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The Fruits of El Dorado: The Global Impact of American Precious Metals*

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Abstract

The quest for precious metals and trade routes during the early modern period fundamentally changed the world. What was the global impact of the large deposits of silver and gold which existed in the Americas? In this chapter, we take a global view. We find that in Europe, England and the Netherlands benefited the most. By contrast, the colonizers par excellence, Spain and Portugal, were unable to profit from their colonial expansion. In Latin America, the exploitation of precious mineral resources enabled the geographic expansion of the empire. The direct impact on other parts of the world was negligible; but the long-term political consequences of European presence shaped the world as we know it today.

JEL Codes: N50, O43, Q33, F54

Keywords: Global history, early modern period, Spanish empire, European little divergence, counterfactual history

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1. Introduction

"Behold rich lands! May you know how to govern them well!"

—Hernández Puertocarrero to Cortés in 1519 (Díaz del Castillo 2003, p. 63)

The quest for riches shaped the colonization of the "New World". How did the discovery of large deposits of gold and silver affect the world economy? Many volumes have looked into different aspects and consequences of the phenomenal wave of precious metals that came out of Latin America following the Conquest. The long-run consequences were not the same everywhere. Our task in the present paper is to present a global view.

In Western Europe, the colonizers *par excellence* – Spain and Portugal – suffered negative consequences in the long run. The Spanish government enjoyed increased revenues, but it squandered those revenues on ultimately unsuccessful European wars. Silver enriched a merchant class in both Spain and Portugal, but both economies suffered from the Dutch disease as a result. More seriously, both countries suffered from the political resource curse, as pervasive rent-seeking distorted state institutions. By contrast, England and the Netherlands benefited from the influx of silver coins, which lowered transaction costs and increased fiscal capacity.

In Latin America, silver was the backbone of the colonial enterprise. The colonizers created a complex infrastructure to maximize the proceeds from mineral extraction. Without precious metals, the extent and depth of the Spanish empire would have paled compared to what actually occurred. The wealth from the metal-rich areas supported the imperial fringes and less affluent regions. Local elites, not the Spanish Crown, benefited most from mining and the subsequent growth. In Brazil, the absence of precious metals in the first two centuries gave rise to a plantation economy, which was overshadowed by the discovery of gold in the early 1690s.

American precious metals travelled far, transforming economies and polities in Asia and Africa. American silver lubricated the wheels of trade in Asia. Europeans were able to enjoy silk and porcelain from China and Japan thanks to silver from Latin America.

Mining prosperity in America also fueled the demand for African slaves, contributing the largest involuntary migration in history.[1]

In this paper, we look into the role and impact of precious metals on economic development. We start with the colonizers *par excellence*, Spain and Portugal. We then turn our attention to other European countries. We then move to detail how the exploitation of precious metals shaped Latin America. Finally, we briefly consider the experience of Asia and Africa.

2. Impact on European economies

The trans-Atlantic mining economy consisted largely of silver and gold flowing from the Western Hemisphere. While there was some trade in iron from Europe (and a substantial mercury trade driven entirely by silver production), the overwhelming movement consisted of silver leaving American mines for Europe and China. Somewhere between 85,000 and 150,000 metric tons of silver were produced between 1500 and 1800 in Spanish America alone, although sources vary as to the exact amount (TePaske 2010; Barret 1990, p. 236). Whatever the exact amount, the quantities of silver and gold produced in the Americas during the early modern era dwarfed the combined production of the rest of the world (Barret 1990).

Trade between the colonies and the metropolis consisted of American production in exchange for European goods. In terms of the balance of payments, most of the action were profits remitted in silver and gold by Iberian merchants and, to a lesser extent, tax payments levied by the Portuguese and Spanish imperial governments. In both cases, those remittances mostly took the form of physical shipments of coins across the Atlantic, with all the associated security costs that implied. From early on the Crown needed to protect against unauthorized smuggling and state-sponsored piracy by other European powers (e.g. TePaske 2010, p. 214).

