) has taken place, we observe how the behavior of the treated unit differs from that of the donor pool. The behavior of the donor pool in the post-treatment period is understood as the counterfactual of how the treated unit would have behaved in the absence of the event. Our counterfactual does not correspond to a situation in which no gold existed in Brazil, but instead to one in which Portugal was a second-stage receiver of the gold windfall. This is because the observational data for donor countries corresponds to the historical scenario in which second-stage receivers potentially benefited from the gold (Palma, 2018, 2020; Chen et al., 2022).

This procedure requires an appropriate donor pool to construct an optimal combination of weights chosen to minimize the pre-shock differences between Portugal and a synthetic counterfactual. In our analysis, this is built using long time series from a donor pool formed by several Western European countries for which such data exists: England/Britain (Broadberry et al., 2015), Italy (Malanima, 2002, 2011), Germany (Pfister, 2022), France (Ridolfi and Nuvolari, 2021), Spain (Prados de la Escosura et al., 2022), and Holland (van Zanden and van Leeuwen, 2012).[41] By design, causal inference

[41] In the baseline results we include Spain and Holland. But Spain was also subject to a resource curse during the early modern period, and Holland was subject to Habsburg rule during some of our period, arguably at least in part

using this method is valid in settings where an excellent fit on pre-treatment outcomes is possible (Abadie et al., 2015); when this is infeasible, the SCM approach must be modified to adjust for pre-treatment fit. This leads us to the Augmented Synthetic Control Method (ASCM) on which we rely here.

A Counterfactual Portugal

We now report the results of our synthetic control analysis. We follow Ben-Michael et al., (2021) and use the ASCM, which controls pre-treatment fit while minimizing extrapolation, to estimate the long-run impact of Brazilian gold on Portuguese economic development. Formally, we consider a panel data setting with $i = 1,...,N$ units observed for $t = 1,...,T$ time periods. Let $W_i = 1$ be an indicator that the unit i received the treatment at time $T_0 < T$, and $W_i = 0$ means that the unit i never received the treatment. To simplify the notation, we define the pre-treatment period as $T_0 = 1,....,T_0$ and the post-treatment period as $T = T_0 + 1,...,T$. Also, we follow the convention that $i = 1$ is the unit that receives the treatment. Therefore, the observed outcomes of interest are:

$$Y_{it} = \begin{cases} Y_{it}(0), & if\ W_i = 0\ or\ t \leq T_0 \\ Y_{it}(1), & if\ W_i = 1\ and\ t > T_0 \end{cases} \quad (1)$$

The treatment effect is $Y_{1T}(1) - Y_{1T}(0)$. Following Ben-Michael et al. (2021), we define the ridge-augmented SCM estimator as $\hat{Y}_{1T}^{aug}(0) = \sum_{i=2}^{N} \hat{\gamma}_i^{aug} Y_{iT}$, where the weights $\hat{\gamma}^{aug}$ solve:

until the Peace of Münster (1648), which happened later than the start of our sample period determining pre-treatment weights (1640). In the Online Appendix, (see Figures B.11, B.12, and B.13) we show that the results remain similar if we exclude Spain and Holland. We do not include data for Sweden because of its idiosyncratic monetary situation, due to which it suffered from high levels of inflation in the second half of the eighteenth century (Edvinsson, 2012; Karaman et al., 2020). To convert prices from silver to monetary units or vice-versa, as needed, we relied on Allen (2001) for Germany (based on Leipzig), Malanima (2013) for Italy (based on the Florence), and Karaman et al. (2020) for the others.

$$\min_{\gamma} \frac{1}{2\lambda^{ridge}} \left(Y_{1T_0} - Y'_{iT_0}\gamma\right)' \left(Y_{1T_0} - Y'_{iT_0}\gamma\right) + \frac{1}{2}(\gamma - \hat{\gamma}^{scm})'(\gamma - \hat{\gamma}^{scm}) \qquad (2)$$

$$\text{subject to } \sum_{i=2}^{N} \gamma_i = 1$$

Where γ is the vector of weights being optimized, $\hat{\gamma}^{scm}$ is the vector of SCM weights, and λ^{ridge} is the hyperparameter which determines the amount of extrapolation (with the level of imbalance). The second term in Equation 2 is introduced in ASCM equations to penalize deviations from the SCM weights.[42] We follow the cross-validation approach proposed by Ben-Michael et al. (2021) and the "one-standard-error" rule (Hastie et al., 2009) to select λ^{ridge}. We show the resulting weights in the Online Appendix (Table B.3).

In Figure 5, the price level is shown to increase strongly above the synthetic counterfactual immediately in the decades following the selected treatment date of 1694, concurrent with the growing influx of gold imports. In turn, Figure 6 shows a dramatic divergence between the synthetic and actual GDP measures for Portugal during the second half of the eighteenth century.[43] GDP declined in absolute terms during much of the second half of the century and ended up over 200 percent lower than the counterfactual path in 1800. Finally, Figure 7 shows the trajectories of the synthetic counterfactual and actual GDP per capita series for Portugal for the treatment, pre-treatment, and post-treatment periods. As predicted, the two correspond closely prior to the gold shock. During the treatment period, however, distinct divergences appear in the

[42] Intuitively, the ridge-augmented SCM permits the use of negative weights to extrapolate from the control units if regular SCM weights do not achieve a near-perfect fit. The first term penalizes imbalance on lagged outcomes and the second term deviations from the weights generated in a standard SCM setting. The hyperparameter governs the extent of permissible extrapolation—if it is high, then the imbalance term is small and the ASCM weights are forced to be close to the regular SCM weights.

[43] A confounder for the first decade and a half of the eighteenth century, before the largest quantities of gold arrived, was Portugal's participation in the War of the Spanish Succession (1701–1714), which was partly fought in Portugal's territory and had an economic cost which was specific to Portugal but orthogonal to the gold finds in Brazil. Portugal's GDP per capita declined over this period, hitting a trough around 1711-12, a period when hostilities took place in parts of Portugal's mainland territory.

actual and counterfactual outcomes. Following a short dip after 1700, the historical series booms during the early years of the gold shock, exceeding the actual series around 1750. From this peak, per capita income tumbled sharply, falling well below the simulated trend line by the end of the century.

Such patterns precisely fit expectations for an economy beset by resource curse. During initial decades of the gold inflows, the economy grew faster than the counterfactual, bolstered by rising real wages due to the flood of imported gold. From the mid-century, however, the accumulated structural weaknesses began to manifest, and stagnation from the mid–1750s was soon followed by outright decline from the 1770s (Palma and Reis 2019). By 1800, GDP per capita was over 40 percent below the counterfactual, as mentioned: with the difference between the two series being both economically large and statistically significant.[44]

The golden origins of Portugal's divergence

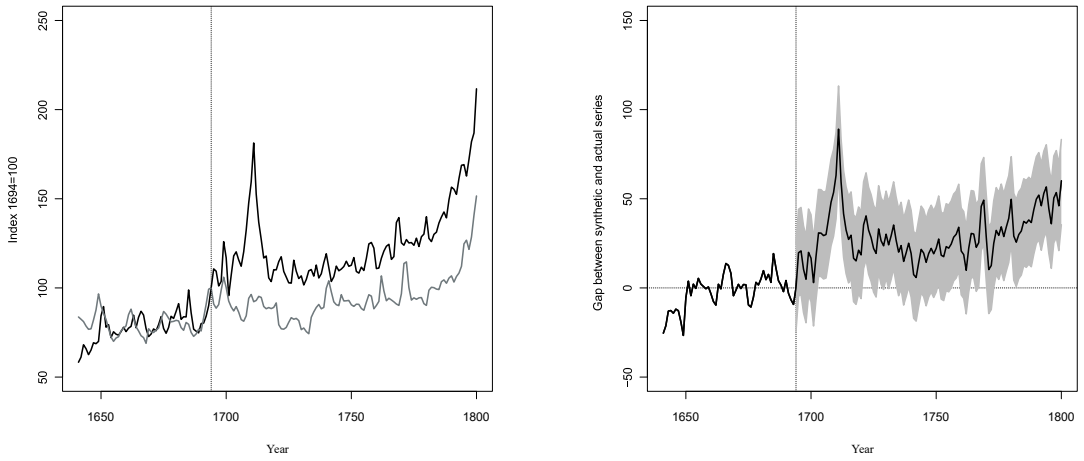
The movements exhibited above in relative prices and the real exchange rate are as predicted by the Dutch disease theory. In turn, the worsening political environment during the eighteenth century is consistent with an institutional resource curse. It remains to connect these factors more closely with Portugal's observed economic decline and divergence from Western Europe. The causes of the ailment—whose symptoms included trade deficits and stagnating output—fall into proximate and ultimate categories. The former comprises real exchange rate appreciation, industrial

[44] As a robustness check, Online Appendix Figures B.11, B.12, and B.13 show the synthetic control levels dropping Spain and Holland, while Online Appendix Figures B.14, B.15, B.16) show the gaps. The results are similar. Additionally, Online Appendix Figures B.17 and B.18 show the equivalent figures for our baseline GDP results using population as an additional control. This makes little difference to the overall outcomes. Finally, Online Appendix Figures B.19 and B.20 show the results for the CPI using prices denominated in silver rather than monetary units. Weights for the synthetic control analysis are shown in Online Appendix Table B.4.

decline, and institutional deterioration; these were driven by colonial gold inflows via a resource curse mechanism. While real exchange rate appreciation, increasing trade deficits, and political challenges are characteristic results of a resource curse, additional work will be required to understand the effects of the gold boom on Portuguese economic performance.

Figure 5: Synthetic Control Results for Portuguese CPI, 1640-1800

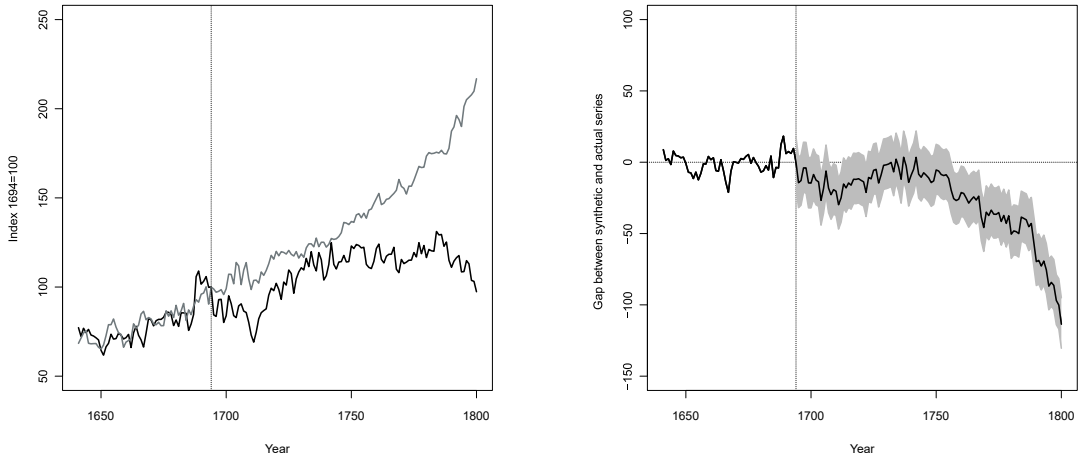
(a) CPI levels (simulated in gray, observed in black) **(b)** CPI Gap (95 percent confidence intervals shaded)



Sources: See Table 1.
Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal. As a robustness check, in Online Appendix Figure B.21 we show the same figure using an unweighted mean, rather than the synthetic counterfactual, and demonstrate that the result is largely unaffected.

Figure 6: Synthetic Control Results for Portuguese GDP, 1640-1800

(a) GDP levels (simulated in gray, observed in black) **(b)** GDP Gap (95 percent confidence intervals shaded)

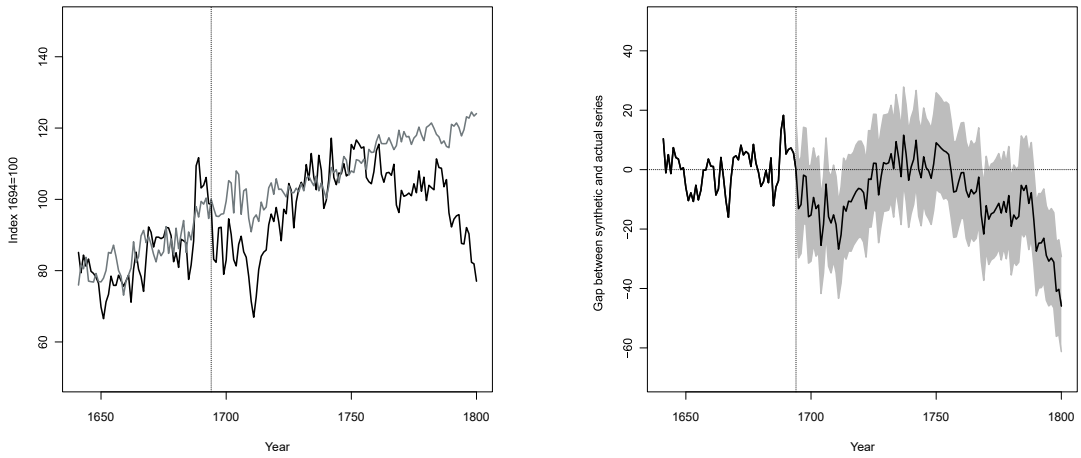


Sources: See Table 1.
Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal. As a robustness check, in Online Appendix Figure B.22 we show the same figure using an unweighted mean, rather than the synthetic counterfactual, and demonstrate that the result is largely unaffected.

Figure 7: Synthetic Control Results for Portuguese GDP per capita, 1640-1800

(a) GDP per capita levels (simulated in gray, observed in black)

(b) GDP per capita Gap (95 percent confidence intervals shaded)



Sources: See Table 1.
Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal. As a robustness check, in Online Appendix Figure B.23 we show the same figure using an unweighted mean, rather than the synthetic counterfactual, and demonstrate that the result is largely unaffected.

Annual output data are unavailable for most individual industries except agriculture, so a variety of substitute measures must be employed, in particular, to differentiate between the direct consequences of gold via its effect on the economy and its indirect effect via a political resource curse which negatively affected institutions.[45] Notice however, that the latter effect is not independent from the former: the expansion of the non-tradables sector (for example, landed and Church-related interests) led to the formation of powerful lobbies as had happened earlier in Spain (Charotti et al., 2022). In Portugal, during the first half of the eighteenth century, King João V (r. 1706–1750) spent a significant proportion of the tax revenues generated by the Brazil windfall on frivolous expenses, including the construction of the huge Palace-Convent of Mafra and an expensive and ostentatious embassy to Pope Clement XI. During this time, there was limited interest in promoting domestic manufacturing, with political priorities being

[45] See Ross (2015) for a review of the political resource curse literature.

focused in maximizing revenues related to gold extraction in Brazil (Pedreira, 2005, 1994, pp. 41–42).