The influx of silver affected Western Europe via three channels. The first was the fiscal impact on the Spanish imperial government. In principle, revenues from the Americas could have subsidized the Crown and thereby given Spain an advantage in its bat-

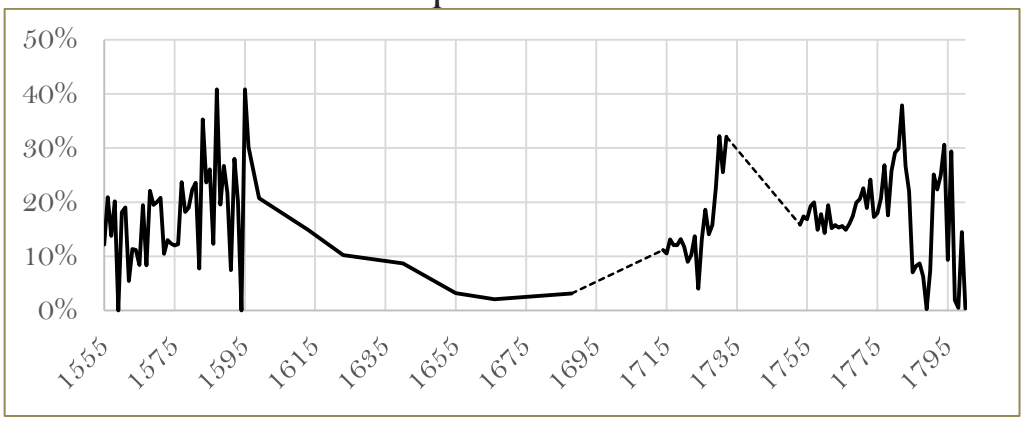
[1] Later the need for plantation labor would overtake the smaller demand driven by American elites, but mining sustained the early trans-Atlantic slave trade.

tles to control much of Europe. The second channel was via short and medium-term stimuli to various European economies. Spain (and to a lesser extent Portugal) would be presumed to benefit from the influx of silver, but the increase in demand also produced secondary effects in other European economies. The third would be the longer-term negative effects of the natural resource boom. Those effects would operate through two sub-channels: (1) a loss of competitiveness in other industries via the Dutch disease, and (2) a distortion of political institutions caused by excessive rent-seeking. Let us examine the above channels in turn.

2.1 Fiscal revenue

The silver resources of the New World were not directly exploited by the Spanish state. Rather, the mines were operated by private entrepreneurs. Anyone who discovered minerals could stake a claim of 160 by 80 *varas* (approximately 440 by 220 feet) along or across the vein, and could additionally pursue a continuous vein outside the claim (Lacy 1987, pp. 2-3; see also Elliott 2006, p. 93). Miners had to continuously work their claims and submit production to the treasury for minting and to pay taxes. Taxes consisted of a royalty of at most 20% (the *quinto*), plus additional (but much smaller) assaying, brassage, and seigniorage taxes related to the minting of coins.[2]

Figure 1: Tax revenue from precious metals production as a share of Spanish imperial revenue



Sources: 1555-96 from Drelichman and Voth (2010), Appendix 1; 1599-1688: Ucendo and Lanza García (2020), 1714-1732: Jurado Sánchez (2008), 1753-1788: Gelabert (1999). Loan proceeds are not included as revenues. Additionally, notice that this only includes direct taxes over metals production, hence excluding other economic activities which appeared as a consequence of that industry.

[2] Mining taxes were initially 1/5 in all Spanish colonies. Mexico negotiated a decrease to 1/10 in 1548, while Peru only obtained that benefit in 1736 (Garner 1988, p. 906). In Brazil, mining taxes remained at 1/5 throughout colonial times, except for a period of about a decade during the mid-eighteenth century, when they were based on the number of slaves used in the mines.

These revenues formed a significant portion of the resources available to the Spanish Crown (Figure 1). Over the course of the colonial era, they averaged approximately a fifth of the empire's fiscal resources. The problem for the Crown was that the revenue stream from the Americas was exceedingly volatile. Production disruptions, enemy naval actions, local labor shortages, access to key raw materials (especially mercury), the vagaries of geology, and changing demands on colonial treasuries (which were also financed by silver) all led to large swings in the silver tax revenue available to the imperial government.

Inasmuch as colonial resources enabled the Spanish Empire to conduct its large-scale military campaigns across Europe, the impact of colonial silver on the Old World was profound indeed. That said, the scale of the Crown's silver income remitted from the New World was not large as a share of the Spanish economy. Silver tax remittances only look large as a share of imperial revenues because the Spanish government was so inefficient at raising revenues from its European territories.[3] Using the lower bound on Spanish GDP from Nogal and Prados de Escosura (2007), Spanish public spending averaged roughly 2.7% of the country's GDP in the 16th century and it did not grow appreciably thereafter (Drelichman and Voth 2010, p. 835). As we will discuss below, it is plausible that a Spanish Empire devoid of its access to American silver could have developed alternative revenue sources.

2.2 Short and medium-term effects

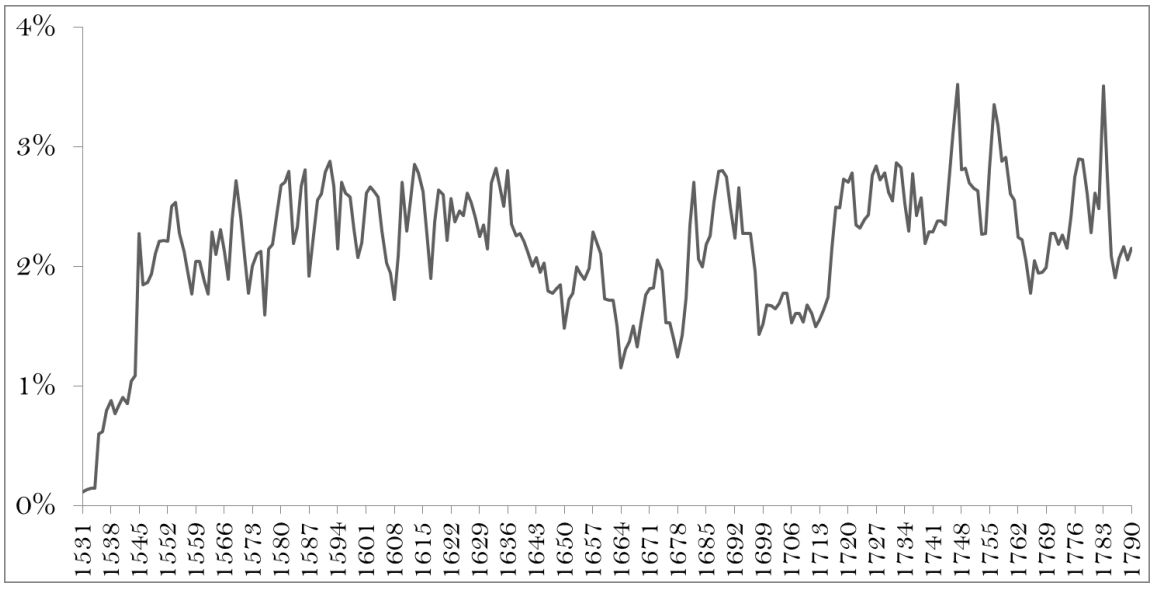
Most of the revenue from silver and gold production did not accrue to the Spanish state. Rather, it remained in the hands of private miners and merchants. Total production corresponded to a roughly constant 2% of Spain's nominal GDP (see Figure 2). Not all of this arrived in Spain, as much was retained in the Americas or shipped directly to China (via Manila and the galleon trade). There is a debate concerning the exact quantities that went to Europe, but whichever figures one adopts, the share of

[3] In practice, the lion's share of the European revenue collected by the Spanish imperial government came from Castile. Aragón contributed taxes based on extremely ligh feudal levies dating from the medieval period. The Austrian territories paid little before 1556 and nothing thereafter. Italian revenues were eaten up by local expenses and the Netherlands only paid for imperial expenses if local parliaments agreed. Finally, the nobility throughout the empire was mostly exempt from taxation. After desultory attempts to raise revenues from the Netherlands and Italy, Emperor Charles V made the somewhat astonishing statement in 1540 that "I cannot be sustained except for my realms in Spain." See Reyna (1999): 32-33.

silver remittances flowing back to Spain during the early modern period was never less than half of total American production.[4]

Did the inflows of American silver stimulate the Spanish economy? It is now possible to evaluate the effects of the discovery of silver and gold in the Americas on the Iberian economies thanks to three new interdependent research developments. The first is a series of new datasets on prices and GDP. The second is a set of improved econometric estimation methodologies (Jordà 2005). The third is the identification of historical events that allow for credible identification strategies.