Between 1720 and 1750, as discussed above, the Portuguese trade deficit rose from 2 billion reis (2.4 percent of nominal GDP) to more than 4 billion (3.9 percent), reaching nearly 6 billion (6.1 percent) in 1756 in the wake of the Lisbon earthquake.[46] The foreign accounts remained in the negative until the last decade of the eighteenth century, notwithstanding the efforts of Pombal and his successors after 1777 to boost domestic industry and prohibit imports. In any event, Costa et al. (2016, p. 197) suggest that the restoration of the trade balance was the result of falling domestic consumption, given that exports did not substantially increase. This is also consistent with the evidence of Palma and Reis (2019) regarding falling real incomes in the last decades of the eighteenth century, well before the Napoleonic invasion in 1807.[47] Even the suppression of Brazilian manufacturing by a decree of 5 January 1785, and Pombal's earlier efforts to exclude English "interlopers" from the colonial trade through the assignment of monopoly rights failed to lift exports considerably, and if their value rose at the end of the century, this was at least partly the result of a pan-European wave of price inflation. So long as the golden tide flowed into Lisbon, Portugal was doomed to involution.[48]

Did individual traded and non-traded industries fit the general pattern? Not much reliable data exists on manufacturing, but what limited figures can be adduced are not suggestive of general expansion. In 1769, only 15 factories existed across the country at large; just four of these produced textiles, the growth sector of the British Industrial

[46] Over the eighteenth century, the size of Portugal's deficit had a inverse-U shape, closely tracking the value of gold coin imports over time (Fisher, 1971).
[47] The viewpoint that the French invasions led to a dramatic fall in industrial development is common in the Portuguese-language literature. It is, for example, defended in some detail by Pedreira (1994, p. 298), who however compares nominal export values across time without accounting for inflation. From 1790 to 1805 prices increased by 50 percent, then stabilizing until rising again from 1809. Some years later, a persistent deflationary period took place; this volatility implies comparisons must be performed in real terms (Palma and Reis, 2019).
[48] Even once the gold inflows stopped in the nineteenth century, Portugal's economic and political backwardness was hard to recover from.

Revolution (Pedreira, 1994, p. 59). Metallurgy, silk throwing, and dyeing were all neglected, while cotton, woolens, and linen each received only one new venture. Given that between 1736 and 1740 Portugal was purchasing half of the English textile industry's exports (Fisher, 1971, p. 144), demand for manufactured goods clearly outstripped the supply response of domestic industry. There was no push, as in England, toward modernization and mechanization; rather, the traditional putting-out system that had persisted since the sixteenth century was all but universal. Larger-scale operations—either state-run or state-sponsored—merely subcontracted tasks to peasant production networks. Only by the turn of the century, once gold imports had nearly ceased, does any evidence appear of output and exports marginally increasing. But the picture was not optimistic, given the low base from which industry restarted, and the fact that Brazil—subjected to a colonial monopoly until 1808—was the primary recipient of Portugal's manufactures. The share of population outside agriculture, which had risen quickly until 1750, then fell from 46.5 percent in 1750 to 33.1 percent a century later (Palma and Reis, 2019).[49] The technical stagnation noted above, therefore, would be a predictable consequence of this contraction. While Lisbon and Porto did experience strong urban growth during the eighteenth century, they were "consumption cities" dependent on the provision of non-traded services. Gollin et al. (2016) find that consumption cities, by contrast with manufacturing-based "production cities," tend to proliferate in countries with high levels of natural resource exports. Lisbon, home to the Crown and Court, proved a particularly voracious consumer of goods funded by gold imports. While aggregate demand increased, Lisbon's status as a hub for foreign trade ensured that much of this was siphoned off into purchases of foreign manufactures (Fisher, 1963).

[49] Using a different set of sources and methodology, Carvalhal and Silva (2019) similarly find that in the 1760s, around half of Portugal's working population worked outside of agriculture.

Viticulture is a possible confounding factor. Both wine and olive oil increased production, with the former doubling in cultivated area during the 1700s. Over 70 percent of wine output was exported to England, while olive oil was also traded, especially with Brazil. The foreign demand for these products boosted wine prices throughout the latter half of the eighteenth century. Yet the nature of the industry should give the skeptic pause. First, port wine had no close international substitutes; beer was not treated as such, as evidenced by the behavior of British consumers, while the Methuen Treaty undercut French competition. Thus, even if costs increased and opportunities arose to switch capital and labor into the non-traded sector, wine producers were able to compensate with higher prices. Diplomacy protected the winemaker. Furthermore, the growth of a traded subsector is consistent with Dutch disease. According to the Corden-Neary decomposed "Paradox Model" (see Online Appendix A), the most capital-intensive lagging industries might raise production at the expense of competing trades. Wine was surprisingly capital-intensive, and small farmers were unable to muster the investment necessary to compete with the nobility and urban elites who dominated the sector. Thus, the decrease in available labor might well have tended to increase the output of viticulture, and the evidence suggests that both cereal and wasteland were converted extensively for this purpose.

Cereal production, meanwhile, suffered an unambiguous decrease in output during the second half of the eighteenth century (Reis, 2017). Total factor productivity fell over this period, and yields remained both low and stagnant by European standards (averaging 1:4, and never exceeding 1:7). Though the introduction of maize proved increasingly successful, Portugal continued to import increasing amounts of grain, peaking at 151.6 tons worth (as discussed above) by 1800. Lisbon's foreign consumption rose from an already-high 55 percent in 1729 to a colossal 72 percent by

1778 (Costa et al., 2016, p. 183). Though this figure was smaller for the country at large (5.5 to 7 percent), it was still considerably more than England's 3 percent, and was impressive in an age of debilitating overland transport costs. Indeed, 5 to 12 percent of Britain's rising exports to Portugal were composed of wheat throughout the period (Fisher, 1963, p. 222). Because of low productivity and profits, vast tracts of land were switched over to pastoral husbandry, grain production being restricted to poor soils (Costa et al., 2016, p. 180). Since the raising of cattle and sheep is more capital-intensive, this outcome should be expected within a Dutch disease model. The contraction of the sector, moreover, would have inhibited productivity advances, and the changes in technique that revolutionized agriculture in eighteenth-century England were absent in contemporary Portugal.

Resource curse: Economic and political consequences

Gold directly augmented incomes – of some people, and in the short-run. Increasing gold production in Brazil enriched Portuguese nationals in the colonies, who either remitted their funds home or exchanged them directly for the durable goods arriving on the thrice-annual treasure fleets.[50] Newly expanded incomes would necessarily increase demand in the non-traded sector, causing a real appreciation and a consequent withdrawal of resources from the lagging sector through the spending effect.[51] A smaller though still significant contraction might follow from the emigration of hundreds of thousands of Portuguese prospectors and other individuals working on their supply lines, which would constitute a resource movement effect. With the collapse of the traded

[50] Three annual fleets brought large quantities of gold to Portugal annually from Brazilian ports. Most of the money was imported already coined in the colony's mint houses, and it was delivered to an average of 2,300 recipients (Costa et al., 2018, p. 1148).

[51] Manufacturing, viticulture, and cereal agriculture constituted the lagging traded sector; animal and forest production formed the land-intensive non-traded sector.

export sector and the increased purchasing power of the currency, exports would decline and imports surge, increasing the trade deficit. Gold re-exportation would then be required to pay the outstanding balances, as the proceeds of domestic industry no longer earn foreign exchange.

In the long run, the decades-long influx of gold would have continued the compression of the traded sector. Skill-based productivity advances, which depended on industry and cereal agriculture, were persistently stifled, removing the principal driver of expansion. After an initial boom, therefore, GDP growth rates slowed, and eventually reversed, with critical sectors of the economy being replaced by imports and with the practical consequences of worsening political institutions. Though wine prices and exports apparently flourished, this can be reconciled with the "decomposed" traded-sector model discussed in Online Appendix A, with land as an additional mobile factor. This fits with the general pattern of farms being transferred to relatively land- and capital-intensive industries, especially viticulture and husbandry, throughout the course of the eighteenth century. Costa and Reis (2017) estimate that the 1750–1800 period was the only extended span in Portuguese history in which there was a trade deficit in the agricultural sector. The increasing success of English textiles in both the home and Brazilian markets, meanwhile, indicates that domestic production was increasingly not competitive.

As noted in section 2, Portugal's increased efforts to sustainably boost industrial production failed. Yet, the implementation of import-substitution policies during the second half of the eighteenth century hint at contemporary recognition by Pombal that gold imports (and re-exportation) led to economic involution. Some writers of the period were in fact at least vaguely aware of the negative consequences of the gold imports

(Antonil, 2011; Silva, 2013).[52] The tariffs, bans, and state entrepreneurship of the Pombal era were coupled with the capture and protection of the Brazilian market on behalf of domestic merchants; in the second half of the century, manufacturing in the colony was banned outright, and, as mentioned, efforts were made to reduce the influence of "interloper" English shippers and producers by handing monopoly rights to chartered companies. The Company of Grão-Pará and Maranhão exploited state credit to establish primary product plantations in cacao, rice, coffee, and cotton, for which they exchanged manufactured exports, which rose to 43.1 percent of all goods sent to the colony by 1800 (Costa et al., 2016, pp. 206-08). There is no basis for attributing Portugal's economic ineptitude to a historically poor representation of merchant interests due to comparatively backward political institutions going back to the 1500 or earlier (Henriques and Palma, 2023). But it is nonetheless true that the merchant push of the Pombal era was state-led and associated with rent-seeking, crony capitalism, and state capture (Madureira, 1997; Costa et al., 2016, pp. 215–16). Accordingly, negative structural transformation occurred despite concerted state efforts to boost industry at the expense of Brazil. Overall, the resource curse meant that Portugal's industry not only lost competitiveness but also missed out on the expansion opportunities which, absent Brazilian gold, would have occurred in the eighteenth century, and which would have likely continued via agglomeration and other spillover effects (for example, related to human capital) into the future.

In addition to direct economic consequences for de-industrialization and missed agglomeration opportunities, Portugal also suffered a political resource curse due to Brazil's gold.[53] As late as the second half of the seventeenth century, Portugal's political

[52] For example, the Frenchman Ange Goudar noticed, in a text later falsely attributed to Pombal, that the discovery of the mines in Brazil in fact made Portugal poorer (Barreto, 1982).
[53] In turn, Brazil's long-run development would be negatively affected from a feedback effect due to the inadequate institutional blueprint it was endowed with (Abad and Palma, 2021).

institutions, namely courts and parliaments (*Cortes*), had limited the power of the ruler (Henriques and Palma, 2023). The additional revenues of the Crown due to the Brazilian gold windfall, and the military protection guaranteed by the Methuen Treaty of 1703 which was itself a result of it, meant that rulers no longer needed to negotiate, and parliaments stopped meeting altogether, leading to reduced executive constraints and a lack of checks and balances.[54]

Previously active in providing checks and balances against executive power, the *Cortes* never met during the entire eighteenth century. Power accordingly became absolutist, with consequences that reached a peak during the rule of Sebastião José de Carvalho e Melo (1699–1782), who became Count of Oeiras in 1759 and Marquis of Pombal in 1770. He was the de-facto ruler from around 1755 to the death of King José I in 1777. Perhaps most disastrously, Pombal's educational reforms in association with the expulsion of the Jesuits, who opposed his absolutism, drastically reduced the number of students, and the industrialization effort he promoted was ultimately unsuccessful (Madureira, 1997; Macedo, 1982a; Pedreira, 2005, pp. 205-06, Romeiras and Leitão 2022). Pombal was responsible for large numbers of political prisoners and for instrumentalizing the Inquisition to pursue his political goals, for example by placing his brother at its head.[55] He also centralized censorship in his hands (*Real Mesa*

[54] In prior decades, by contrast, the parliament had considerable power (Henriques and Palma, 2023). It even had ambitions over auditing power if not direct control on public expenses (Rocha, 1896, p. 169).
[55] The Inquisition fell under political control and was often used to persecute enemies who were forced to confess they were Jewish even when this was not the case (Saraiva, 1994). On the endogeneity of culture to political institutions, see Acemoglu and Robinson (2021).

Censória).[56] His rule was characterized by organized state predation and capture, putting an extractive system in place which continued after his fall in 1777.[57]

Pombal's unchecked policies were disastrous for human capital formation. There had been around 20,000 students in pre-university education until 1759, a figure which Pombal's reforms from 1759 reduced sharply (Leitão, 2007, p. 88).[58] The same absolute number of pre-university students was only reached again in the 1930s, when the overall population was considerably larger (Romeiras, 2019; Leitão and Romeiras, 2015, Palma et al., 2020). Portugal still had a numeracy rate close to the most advanced countries in Europe during the first half of the eighteenth century, but this comparative situation was to change drastically from the second half of the eighteenth century (Stolz et al., 2013, pp. 562–64). By 1773, less than a third of the existing primary schools had a teacher (Fernandes 2006, p. 608). By 1800, literacy rates in Portugal – measured by the percentage of adults who could sign their name – were well behind other parts of Western Europe (Reis, 2005, p. 202).[59] The fact that it was the nature of the existing political institutions and not the Catholic religion which by itself prevented industrialization is suggested by the fact that the second European country to industrialize and enter modern economic growth was Belgium.[60] The lack of explanatory power of the Catholic religion is also reflected in the absence of observable

[56] Pombal was a despot who violently murdered his perceived enemies under fabricated charges, while facing no checks and balances. This happened, for example, when he ordered the torture and execution of the Távora family who opposed his power and were falsely incriminated, with their property expropriated. But he was did not limit himself to his peers. In 1757 Pombal suppressed the Innkeepers' Revolt (*Revolta dos Taberneiros*), a popular uprising against one of his monopolies, with hundreds arrested and dozens executed. Inhabitants of the city of Porto were ordered to feed the troops sent to suppress the revolt and pay a tax to cover the salary of soldiers and their munitions.

[57] Costa et al. (2016, p. 216) write that "a small and coherent moneyed elite seems to have been one of the most enduring legacies of his government."

[58] In Online Appendix Table B.2, we list the Jesuit schools open in Portugal by 1759, whose sheer number and size (some with over 1000 students) suggest that the above figure is accurate.

[59] A partial catch-up only happened in the twentieth century (Palma and Reis, 2021).

[60] It is also remarkable that in England, sustained per capita economic growth only began following institutional reforms more than a century after the Reformation, and that within Germany there were no significant differences in outcomes such as income levels, savings, and literacy rates between Catholics and Protestants, except when related to a discriminated Polish minority (Kersting et al., 2020).

differences with respect to other variables. For example, there is no evidence of different social norms at the family level, meaning that women were more discriminated in Southwestern Europe than in the Northwestern Europe—a factor which could have led to different fertility practices causing low human capital accumulation and other inferior development outcomes (Palma et al., 2023). Finally, recent research has shown that Portugal had a high level of state capacity, even when compared with other Western European polities (Costa et al., 2024); hence, its problem lay elsewhere.