Figure 2: Precious metal production in the Americas as share of Spanish GDP



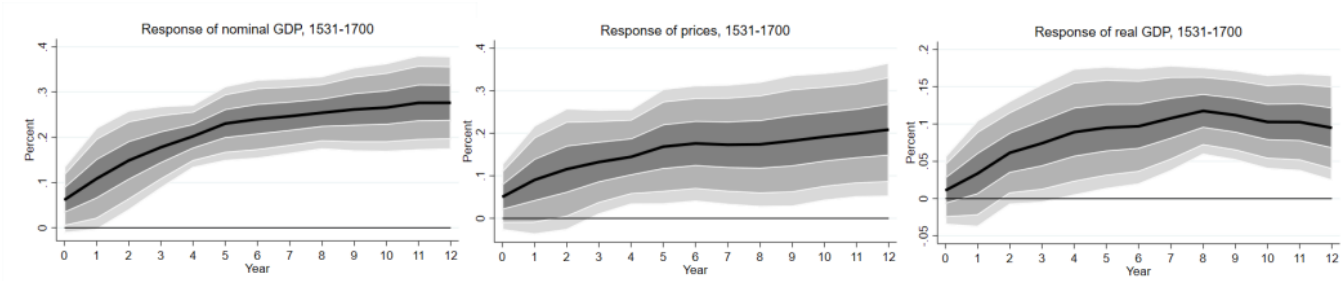
Source: the appendix of Palma (2019a).

One way to identify the effects on the European economy is to explore exogenous variations in the timing of discovery of new mines and the intensity of production (Palma 2019a). Mining discoveries were not driven by European events but by American geology and colonial entrepreneurship. By focusing on a source of variation exogenous to Europe's economy – but which can still influence it – this type of strategy is immune to the argument that it was population, not American silver, which led to the observable price inflation in Europe (see Munro 2003 for a critical review).

[4] Hamilton (1934), Morineau (2009), and González (1996) present alternative estimates for arrivals to Seville and Cádiz. For the case of Brazilian gold arriving to Portugal, see Costa et al. (2013).

Figure 3 shows the average response of six Western European economies to a (normalized) 1% increase in precious metals production in the Americas relative to the European money stock.[5] The economies included are England, the Netherlands, North and Central Italy, Germany, Spain, and Portugal. Nominal GDP, price levels, and real GDP all respond positively to a silver supply shock. Prices take longer to respond than output. Real output peaks around year 8, roughly 0.1% higher than it would have been. These gains remain in subsequent years; booms are not inevitably followed by busts.

Figure 3. Response of European Nominal GDP, Price level, and real GDP to a 1% increase in precious metals production relative to stock (1531-1700)



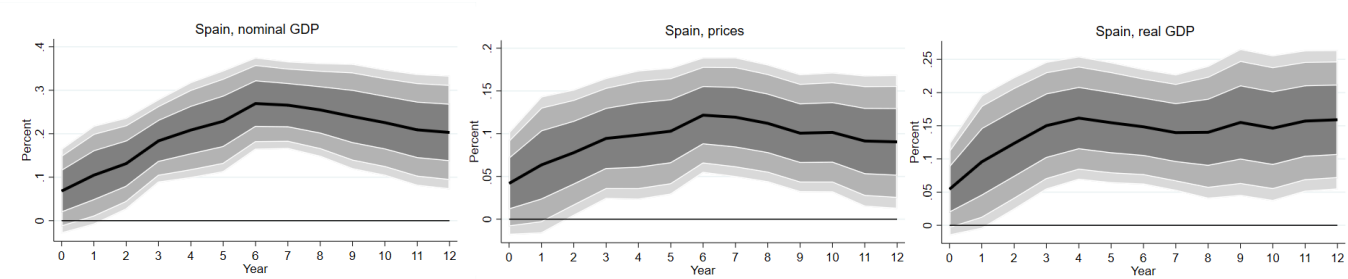
Source: Palma (2019a)
Note: Country fixed effects are included and standard errors are clustered by country. One standard deviation, 90% and 95% confidence intervals are shown. The regressions control for four lags of the dependent variable, country-specific quadratic trends, four lags of temperature and a dummy variable indicating whether a country is at war with Spain in a given year.

Did the Spanish economy react differently from other European ones? There are reasons to believe that it might have. After all, influxes of silver hit its economy first. Moreover, those influxes consisted both of remitted profits and tax revenues. The Spanish economy might therefore be reasonably expected to respond more positively to the silver influxes than other European economies. Figure 4 shows the response of the Spanish economy to a 1% increase in precious metals production in the Americas. Prices again take longer to respond than output. Real output therefore rises, peaking around year 4 about 0.15% higher than it otherwise would have been. Output remains high in subsequent years. In short, the peak effect for real GDP in Spain occurs twice as fast as in the full sample and the size of the effect is 50% larger. The effect on Spanish prices also peaks earlier, but the magnitude is smaller.

[5] The baseline period does not go beyond 1700 due to the lack of annual gold production data for the eighteenth century. Results are, however, qualitatively similar when including that century.

The smaller effect on Spanish price levels may be surprising and so warrants additional explanation. First, most of the silver coins did not stay in Spain. The initial influx caused Spanish prices to rise faster, but that in turn pushed coins out of Spain via reduced exports, additional imports and increased military payments abroad. Secondly, prices are in monetary units, not silver units (to avoid the possibility of endogenous debasement responses). When measured in silver units, prices in Spain did rise more than elsewhere (Allen 2001, Karaman et al 2019; Palma 2019b). Much of this rise in Spanish prices (felt first in Andalusia) spilled over to nearby Portugal (e.g. Magalhães 2018, pp. 163-4), which also experienced considerable inflation, particularly when expressed in silver (Karaman et al. 2019; Palma and Reis 2019).

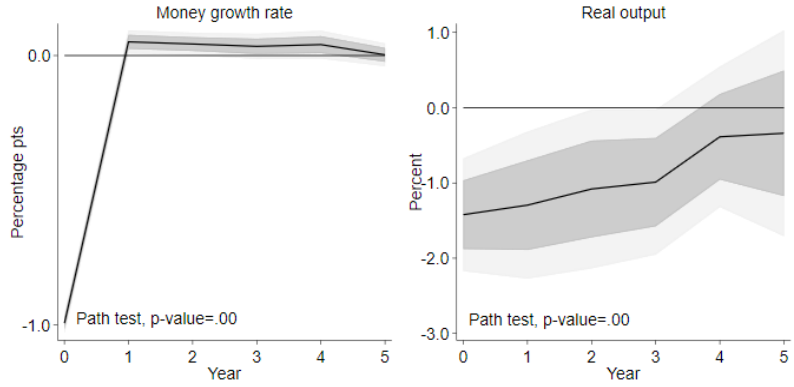
Figure 4. Response of Spanish Nominal GDP, Price levels, and real GDP to a 1% increase in precious metals production relative to stock (1531-1700)



Source: The appendix to Palma (2019a)
Note: Newey-West standard errors are employed. One standard deviation, 90% and 95% confidence intervals are shown. The regressions control for country-specific quadratic trends and two lags of the dependent variable.

It is possible to run the above experiment in reverse when silver fleets were partly shipwrecked or otherwise destroyed. This generates exogenous negative shocks in the growth of the Spanish money supply. Figure 5 shows that a one percentage point reduction in the Spanish money growth rate caused a drop in real output which persisted for several years, with output remaining 1% lower three years later.

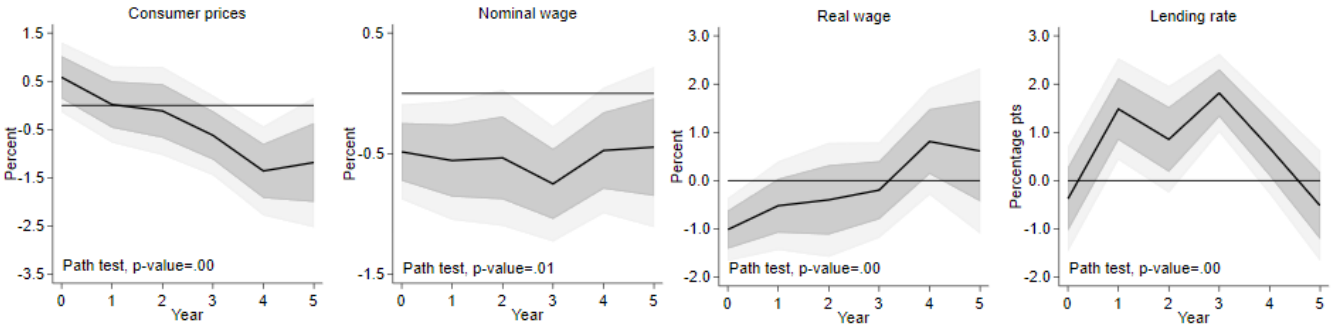
Figure 5. Real response of the Spanish economy to a negative 1 percentage point money growth shock