Conclusion

The decline of Portugal was due to the structural effects of massive gold imports from Brazil, which peaked around the 1740s. In this paper we have focused on this resource curse. It had an economic aspect (the de-industrialization of the economy) and a complementary political resource curse operating through channels such as additional royal revenues. On the economic front, increasing imports of gold coincide with a strong appreciation of the real exchange rate, which only began to recover with the decline of remittances during the 1770s. Price data derived from archival sources shows a sharp appreciation of the real exchange rate consistent with the onset of Dutch disease and loss of competitiveness of national industry. The prices of traded goods remained for the most part stagnant, barring wheat, whose price alone among grains tended upward during long spells of the eighteenth century. Imports rose throughout the first half of the eighteenth century, with gold remittances and the deficit peaking simultaneously, while exports remained stagnant or declined outright, despite deliberate efforts at import substitution. In sum, there was a sharp rise in the prices of the non-traded sector—chiefly primary products—leading to withdrawn resources from the traded sector, and hence reduced output and employment in manufacturing and grain agriculture. While the

economy boomed in the short run, the longer-term effects of the gold shock were negative — contractions in industry and cereal production slowed the accumulation of technical progress, causing stagnant growth in successive years. Income growth was permanently reduced. Over the second half of the eighteenth century, the country de-industrialized, and the percentage of the population working outside of agriculture declined from around 46 percent in 1750 to only 33 percent a year later.

In proffering resource curse as a cause of Portuguese retrogression, we also hope to show that initial institutions were not to blame for this Iberian episode of the "Little Divergence." Contrary to the arguments presented in Acemoglu et al., (2005), Portugal was ruled by a political system not meaningfully distinguishable from England's until the second half of the seventeenth century (Henriques and Palma, 2023). Portugal's culture and family-level organization was also not different in relevant dimensions from that England or the Netherlands (Palma et al., 2023). Instead, a resource curse provides a compelling alternative conception of the Portuguese problem. Dutch disease meant that industry became less competitive. And given the access to the additional revenues due to the gold, the Crown no longer needed to negotiate, meaning that unlike in previous centuries, the Parliament did not meet in the eighteenth century, with power becoming absolute (Palma, 2020; Henriques and Palma, 2023). Resource curse interrupted the economic and institutional improvement that had been taking place in Portugal during the second half of the seventeenth century. Given the backwardness of institutions and human capital, Portugal's continued divergence was by then inevitable. Once the gold was gone, Portugal was left with no viable industry, and with a backward institutional and educational system. It then systematically diverged relative to Western Europe, until a partial recovery began to take place only from around the mid-twentieth century (Palma and Reis, 2019, 2021; Amaral 2019).

References

Abad, L. A., and N. Palma. "The Fruits of El Dorado: The Global Impact of American Precious Metals." In *The Fruits of the Early Globalization*, edited by R. Dobado-Gonzalez and A. García-Hiernaux, 95–131. Springer, 2021.

Abadie, A., A. Diamond, and J. Hainmueller. "Comparative Politics and the Synthetic Control Method." *American Journal of Political Science* 59, no. 2 (2015): 495–510.

Acemoglu, D., S. Johnson, and J. A. Robinson. "The Rise of Europe: Atlantic Trade, Institutional Change, and Economic Growth." *American Economic Review* 95 (2005): 546–579.

Acemoglu, D., and J. A. Robinson. "Culture, Institutions and Social Equilibria: A Framework." NBER Working Paper, 2021.

Allen, R. C. "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." *Explorations in Economic History* 38, no. 4 (2001): 411–447.

Amaral, Luciano. *The Modern Portuguese Economy in the Twentieth and Twenty-first Centuries*. Cham: Palgrave Macmillan, 2019.

Saraiva, António José (1994). Inquisição e Cristãos-Novos. Lisboa: Editorial Estampa.

Antonil, A. J. "Cultura e Opulência do Brasil por Suas Drogas e Minas." Volume 160. Brasília: Edições do Senado Federal, 2011. Originally published in 1711.

Asea, P. K. and Lahiri, A. "The Precious Bane." *Journal of Economic Dynamics and Control* 23 (1999): 823–849.

Badia-Miró, M., Pinilla, V., and Willebald, H. Natural Resources and Economic Growth. Taylor & Francis, 2015.

Barreto, J. "O Discurso Político Falsamente Atribuído ao Marquês do Pombal." *Revista de História das Ideias* 4, no. 1 (1982).

Ben-Michael, E., Feller, A., and Rothstein, J. "The Augmented Synthetic Control Method." *Journal of the American Statistical Association* 116, no. 536 (2021): 1789–1803.

Boxer, C. R. *The Golden Age of Brazil 1695-1750: Growing Pains of a Colonial Society*. University of California Press, 1962.

———. "Brazilian Gold and British Traders in the First Half of the Eighteenth Century." *The Hispanic American Historical Review* 49, no. 3 (1969).

Broadberry, S. "Accounting for the Great Divergence: Recent Findings from Historical National Accounting." CEPR Discussion Paper No. DP15936, 2021a.

———. "The Industrial Revolution and the Great Divergence: Recent Findings from Historical National Accounting." In *The Handbook of Historical Economics*, edited by A. Bisin and G. Federico, 749–771. Academic Press, 2021b.

———, Campbell, B. M. S., Klein, A., Overton, M., and van Leeuwen, B. British Economic Growth, 1270–1870. Cambridge: Cambridge University Press, 2015.

Carvalhal, H. and Silva, F. R. d. "Occupational Structures and Labour Relations in Portugal, 1750-1800." Paper presented at the Population, Labour and Wealth in Early Modern Portugal Conference, Universidade do Porto, 2019.

Caselli, F. and Tesei, A. "Resource Windfalls, Political Regimes, and Political Stability." *Review of Economics and Statistics* 98, no. 3 (2016): 573–590.

Charotti, C., Palma, N., and Santos, J. P. "American Treasure and the Decline of Spain." CEPR Discussion Paper, 2022.

Chen, Y., N. Palma, and F. Ward. "Reconstruction of the Spanish Money Supply, 1492–1810." *Explorations in Economic History* 81 (2021): 101401.

———. "Goldilocks: American Precious Metals and the Rise of the West." Technical report, Tinbergen Institute Discussion Paper, 2022.

Chilosi, D. and C. Ciccarelli. "Evolving Gaps: Occupational Structure in Southern and Northern Italy, 1400–1861." *The Economic History Review* 75, no. 4 (2022): 1349–1378.

Cordeiro, J. M. L. *História da Indústria Portuense. Volume 1 - Dos Finais do Século XVIII a 1852*. Porto: Edições Afrontamento, 2017.

Corden, W. M. "Booming Sector and Dutch Disease Economics: Survey and Consolidation." *Oxford Economic Papers* 36 (1984): 359–380.

Corden, W. M. and J. P. Neary. "Booming Sector and De-Industrialisation in a Small Open Economy." *The Economic Journal* 92 (1982): 825–848.

Costa, L., P. Lains, and S. Münch Miranda. *An Economic History of Portugal, 1143-2010*. Cambridge: Cambridge University Press, 2016.

Costa, L., N. Palma, and J. Reis. "The Great Escape? The Contribution of the Empire to Portugal's Economic Growth, 1500-1800." *European Review of Economic History* 19 (2015).

Costa, L. F., A. Henriques, and N. Palma. "Anatomy of a Premodern State." *European Review of Economic History* (2024), forthcoming.

Costa, L. F. and J. Reis. "The Chronic Food Deficit of Early Modern Portugal: Curse or Myth?" *Análise Social* 52 (2017): 416–429.

Costa, L. F., M. M. Rocha, and P. B. Brito. "The Alchemy of Gold: Interest Rates, Money Stock, and Credit in Eighteenth-Century Lisbon." *The Economic History Review* 71, no. 4 (2018): 1147–1172.

Costa, L. F., M. M. Rocha, and R. M. d. Sousa. *O Ouro do Brasil*. Imprensa Nacional-Casa da Moeda, 2013.

Dias, L. F. C. *Os Lanifícios na Política Económica do Conde da Ericeira*. Lisboa, 1954.

Edvinsson, R. "Early modern copper money: multiple currencies and trimetallism in Sweden 1624–1776". *European Review of Economic History* 16 no. 4, (2012): 408-429.

Fernandes, R. *Os Caminhos do ABC. Sociedade Portuguesa e Ensino das Primeiras Letras*. Porto Editora, 2006.

Fisher, H. "Anglo-Portuguese Trade, 1700–1770." *The Economic History Review* 16 (1963): 219–233.

Fisher, H. E. S. *The Portugal Trade*. Taylor & Francis, 1971.

Forsyth, P. J. and S. J. Nicholas. "The Decline of Spanish Industry and the Price Revolution: A Neoclassical Analysis." *Journal of European Economic History* 12, no. 3 (1983): 601–610.

Francis, A. D. *The Methuens and Portugal, 1691-1708*. Cambridge University Press, 1966.

Godinho, V. M. *Prix et Monnaies au Portugal: 1750-1850*. Armand Colin, 1955.

Gollin, D., R. Jedwab, and D. Vollrath. "Urbanization with and without Industrialization." *Journal of Economic Growth* 21, no. 1 (2016): 35–70.

Gylfason, T., T. T. Herbertsson, and G. Zoega. "A Mixed Blessing: Natural Resources and Economic Growth." *Macroeconomic Dynamics* 3, no. 2 (1999).

Hanson, C. A. *Economy and Society in Baroque Portugal, 1668-1703*. University of Minnesota Press, 1981.

Hastie, T., R. Tibshirani, and J. Friedman. *The Elements of Statistical Learning: Data Mining, Inference, and Prediction*. Springer Series in Statistics. Springer, New York, NY, 2009.

Henriques, A. and N. Palma. "Comparative European Institutions and the Little Divergence, 1385-1800." *Journal of Economic Growth* 28 (2023): 259–294.

Juhász, R., N. J. Lane, and D. Rodrik. "The New Economics of Industrial Policy." *Annual Review of Economics* 16 (2023).

Juhász, R. and C. Steinwender. "Industrial Policy and the Great Divergence." Annual *Review of Economics* 16 (2023).

Karaman, K. K., Ş. Pamuk, and S. Yıldırım-Karaman. "Money and Monetary Stability in Europe, 1300–1914." *Journal of Monetary Economics* 115 (2020): 279–300.

Kedrosky, Davis, and Palma, Nuno. Replication package for: "The cross of gold: Brazilian treasure and the decline of Portugal." Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], 2024. Available at: https://doi.org/10.3886/E209481V1

Keibek, S. A. J. "The Male Occupational Structure of England and Wales, 1600-1850." PhD thesis, University of Cambridge, 2017.

Kersting, F., I. Wohnsiedler, and N. Wolf. "Weber Revisited: The Protestant Ethic and the Spirit of Nationalism." *Journal of Economic History* 80, no. 3 (2020): 710–745.

Krantz, O. "Swedish GDP 1300-1560: A Tentative Estimate." Department of Economic History, Lund University, 2017.

Krugman, P. "The Narrow Moving Band, the Dutch Disease, and the Competitive Consequences of Mrs. Thatcher: Notes on Trade in the Presence of Dynamic Scale Economies." *Journal of Development Economics* 27 (1987): 41–55.

Leitão, H. *A Ciência na "Aula da Esfera" no Colégio de Santo Antão, 1590-1759*. Comissariado Geral das Comemorações do V Centenário do Nascimento de São Francisco de Xavier, 2007.

Leitão, H. and F. M. Romeiras. "The Role of Science in the History of Portuguese Anti-Jesuitism." *Journal of Jesuit Studies* 2, no. 1 (2015): 77–99.

List, F. *The National System of Political Economy*. Longmans, Green, and Company, 1841.

Lourenço, M. P. M. *D. Pedro II*. Lisboa: Círculo de Leitores, 2007.

Macedo, J. B. d. *Problemas de História da Indústria Potuguesa no Século XVIII*. Querco, 1982a.

———. *A Situação Económica no Tempo de Pombal: Alguns Aspectos*. Moraes Editora, 1982b.

Madureira, N. L. *Mercado e Privilégios: A Indústria Portuguesa Entre 1750 e 1834*. Lisboa: Editorial Estampa, 1997.

Magalhães, J. R. "O Império." In *História Económica de Portugal*, edited by P. Lains and A. F. Silva. Lisboa: Instituto de Ciências Sociais, 2005.

Malanima, P. *L'economia italiana: dalla crescita medievale alla crescita contemporanea*. Mulino, 2002.

———. "The Long Decline of a Leading Economy: GDP in Central and Northern Italy, 1300–1913." *European Review of Economic History* 15, no. 2 (2011): 169–219. Publisher: Oxford University Press.

———. "When did England Overtake Italy? Medieval and Early Modern Divergence in Prices and Wages." *European Review of Economic History* 17, no. 1 (2013): 45–70.

Matsuyama, K. "Agricultural Productivity, Comparative Advantage, and Economic Growth." *Journal of Economic Theory* 58 (1992): 317–334.

Melitz, M. J. "When and How Should Infant Industries be Protected?" *Journal of International Economics* 66, no. 1 (2005): 177–196.

Meneses, A. F. d. "A Economia." In *Nova História de Portugal*, edited by A. H. de Oliveira Marques and J. Serrão, 23–41. Editorial Presença, 2001.

North, D. C. and B. R. Weingast. "Constitutions and Commitment: The Evolution of Institutions Governing Public Choice in Seventeenth-Century England." *The Journal of Economic History* XLIX (1989): 803–832.

Palma, N. "Sailing Away from Malthus: Intercontinental Trade and European Economic Growth, 1500–1800." *Cliometrica* 10, no. 2 (2016): 129–149.

———. "Money and Modernization in Early Modern England." *Financial History Review* 25, no. 3 (2018): 231–261.

———. "American Precious Metals and Their Consequences for Early Modern Europe." In *Handbook of the History of Money and Currency*, edited by S. Battilossi, Y. Cassis, and K. Yago. Springer, Singapore, 2020.

———. "The Real Effects of Monetary Expansions: Evidence from a Largescale Historical Experiment." *The Review of Economic Studies* 89, no. 3 (2022): 1593–1627.

Palma, N. and J. Reis. "From Convergence to Divergence: Portuguese Economic Growth, 1527–1850." *The Journal of Economic History* 79, no. 2 (2019): 477–506.

———. "Can Autocracy Promote Literacy? Evidence from a Cultural Alignment Success Story." *Journal of Economic Behavior & Organization* 186 (2021): 412–436.