Source: Brzezinski et al. (2019).
Note: Gray areas denote one standard deviation and 90% confidence bands.

What were the mechanisms by which GDP fell when the silver supply was reduced? The first mechanism was a permanent fall in the price level, which occurred with a lag: five years later, prices were 1% lower than they would have been otherwise. The failure of prices to adjust immediately caused part of the fall in GDP. The second mechanism was a temporary tightening of credit markets, with the lending rate more than one percentage points higher one year later. The net effect was the result of a combination of nominal rigidities – prices and wages failing to respond at impact – and credit frictions, with a wave of bankruptcies observed as a consequence of the failure of silver to arrive (see Figure 6).

Figure 6. Transmission channels: Response to a negative 1 percentage point of money growth shock

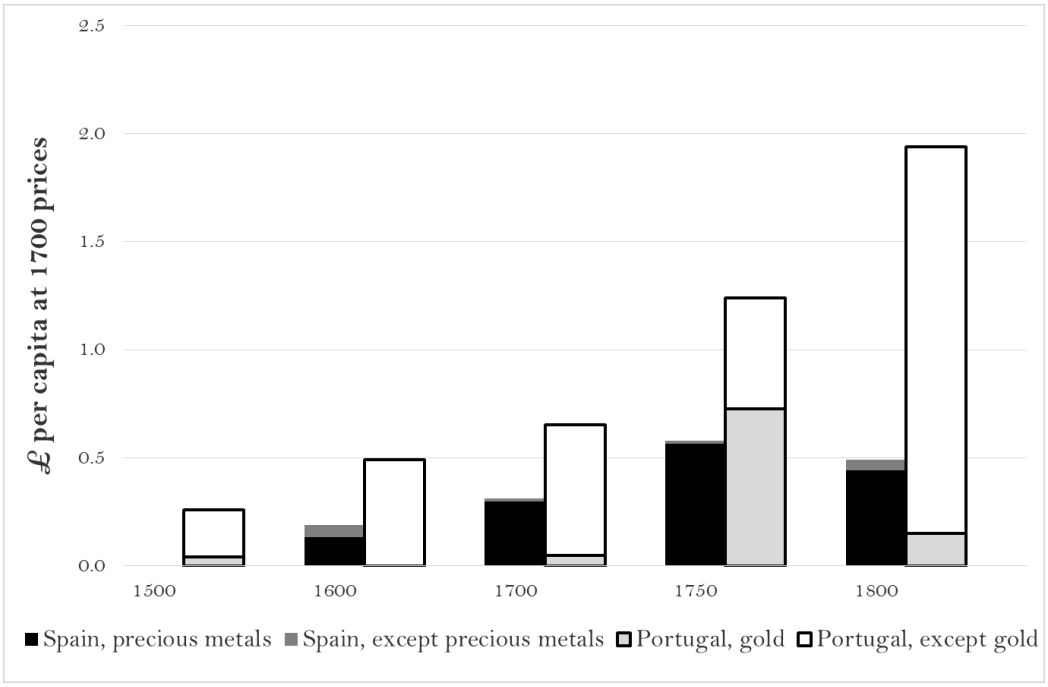


Source: Brzezinski et al. (2019)
Note: Gray areas denote one standard deviation and 90% confidence bands.