Palma, N., J. Reis, and M. Zhang. "Reconstruction of Regional and National Population Using Intermittent Census-Type Data: The Case of Portugal, 1527–1864." *Historical Methods: A Journal of Quantitative and Interdisciplinary History* 53, no. 1 (2020): 11–27.

Palma, N. P., J. Reis, and L. Rodrigues. "Historical Gender Discrimination Does Not Explain Comparative Western European Development: Evidence from Portugal, 1300-1900." *Explorations in Economic History* 88 (2023).

Pedreira, J. *Estrutura Industrial e Mercado Colonial: Portugal e Brasil (1780-1830)*. Lisboa: Difel, 1994.

———. "A Indústria." In *História Económica de Portugal*, edited by P. Lains and A. F. Silva, 177–208. Lisboa: Instituto de Ciências Sociais, 2005.

Pfister, U. "Economic Growth in Germany, 1500–1850." *The Journal of Economic History* 82, no. 4 (2022): 1071–1107.

Prados de la Escosura, L., C. Alvarez Nogal, and C. Santiago-Caballero. "Growth Recurring in Preindustrial Spain?" *Cliometrica* 16, no. 2 (2022): 215–241.

Reis, J. "How Poor Was the European Periphery Before 1850?" In *The Mediterranean Response to Globalization Before 1950*, edited by Ş. Pamuk and J. G. Williamson. Routledge, 2002.

———. "Economic Growth, Human Capital Formation and Consumption in Western Europe Before 1800." In *Living Standards in the Past: New Perspectives on Well-Being in Asia and Europe*, edited by R. C. Allen, T. Bengtsson, and M. Dribe, 195–225. Oxford University Press Oxford, 2005.

———. "Gross Agricultural Output: A Quantitative, Unified Perspective, 1500–1850." In *An Agrarian History of Portugal, 1000-2000: Economic Development on the European Frontier*. Brill, 2017.

Ridolfi, L. and A. Nuvolari. "L'histoire Immobile? A Reappraisal of French Economic Growth Using the Demand-Side Approach, 1280–1850." *European Review of Economic History* 25, no. 3 (2021): 405–428.

Robinson, J. A., R. Torvik, and T. Verdier. "Political Foundations of the Resource Curse." *Journal of Development Economics* 79, no. 2 (2006): 447–468.

Rocha, M. A. C. *Ensaio Sobre a Historia do Governo e Legislação de Portugal: Para Servir de Introdução ao Estudo do Direito Patrio*. Imprensa da Universidade de Coimbra, 1896.

Romeiras, F. M. "The Pombaline Expulsion and the Building of Anti-Jesuitism." In *Jesuits and the Book of Nature*, 23–41. Brill, 2019.

Romeiras, F. M. and H. Leitão. "The Rise and Fall of Jesuit Education in Portugal, 1540–1759." Unpublished manuscript, 2022.

Ross, M. L. "What Have We Learned About the Resource Curse?" *Annual Review of Political Science* 18 (2015): 239–259.

Sachs, J. and A. Warner. Natural Resource Abundance and Economic Growth. NBER Working Paper, 1995.

Schön, L. and O. Krantz. "New Swedish Historical National Accounts since the 16th Century in Constant and Current Prices." Lund University, Department of Economic History, 2015.

Saraiva, António José. *Inquisição e Cristãos-Novos*. Lisboa: Editorial Estampa, 1994.

Serrão, J. V. "Os Impactos Económicos do Terremoto." In *O Terramoto de 1755: Impactos Históricos*, edited by A. C. Araújo, J. L. Cardoso, and N. G. Monteiro. Livros Horizonte, 2007.

Silva, A. D. *Testamento Político de D. Luís da Cunha*. Lisboa: Biblioteca Nacional, 2013.

Smits, J.-P., E. Horlings, and J. L. van Zanden. "Dutch GNP and its Components, 1800-1913." 2000.

Sousa, R. M. d. *Moeda e Metais Preciosos no Portugal Setecentista: 1688-1797*. Imprensa Nacional-Casa da Moeda, 2006.

Stein, S. J. and B. H. Stein. *Silver, Trade, and War: Spain and America in the Making of Early Modern Europe*. John Hopkins University Press, 2000.

Stolz, Y., J. Baten, and J. Reis. "Portuguese Living Standards, 1720–1980, in European Comparison: Heights, Income, and Human Capital." *The Economic History Review* 66, no. 2 (2013): 545–578.

TePaske, J. J. *A New World of Gold and Silver*. Brill, 2010.

Van Wijnbergen, S. "The 'Dutch Disease': A Disease After All?" *Economic Journal* 94 (1984): 41–55.

van Zanden, J. L. and B. van Leeuwen. "Persistent but not Consistent: The Growth of National Income in Holland 1347–1807." *Explorations in Economic History* 49, no. 2 (2012): 119–130.

Appendix (for online publication only)

A. Additional information

Portugal in Spain's mirror

Portugal's scenario was analogous to that of Spain in an earlier period. Spain's early modern resource curse has been discussed since the sixteenth century, and Earl J. Hamilton investigated it in detail in multiple works during the twentieth century (e.g. Hamilton 1934). More recently, Drelichman (2005a) studied the real exchange rate in Spain following the mass importation of silver from Latin America during the sixteenth century. As with our paper, he constructs weighted baskets of traded and non-traded goods and finds a "strong and persistent increase" in the relative price of non-traded goods coincident with the discovery of precious metals, which persisted for three decades before subsiding. Drelichman also produces a set of stylized facts for the evolution of the Spanish economy which fit the Portuguese case as thus described. For example, Spain, like Portugal, lost control of shipping services to the English and Dutch; ceded her fisheries; and started to purchase foreign cereals and manufactured goods in bulk.[61] Drelichman (2005b) additionally provides evidence of a political curse channel, while Charotti et al. (2022) provide evidence of the overall effect. Spain hence provides an early case in which the influx of precious metals damaged an early modern economy. We see our results for Portugal, given the later timing of the resource inflows, as providing independent evidence that such effects operated. Both nations also saw a roughly forty-year lag between the onset of metallic inflows and the beginning of overall decline, coinciding closely with the peak in remittances (Palma, 2020).

[61] See also Stein and Stein (2000).

As had also been the case in Spain, the effects of Dutch disease in Portugal were compounded by the political resource curse: with additional windfall revenues associated with the gold imports, the Crown no longer needed to negotiate with the *Cortes* as much as before. As a result, the process of increased executive checks along with increasingly frequent parliamentary meetings which had been underway in Portugal during the second half of the seventeenth century reached a sudden stop around 1700, and the *Cortes* did not meet even once during the eighteenth century (Henriques and Palma, 2023). There is hence good reason to suppose that in the absence of those additional Crown revenues, institutional development with increased executive checks and balances as had occurred since the 1640 Restoration would not have been interrupted around 1700.[62]

The Theory of Dutch Disease

A prominent formulation of the Dutch disease theory is that of Corden and Neary (1982), who demonstrate how a natural resource windfall can affect the sectoral composition of output. In their basic model, the economy consists of three sectors, across which one common factor (usually labor) is mobile: a booming sector, a lagging (traded) sector, and a non-traded sector. Corden and Neary postulate the first as energy, the second as manufacturing, and the third as services, but the labels are not necessary for the theory to function. The booming sector experiences an initial increase in aggregate factor incomes, the consequences of which can be decomposed into two effects, varying in magnitude: a resource movement effect and a spending effect. In the

[62] During the reign of Spain's kings over Portugal between 1580 and 1640, the Portuguese *Cortes* only met three times (1581, 1583, and 1619), and only for ceremonial or dynastic reasons. After 1640, however, they became active again as sources of constraints on executive power. In 1643, Portugal's courts annulled a 1614 financial repression (usury) law that determined that no more than 5% interest could be charged for private perpetuities, meaning that the Crown found it easier to attract funds to itself (Silva, 1856, p. 410). This was later reversed again in 1698, after Brazil's gold had been found (Henriques and Palma, 2023, p. 283).

former case, technological progress (or a resource windfall) increases the marginal product of mobile factors and thus demand for them in the booming sector. Rents and wages rise, drawing workers out of the lagging and non-traded sectors. This is referred to as direct de-industrialization, as employment falls in the manufacturing (and the non-traded) sector. Excess demand for non-traded goods, however, can only be resolved by real appreciation — an increase in the price relative to traded goods.

With the spending effect, the newfound wealth of domestic consumers from the boom—provided the income elasticity of demand is positive—is spent on nontraded goods, causing a further real appreciation as well as an increase in services output.[63] Resources will be drawn out of the other two sectors into the provision of non-traded commodities and services, which now command higher profits—thus indirect de-industrialization compounds the contraction in manufacturing. Both the spending and resource movement effects lower rents in the lagging sector, which is constrained by constant terms of trade. Fixed world prices ensure that rising wages cannot be compensated for by inflation. Across the whole economy, the resource movement effect will tend to increase incomes, while the consequences of the spending effect will be ambiguous.

Relaxing the assumption that capital is immobile between sectors gives rise to a "paradox model" in which it can be shown that the resource movement will increase output in the relatively more capital-intensive industry—resulting in proto-industrialization if that sector is manufacturing. This is the result of the Rybczynski (1955) theorem, which states that a rise in the endowment of one factor leads to a more-than-proportional increase in the production of the good that uses it intensively. If labor

[63] The newfound wealth is of course spent on both traded and non-traded goods. However, traded goods can be sourced internationally at a world price. Labor and investments are therefore free to move into the non-traded goods sector in response to an increase in wages, while diminishing returns cause an increase in non-traded prices (and their relative price with respect to traded prices).

supply decreased, the capital-intensive sector would tend to increase output at the expense of its labor-intensive counterpart. The spending effect, however, will continue to unambiguously cause lagging-sector production to fall and non-traded prices and production to increase. In the latter case, if the lagging sector is more capital-intensive, real wages will rise and rents will decline. Further complexity can be added if the lagging sector is decomposed into two or more industries; again by the Rybczynski theorem, the more capital-intensive sector will raise output and employment at the expense of the other. One critical point to consider in the above analysis is that the traded sector need not be explicitly "industrial"; agriculture could, as in Nigeria or Venezuela, see similar declines in output as a result of real exchange rate pressures.

Several authors have developed models illustrating the long-term consequences of resource-induced sectoral contraction. Krugman (1987) assumes that the stock of knowledge is proportional to past production and shows that, by pushing up the relative wage rate, a sustained transfer of resource wealth will lead to the permanent out-migration of some traded industries.[64] Sachs and Warner (1995), following the analysis of Matsuyama (1992), present a simple model within an overlapping-generations framework demonstrating how Dutch disease, by altering the sectoral composition of output, can impact long-run growth. They assume that the relative size of the manufacturing sector determines the rate of increase of the stock of knowledge (human capital accumulation), which is labor-augmenting across all industries. That is, human capital increases the amount of effective labor employed (multiplying that input in the production function) in the traded and non-traded sectors, but is only accumulated in the former. A one-time increase in resource wealth will immediately increase demand for non-traded goods, resulting in a movement of labor out of the traded sector to

[64] Krugman also shows how the discovery of exportable natural resources can lead to a permanent loss of other sectors and reduce welfare in the long run.

compensate. The manufacturing share is thereby reduced, depressing technological progress and thus economic growth. In the subsequent period, savings from the previous influx are again spent on non-traded production, which results in another depression of the manufacturing share. In this model, once the resource windfall has been spent, the proportion of traded employment converges to the steady state; however, the damage has already been done: human capital will remain below normal for multiple periods after the resource shock. Consequently, GDP growth rates will be temporarily depressed, and the affected country could end with output at a permanently lower level. Indeed, depending on the relative capital intensities of the traded and non-traded sectors, GDP could decline. In all events, an expected trajectory would consist of an immediate increase in GDP flowing directly from the resource windfall, followed by years of stagnant growth.

Combining the Corden and Neary theoretical framework with the Sachs and Warner growth model yields distinct predictions about the behavior of prices, wages, and sectoral and aggregate output in the wake of a single-period resource boom. Assuming that the lagging traded sector is manufacturing and the nontraded sector primary production, and that the spending effect predominates over the resource movement effect, prices and output should rise in the non-traded sector relative to the traded sector. This real appreciation will in turn decrease output in the traded sector, whose prices are fixed on the international market and whose products can no longer be both profitable and competitive at home. The contraction in manufacturing, besides reducing employment, will also slow the accumulation of productive knowledge, with the result that output growth rates in future periods will be reduced. If the resource shock is of long duration and large dimension, as was the case with Brazilian gold, the manufacturing collapse and growth slowdown would be far more destructive. Lost

industry agglomeration effects and human capital spillovers, as well as a political channel, complete the picture: the curse becomes long-lasting well beyond the period of gold inflows.

Portuguese industry prior to 1700

We provide here additional details and context to the information in the main text. Linens were produced in a proto-industrial putting-out system in the northwest and Beira, and other branches could be found in Estremadura, Trás-os-Montes, and Alentejo (Costa et al., 2016, p. 188). In Santarém, Coimbra, Moncorvo, and Entre-Douro-e-Minho, flax growing prospered, and abundant female workers contributed to the growth of Braga and Guimarães as major linen centers from the sixteenth century onward. The density and low agricultural productivity of the Minho region ensured that labor supply remained elastic and long household traditions of weaving and spinning provided the necessary skills. Demand was stimulated by the royal shipyard and rope factories of Lisbon, and valuable quantities were also exported from Vila do Conde. Hemp, demanded by the shipping industry for nets and rigging, saw the creation of "royal factories" at Santarém, Coimbra, and Moncorvo. Silk had been manufactured at Bragança since the sixteenth century, led by the descendants of Jewish exiles from Castile, and an enterprise established at Lisbon in 1677 operated 50 looms by 1679 (Neto, 2017, p. 118).

Two small woolen centers had existed since the 1400s in Beira and Alentejo. In Beira, spinning and weaving were conducted in the countryside with the town of Covilhã serving as a hub for the collection, dyeing, and finishing of output. In Alentejo, urban factories in Portalegre and Redondo organized putting-out networks that employed one-third of the rural population. The labor-intensive animal agriculture of the two regions provided opportunities for income augmentation, and local wool and olive oil (for

processing) combined with cheap labor to create a successful industry. Demand from Lisbon and other towns for linens, silks, and woolens had stimulated local production since the sixteenth century, and inefficient transportation networks were no barrier to the connection of urban markets and rural manufacturers. Wine, as previously noted, was internationally competitive, and two-thirds of exports went to the British market in 1715 (Costa et al., 2016, p. 195).

Brazil provided a growing and exclusive market. Linens, flour, olive oil, and wine were shipped on Portuguese vessels; codfish were transported with the intermediation of English shipping. Slaves were taken *en masse* to Brazil for plantation labor on the internal frontier, with 297,000 disembarked from 1676 to 1700 (Costa et al., 2016, p. 203). Leather, hides, tobacco, sugar, and – by the end of the eighteenth century – cotton were all shipped back to the metropolis (Costa et al., 2016, p. 207).

Though foreign re-exports (especially English cloth) predominated on the west-bound trip, the problem was not insurmountable. In the second half of the eighteenth century, Pombal established two commercial companies—one for Grão-Pará and Maranhão and one for Pernambuco and Paraíba—intended to make inroads against the foreign export share. These companies focused on cacao, rice, and coffee, for re-export to Europe, and even managed growing exports of cotton to Britain. Protectionist measures enacted after 1770 included a 1785 ban on manufacturing activity in the colony, more prominently sugar refining. During the first half of the eighteenth century, the Crown, relying on the strength of the treasury due to taxes on Brazilian gold, encouraged the competition of the mercantile groups, leading to overbidding monopoly and tax farming contracts. In practice, this increased Crown revenues at the expense of causing financial difficulties for private investors (Salvado, 2019a, b).

Following a more hands-off period from the Crown during the initial decades of the gold boom, in the second half of the eighteenth century Pombal's companies showed that some competition with foreign exports were possible in the context of privileged access to Brazil; but these companies were of the crony-capitalism kind and associated with state capture practices which enriched elites at the expense of most of the population.[65]

[65] There had been a trade corporation in Portugal (*Mesa do Bem Comum dos Homens de Negocio*). Pombal's desire to create a monopoly clashed with its merchant interests. Displeased with their protests, he decreed their dissolution, exiling the leaders and reinstating a new agency (*Junta do Comercio*), "a political device at the service of the merchants who, from the beginning, had interests aligned with those of Pombal" (Costa et al., 2016, pp. 215-16). In fact, the *Junta do Comércio* was nothing "even approaching a trade corporation, as the *Mesa do Bem Comum* had been. It was an arm of the State ... [and] more of an instrument of social dissension among the domestic mercantile group than an effective means to counter English operations in Portuguese foreign trade" (Costa et al., 2016, p. 216).

B. Additional Figures and Tables

Figure B.1: Annual Gold Production in Portuguese Brazil (TePaske, 2010)

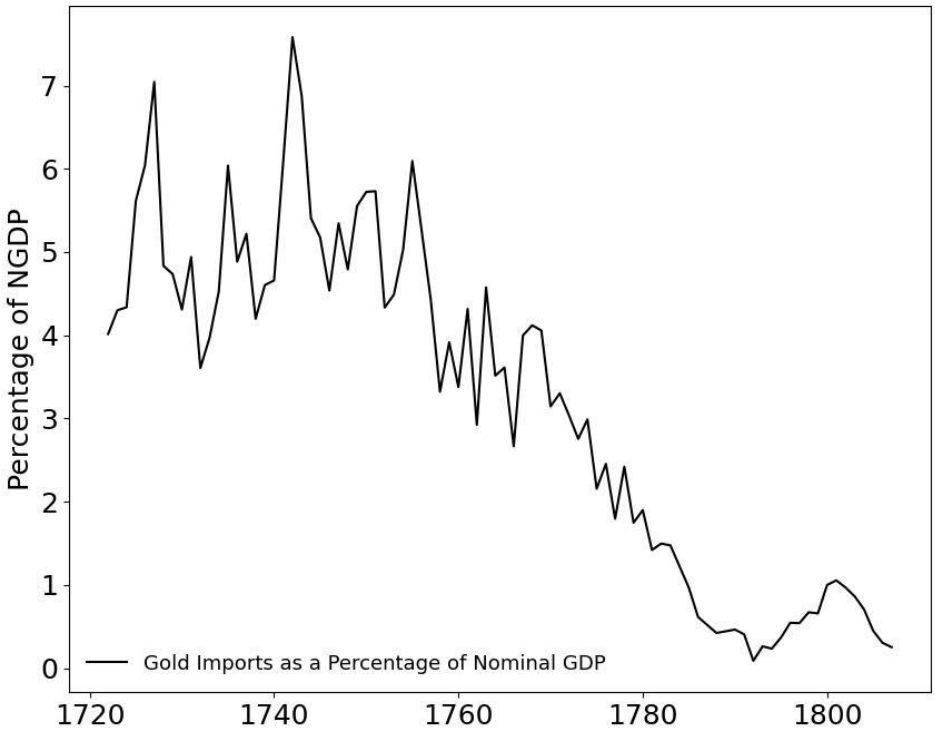


Figure B.2: Gold Imports as a Percentage of Nominal GDP (Costa et al., 2013; Palma and Reis, 2019)

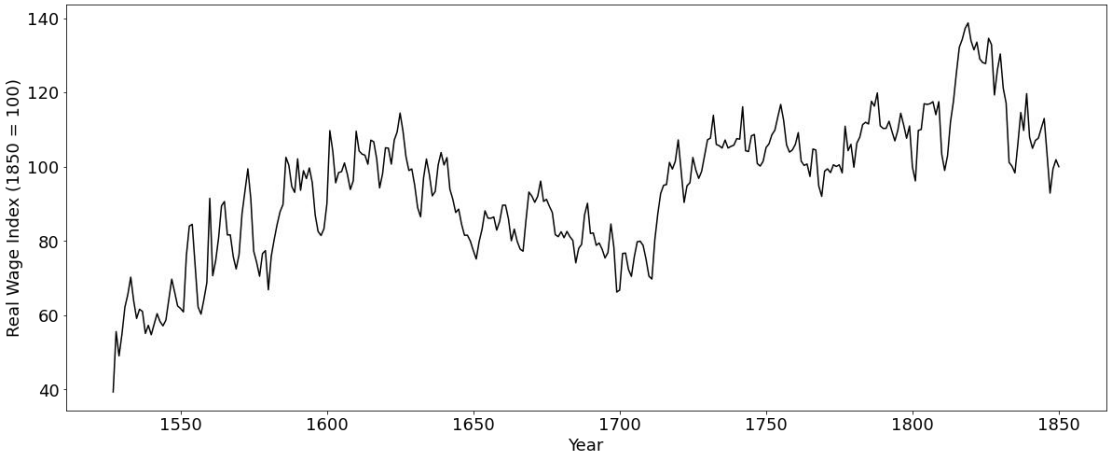


Figure B.3: Real wages in Portugal, 1527–1850. Source: (Palma and Reis, 2019)

Figure B.4: Ratio of Non-Traded to Traded Price Indices for Porto, 1650–1820 (PWR project). Gold Production in Portuguese Brazil from TePaske (2010).

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

Figure B.5: Ratio of Non-Traded to Traded Price Indices for Portugal, 1650–1820 using the geometric index (PWR project). Gold Production in Portuguese Brazil from TePaske (2010).

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

Figure B.6: Ratio of Non-Traded to Traded Price Indices for Lisbon, 1650–1820 using the geometric index (PWR project). Gold Production in Portuguese Brazil from TePaske (2010).

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

Figure B.7: Ratio of Non-Traded to Traded Price Indices for Porto, 1650–1820 using the geometric index (PWR project). Gold Production in Portuguese Brazil from TePaske (2010).

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

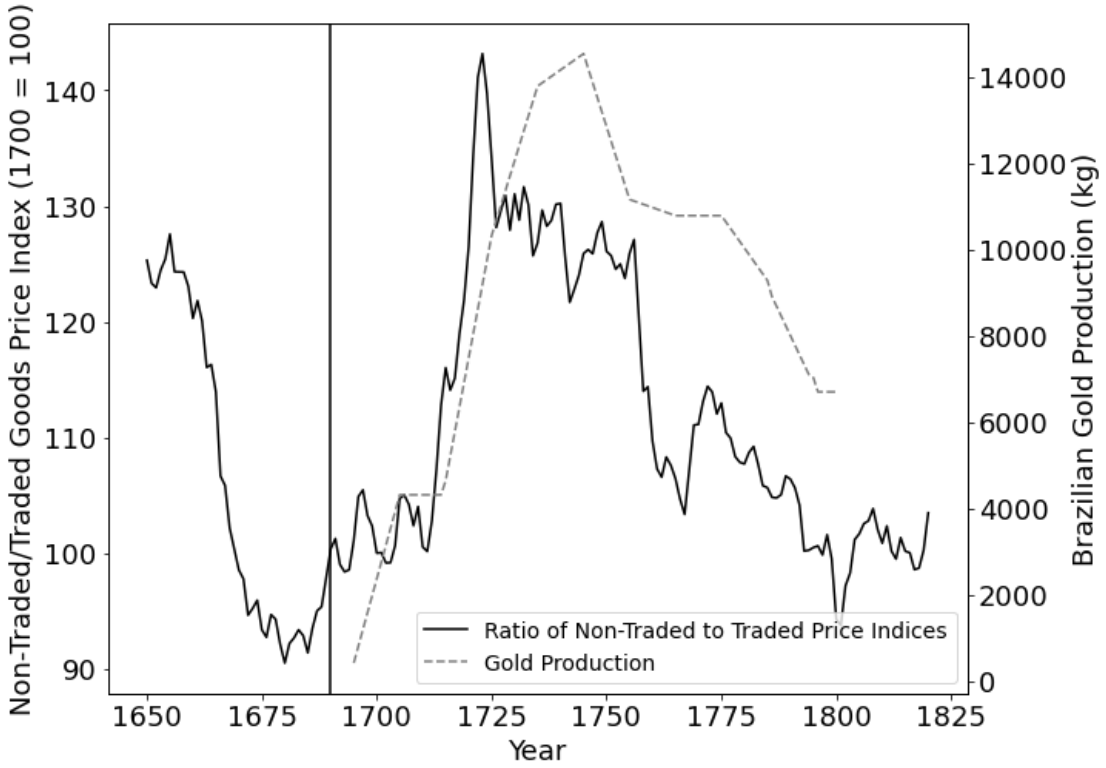


Figure B.8: Ratio of Non-Traded to Traded Price Indices for Portugal (basket without the maize substitution, in other words, only using wheat as the main cereal grain), 1650–1820 (PWR project). Gold Production in Portuguese Brazil from TePaske (2010).

Notes: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal. As explained in the main text, following Palma and Reis (2019, p. 487), we substitute maize in our baseline results for the hinterlands of Porto, Coimbra, and Lisbon – the regions where maize was typically consumed –, but not Évora. Unlike Allen (2001), we use only grain prices instead of bread or flour, as the latter two implicitly includes wages —a classic non-traded "good". Given the considerable weight placed on wheat and the secular increase of its price mean, had we not made the (partial) maize substitution, due to price rises toward the end of the eighteenth century, wheat would take up an implausibly large share of the consumption basket. Nonetheless, this figure shows that our results still hold even if we do not make the maize partial substitution.

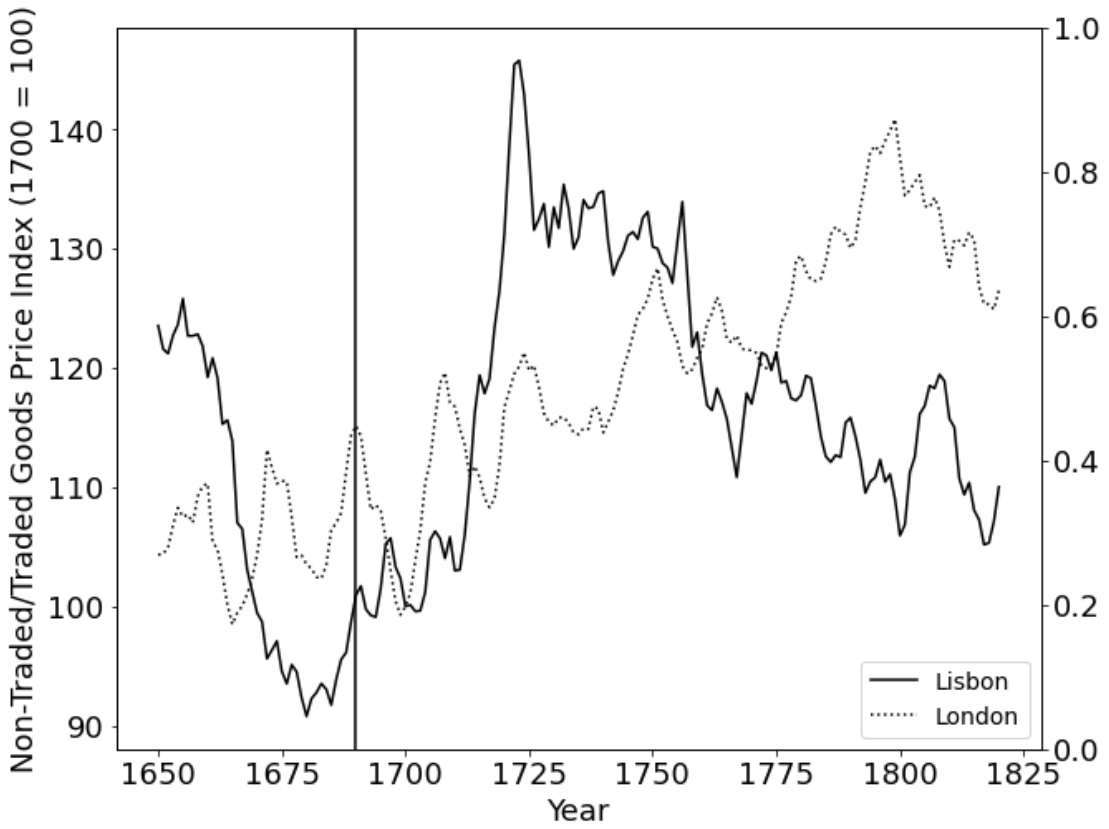


Figure B.9: Ratio of Non-Traded to Traded Price Indices for Lisbon and London. London price data from Allen (2001).

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

Figure B.10: Traded and Non-Traded Price Indices for Portugal, 1650–1820 (PWR project). Gold Production in Portuguese Brazil from TePaske (2010).