2.3 Long-term consequences for Iberia

Evidence of short-term benefits does not imply that in the long run the precious metal inflows were good for the Iberian economies. The Spanish economy entered a period of sustained decline and stagnation over the early modern period, and our view is that this can be attributed to a large degree to the negative consequences from large quantities of precious metals from the Americas – the value of which was much larger than other trade (Figure 7). As a consequence, Spain suffered from Dutch disease and the political form of the resource curse. Dutch disease meant that inflation in silver prices led to a loss of competitiveness of the national industry. In a related process, the influx of precious metals led to widespread rent-seeking, as various groups – with special emphasis on the non-tradable sector such as local religious services, construction, and merchant groups associated with the silver trade lobbying the government – tried to get their share of the bonanza, and progressively weakened Spanish institutions.

Figure 7. Per capita inflow of precious metals and trade, in 1700 £ per capita



Source: Costa, Palma and Reis (2015).

We start with Dutch disease.[6] Early modern Spanish and European observers did not fail to observe that American treasure was not making Spain as wealthy as it had hoped – and its enemies had feared. On the contrary, after flourishing in the fifteenth and some of the sixteenth century, Spanish industry entered a long period of decline. These impressionistic viewpoints were emphasized in Earl J. Hamilton's work (e.g. Hamilton 1934), and recent scholarship continues to support it (Forsyth and Nicholas 1983, Drelichman 2005a). From 1530 to 1570, when the first large-scale imports of precious metals from the Americas took place, the Spanish economy boomed (Figure 8). A secular decline and stagnation followed.[7] The Spanish wool industry experienced considerable growth in the fifteenth century (Elliott 2002, p. 42), but then collapsed in the sixteenth century. Álvarez-Nogal and Prados de la Escosura (2013, pp. 19-20) describe the effects evocatively:

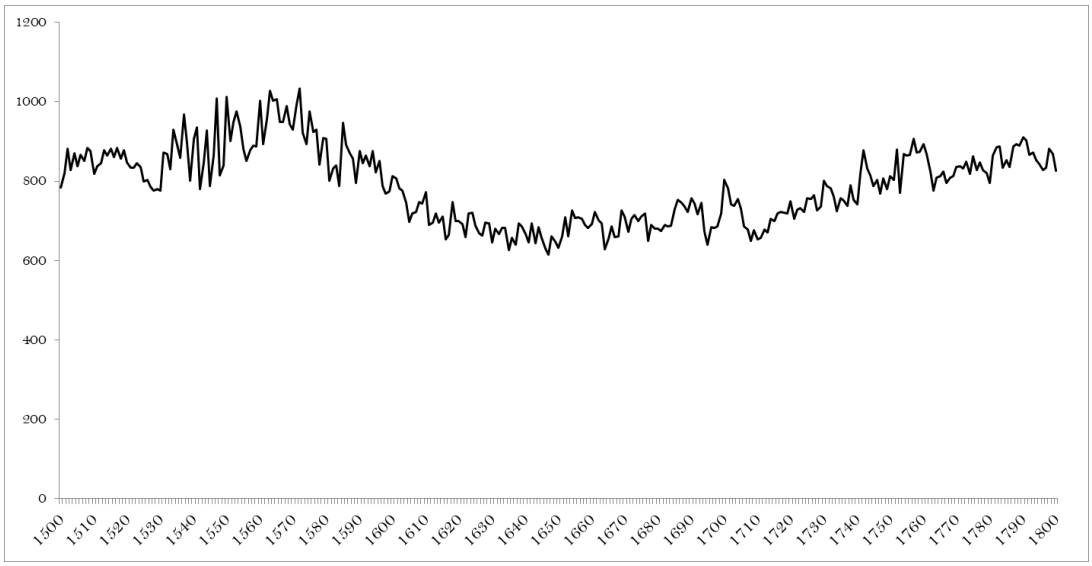
> "American colonization and international trade expansion contributed to the stimulation of economic activity during the 1490s to 1590s [...] The [epoch] ranging from the 1600s to the 1800s, had significantly different features, and the foundations of growth of the previous epoch—wool, trade, and urban activity—would no longer be in place [...] The decline in wool exports after 1570 and the contraction in the purchasing power of American silver from the early seventeenth century forced an inward-looking re-orientation of the Spanish economy. The Dutch disease brought by American silver apparently reinforced low productivity and competitiveness in tradable production [...] Growing taxation from 1575 led towns to increase their indebtedness, which had a negative effect on urban activity, at the time of a decline in wool exports and the disappearance of the Medina del Campo fair. The fiscal system collapsed, as did cities."