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

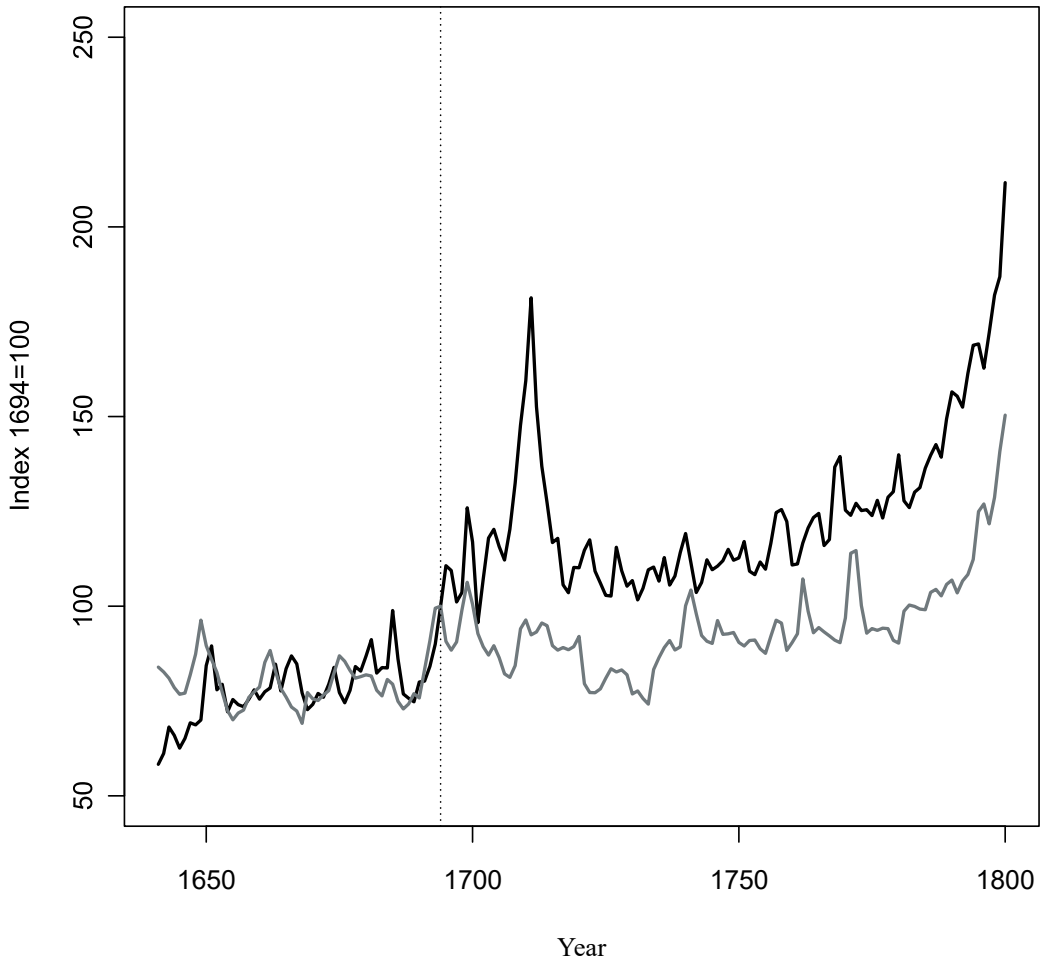


Figure B.11: Simulated (gray) and actual (black) CPI for Portugal, 1640–1800 (Spain and Holland not included).

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

Figure B.12: Simulated (gray) and actual (black) GDP for Portugal, 1640–1800 (Spain and Holland not included).

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

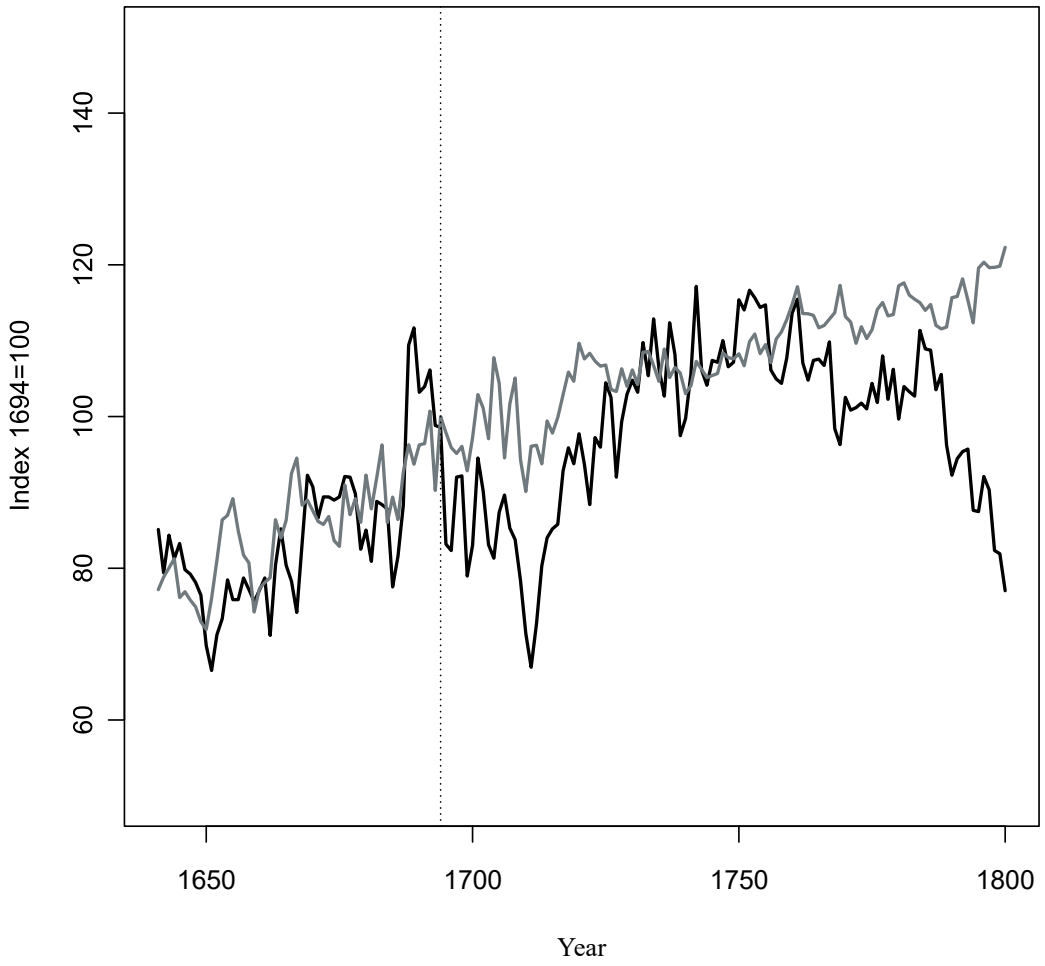


Figure B.13: Simulated (gray) and actual (black) GDP per capita for Portugal, 1640–1800 (Spain and Holland not included).

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

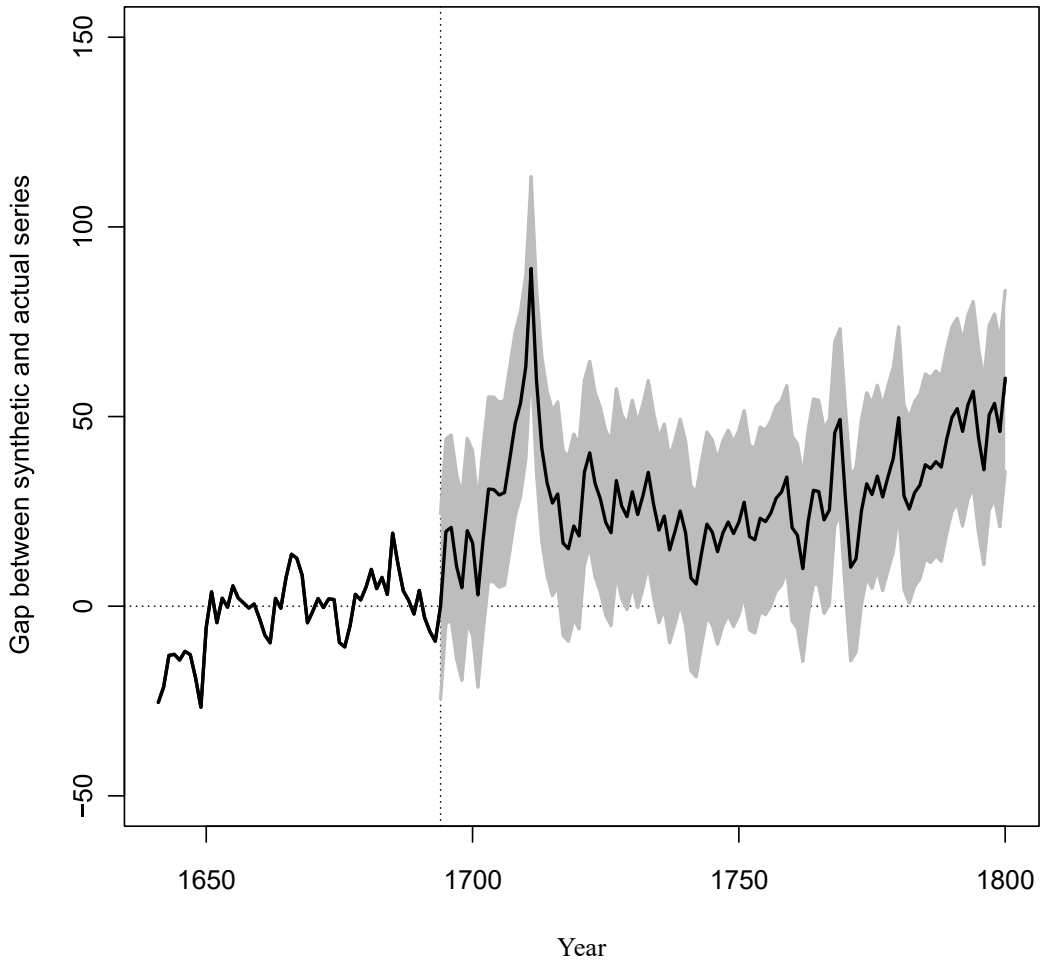


Figure B.14: Gap between simulated and actual CPI series, 1640–1800 (Spain and Holland not included). Gray bands represent 95 percent confidence intervals.

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

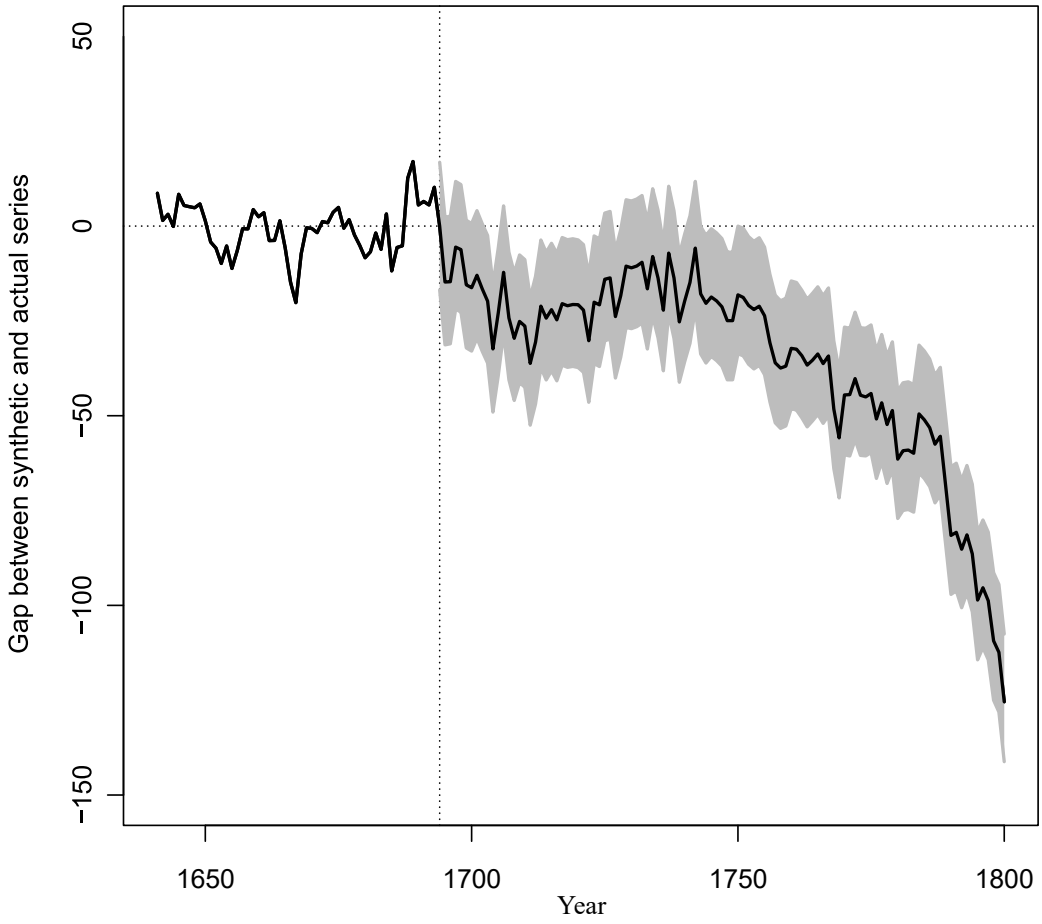


Figure B.15: Gap between simulated and actual GDP series, 1640–1800 (Spain and Holland not included). Gray bands represent 95 percent confidence intervals.

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

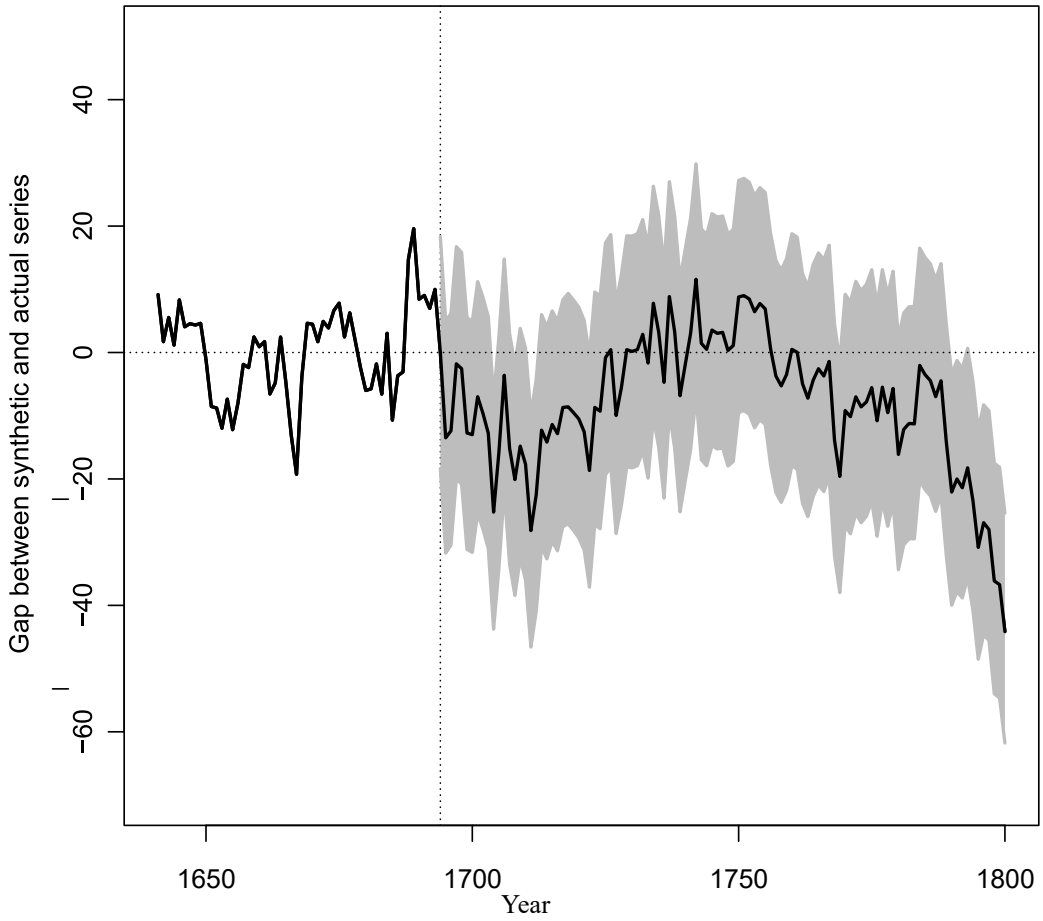


Figure B.16: Gap between simulated and actual GDP per capita series, 1640–1800 (Spain and Holland not included). Gray bands represent 95 percent confidence intervals.

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

Figure B.17: Simulated (gray) and actual (black) GDP for Portugal with population as a covariate, 1640–1800.

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

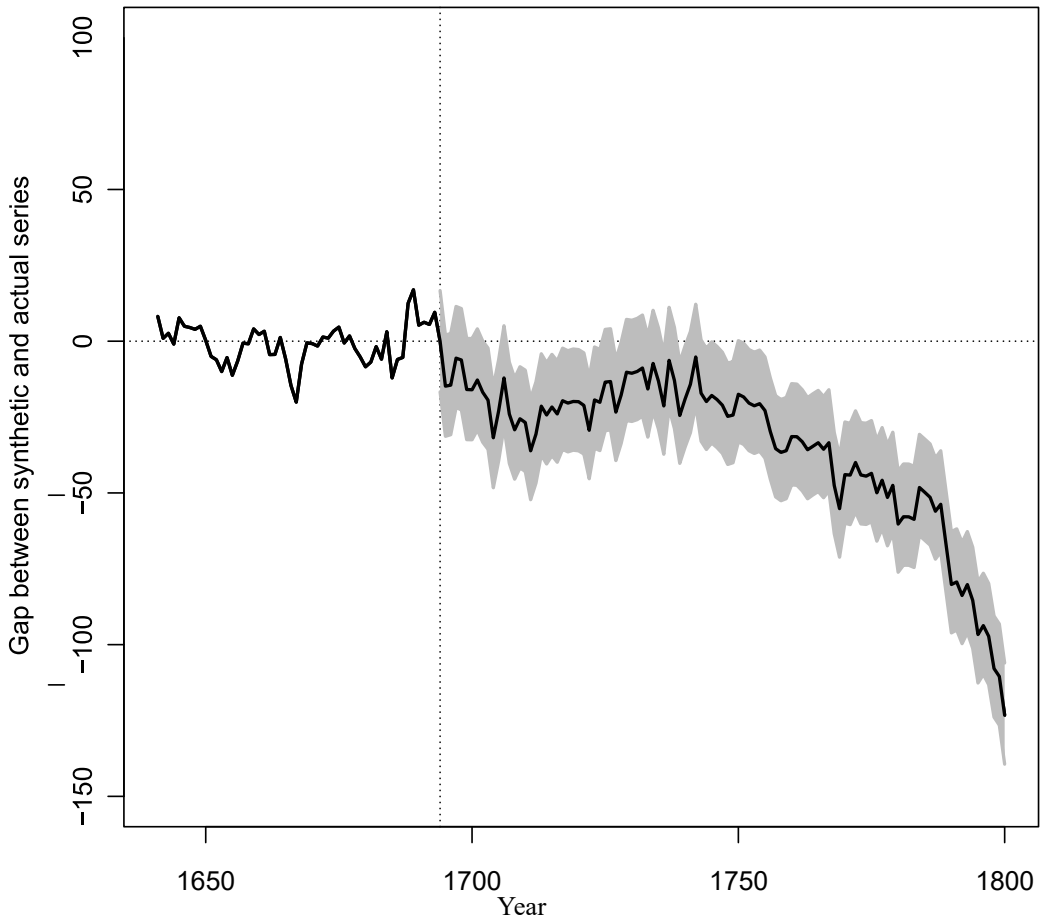


Figure B.18: Gap between simulated and actual GDP series with population as a covariate, 1640–1800. Gray bands represent 95 percent confidence intervals.

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

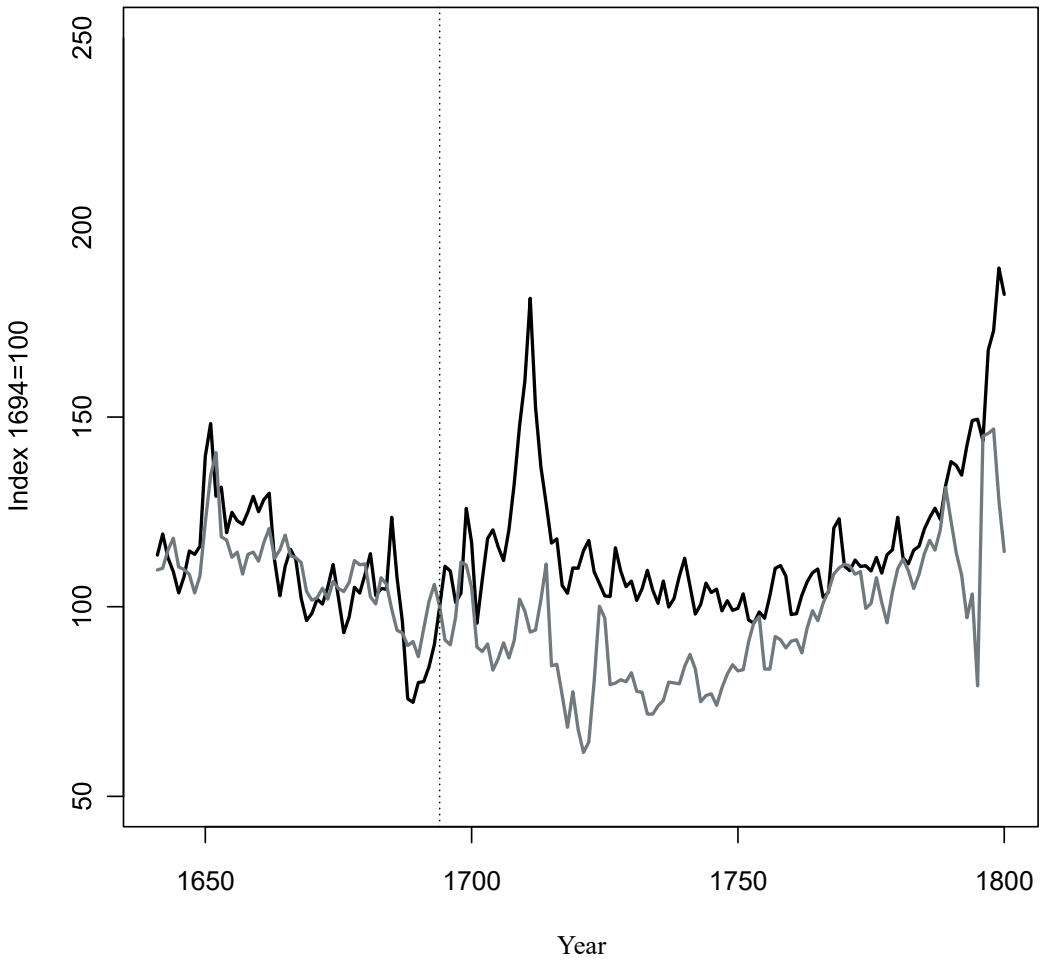


Figure B.19: Simulated (gray) and actual (black) CPI for Portugal in silver units, 1640–1800.

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

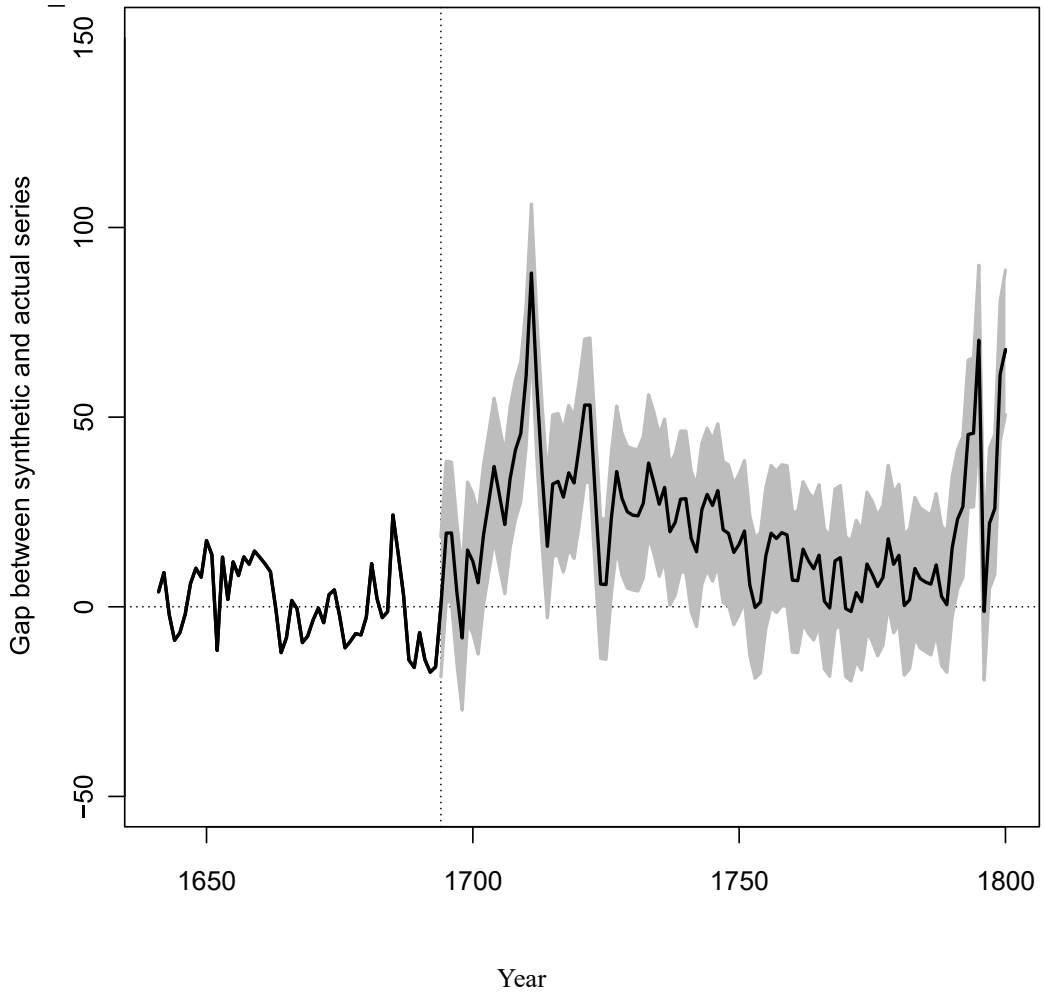


Figure B.20: Gap between simulated and actual CPI series in silver units, 1640–1800. Gray bands represent 95 percent confidence intervals.

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

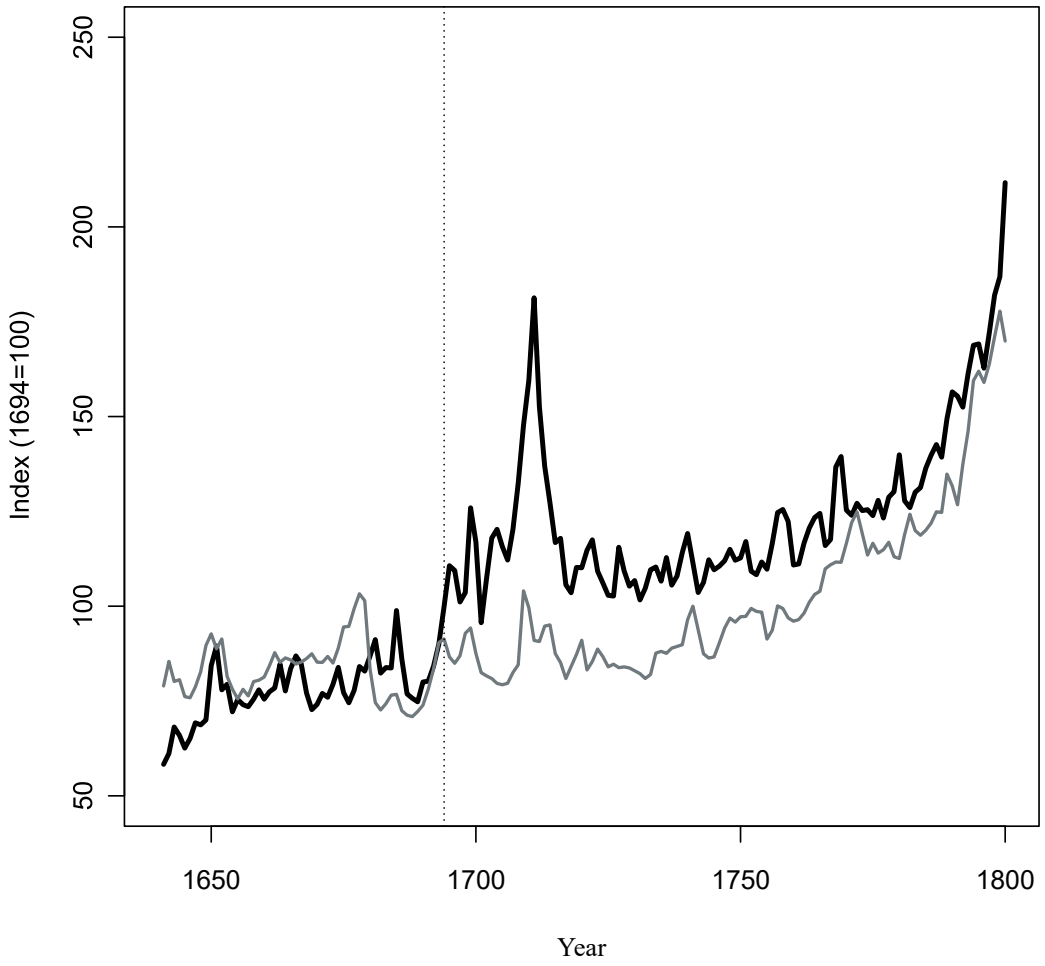


Figure B.21: Simulated (gray) and actual (black) CPI for Portugal, 1640–1800, where the 'simulation' is simply an unweighted mean of GDP per capita among donor countries. Indexed to 1641 for easy comparison of series.

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

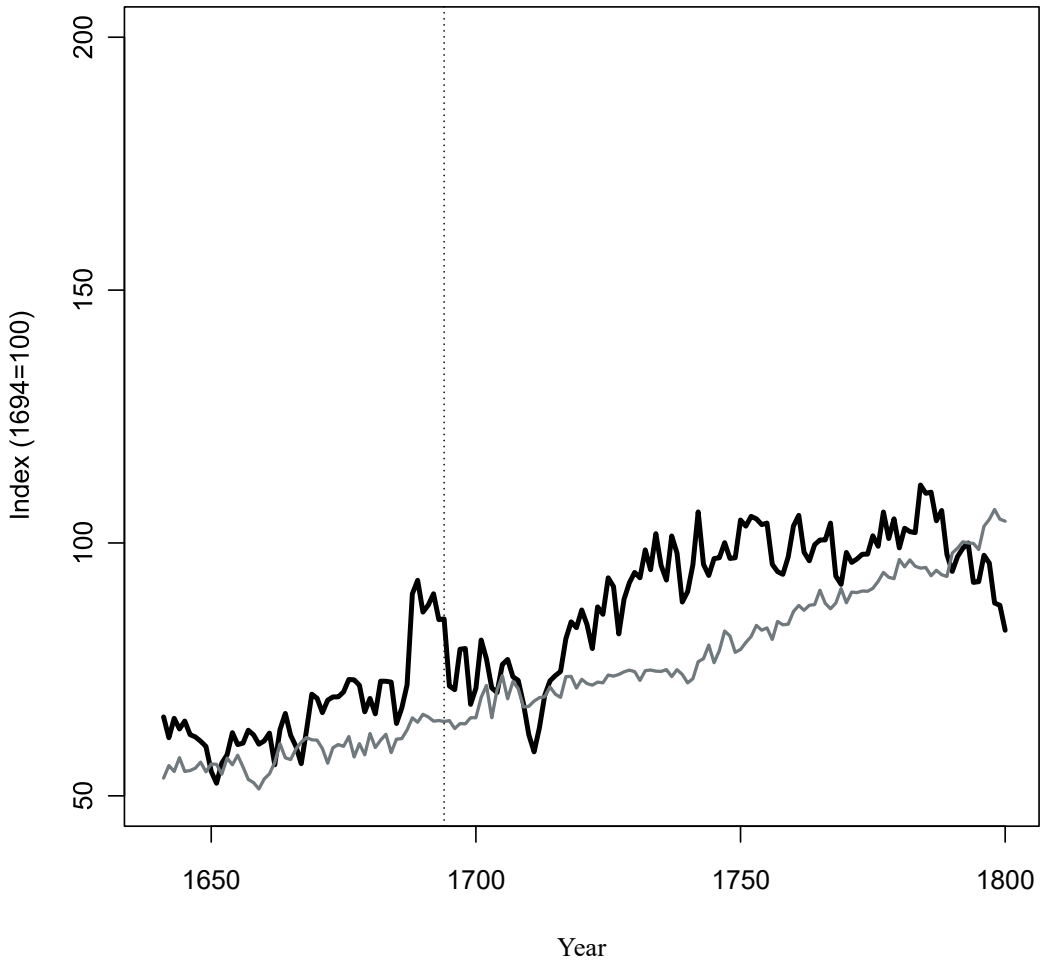


Figure B.22: Simulated (gray) and actual (black) GDP for Portugal, 1640–1800, where the simulation is simply an unweighted mean of GDP per capita among donor countries. Indexed to 1640 for easy comparison of series.

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

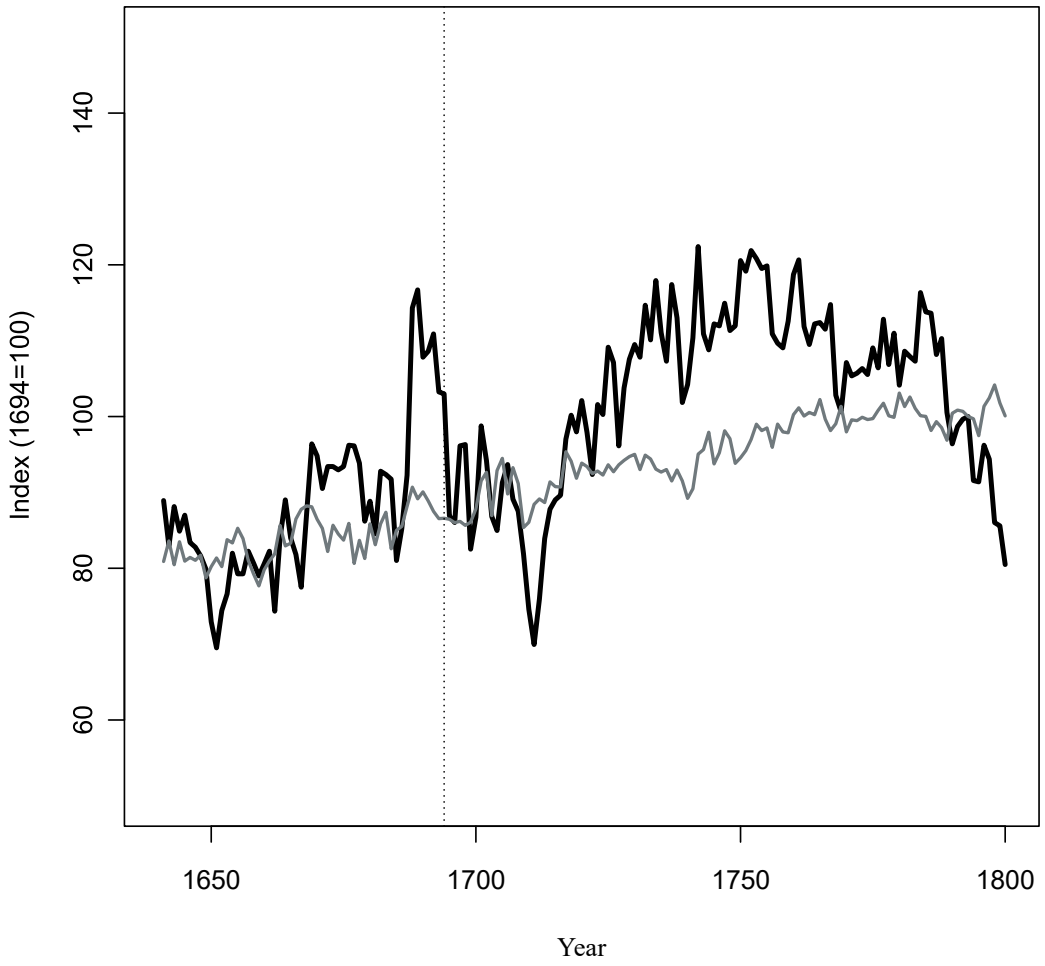


Figure B.23: Simulated (gray) and actual (black) GDP per capita for Portugal, 1640–1800, where the simulation is simply an unweighted mean of GDP per capita among donor countries. Indexed to 1640 for easy comparison of series.

Note: The vertical line in 1694 marks the approximate beginning of gold imports to Portugal.

	Private		Public	
	Nominal	Real	Nominal	Real
1720-1724	13,290	13,290	2,118	2,118
1725-1729	18,807	20,136	6,403	6,856
1730-1734	14,257	14,707	6,764	6,978
1735-1739	15,948	16,475	3,456	3,570
1740-1744	23,621	21,829	5,835	5,392
1745-1749	23,766	23,878	2,397	2,408
1750-1754	21,331	20,839	4,912	4,799
1755-1759	16,356	16,412	4,880	4,897
1760-1764	12,212	12,130	6,192	6,151
1765-1769	13,306	11,773	6,406	5,668
1770-1774	12,443	10,935	3,015	2,649
1775-1779	9,427	8,380	1,285	1,142
1780-1784	4,688	3,690	2,313	1,821
1785-1789	873	705	780	630
1790-1794	791	557	519	365
1795-1799	3,661	2,384	1,321	860
1800-1804	6,303	3,279	1,369	712

Table B.1: Remittances of Gold to Portugal, in millions of réis (real values are in constant 1720 réis). Sources: for the nominal values, Costa et al. (2013), reprinted in Costa et al. (2016, p. 205); for the conversion to real values, we used the price level index of Palma and Reis (2019).

School	Year Founded
Colégio de Jesus de Coimbra	1542
Colégio do Espírito Santo de Évora	1551
Colégio de Santo Antão de Lisboa	1553
Colégio das Artes de Coimbra	1555
Colégio de S. Paulo de Braga	1560
Colégio de S. Lourenço do Porto	1560
Colégio de Jesus de Bragança	1561
Colégio de S. Manços de Évora	1563
Colégio de S. João Evangelista da Madeira	1570
Colégio da Ascensão de Angra	1570
Colégio da Purificação de Évora	1577
Colégio da Madre de Deus de Évora	1583
Seminário de S. Patrício de Lisboa	1590
Colégio de Todos os Santos de Ponta Delgada	1591
Colégio de Santiago de Faro	1599
Colégio de S. Sebastião de Portalegre	1605
Colégio de Nª Sª da Conceição de Santarém	1621
Colégio de Santiago de Elvas	1644
Colégio de S. Francisco Xavier do Faial	1652
Colégio de S. Francisco Xavier de Setúbal	1655
Colégio de S. Francisco Xavier de Portimão	1660
Colégio de S. Francisco Xavier de Beja	1670
Colégio de S. Francisco Xavier de Lisboa	1677
Seminário dos Santos Reis de Vila Viçosa	1735
Colégio da Santíssima Trindade de Gouveia	1739

Table B.2: Portuguese Jesuit Schools in 1759. (Romeiras and Leitão, 2022)

Note: some of these schools had more than 1000 students (Santo Antão in Lisbon had 2500–3000), while even the smallest had several hundred. In addition, the Jesuits had one University (Évora), 2 novitiate homes, 2 professed houses, and 18 student halls. All this evidence indicates that the Romeiras and Leitão (2022) 20,000 figure for total number of students is a good approximation.

Country	CPI	GDP	GDP per capita
England	0.3447858544	0.6480259287	0.558349731
Italy	-0.0019367850	0.0003098356	-0.003613120
Holland	0.0004279600	0.0628412055	0.179271034
Germany	0.6576323497	0.3103989365	-0.002034762
France	0.0006382585	-0.0308490630	0.078166484
Spain	-0.0015476376	0.0092731585	0.189860633

Table B.3: Generated weights for the augmented synthetic control method

Country	CPI	GDP	GDP per capita
England	0.349591138	0.645009901	0.629040708
Italy	-0.017179219	0.008203033	0.164677046
Germany	0.664109054	0.373086137	0.201623413
France	0.003479029	-0.026299069	0.004658833

Table B.4: Generated weights for the Augmented Synthetic Control Method (alternative with Spain and Holland not included)

	Wheat	Maize	Meat	Eggs	Hens	Wine	Olive Oil	Fuel	Linen	Candle	Soap
1527–1600	89	78	63	51	71	86	74	71	50	36	29
1601–1700	100	100	100	99	100	100	100	100	96	89	79
1701–1800	100	100	100	100	100	100	100	100	91	88	62
1801–1825	100	100	100	100	100	100	100	100	100	100	78

Table B.5: Data coverage for the main goods of our series

Appendix References

Allen, R. C. "The Great Divergence in European Wages and Prices from the Middle Ages to the First World War." *Explorations in Economic History* 38, no. 4 (2001): 411–447.

Charotti, C., Palma, N., and Santos, J. P. "American Treasure and the Decline of Spain." CEPR Discussion Paper, 2022.

Corden, W. M. and J. P. Neary. "Booming Sector and De-Industrialisation in a Small Open Economy." *The Economic Journal* 92 (1982): 825–848.

Costa, L., P. Lains, and S. Münch Miranda. *An Economic History of Portugal, 1143-2010*. Cambridge: Cambridge University Press, 2016.

Costa, L. F., M. M. Rocha, and R. M. d. Sousa. *O Ouro do Brasil*. Imprensa Nacional-Casa da Moeda, 2013.

Drelichman, M. "The Curse of Moctezuma: American Silver and the Dutch Disease." *Explorations in Economic History* 42 (2005a): 349–380.

———. "All that Glitters: Precious Metals, Rent Seeking and the Decline of Spain." *European Review of Economic History* 9, no. 3 (2005b): 313–336.

Hamilton, E. J. *American treasure and the price revolution in Spain, 1501-1650*. Harvard University Press, 1934

Henriques, A. and N. Palma. "Comparative European Institutions and the Little Divergence, 1385-1800." *Journal of Economic Growth* 28 (2023): 259–294.

Krugman, P. "The Narrow Moving Band, the Dutch Disease, and the Competitive Consequences of Mrs. Thatcher: Notes on Trade in the Presence of Dynamic Scale Economies." *Journal of Development Economics* 27 (1987): 41–55.

Matsuyama, K. "Agricultural Productivity, Comparative Advantage, and Economic Growth." *Journal of Economic Theory* 58 (1992): 317–334.

Neto, M. S. "Conflict and Decline, 1620–1703." In: *An Agrarian History of Portugal, 1000-2000: Economic Development on the European Frontier, 101–131*. Brill, 2017.

Palma, N. "American Precious Metals and Their Consequences for Early Modern Europe." In *Handbook of the History of Money and Currency*, edited by S. Battilossi, Y. Cassis, and K. Yago. Springer, Singapore, 2020.

Palma, N. and J. Reis. "From Convergence to Divergence: Portuguese Economic Growth, 1527–1850." *The Journal of Economic History* 79, no. 2 (2019): 477–506.

Romeiras, F. M. and H. Leitão. "The Rise and Fall of Jesuit Education in Portugal, 1540–1759." Unpublished manuscript, 2022.

Rybczynski, T. M. "Factor Endowment and Relative Commodity Prices." *Economica* 22, no. 88 (1955).

Sachs, J. and A. Warner. "Natural Resource Abundance and Economic Growth." NBER Working Paper, 1995.

Salvado, J. "Repartição Fiscal no Império Luso-Atlântico, 1720-1760." Paper presented at the XXXIX meeting of APHES, Faro, 2019a.

Salvado, J. P. "The Rise and Fall of a Lisbon Family Business, 1710–1773: The Case of the House of Torres." *Itinerario* 43, no. 1 (2019b): 146–172.

Silva, J. *Collecção Chronologica da Legislação Portugueza Compilada e Anotada desde 1603*. Lisboa: Imprensa de J. J. de Andrade e Silva, 1856.

Stein, S. J. and B. H. Stein. *Silver, Trade, and War: Spain and America in the Making of Early Modern Europe*. John Hopkins University Press, 2000.

TePaske, J. J. *A New World of Gold and Silver*. Brill, 2010.