The relative price of Spanish nontraded goods began escalating between 1545 and 1550, right when American silver production accelerated. Peninsular Spain became a net importer of commodities that it had formerly exported—including leather and iron goods—and started to import food staples that it had never before imported, such as corn and rice (Drelichman 2005a, p. 8).

[6] It is worth noting that the Iberian economies did not perform much worse England until 1650 (Henriques and Palma 2019; Álvarez Nogal and Prados de la Escosura 2013; Broadberry et al. 2015; Palma and Reis 2019).

[7] These patterns confirm the views of Hamilton (1934, pp. 44, 299). Note that 150 years later, Portugal's economy would follow a similar trend with the discovery of gold mines in Brazil in 1690s (Palma and Reis 2019; Palma 2019b).

Figure 8. Spain's GDP per capita (in 1990 "international" GK dollars)



Source: Álvarez-Nogal, Prados de la Escosura and Santiago-Caballero (2020).

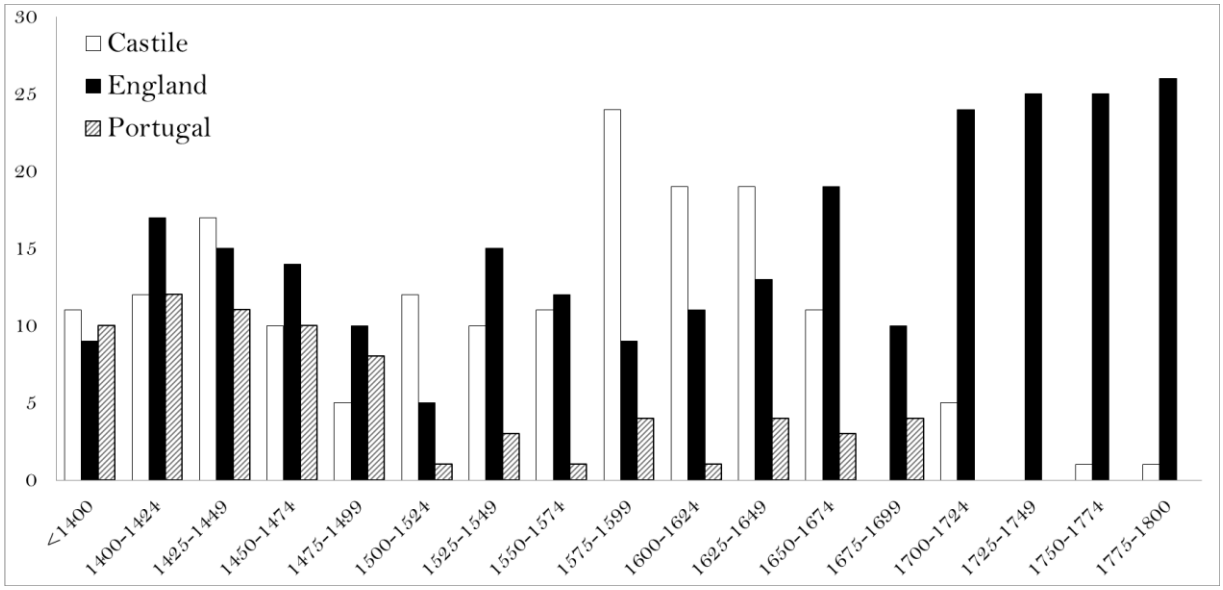
The main alternative explanation for Spain's early modern poor economic performance is that initial conditions were not right for growth at the end of the medieval period. Some believe that Spanish (and, in particular, Castilian) culture was particularly biased towards warfare rather than commerce. This viewpoint seems to have been informed by the comparative experience of American conquest and colonization: in particular, how the Spanish American case compared with the English, French and Dutch territories. The critical differences were that only Spain settled in highly populated areas, and had access to large quantities of precious metals from an early stage. There is no evidence that there was any cultural bias against commerce in either Aragon – heavily involved in medieval Mediterranean trade – or Castile (Elliott 2006, p. 19). Others believe that poor Spanish performance was due to poor initial institutions. Many scholars argue that Iberian political institutions were indeed worse than those of England or the Netherlands by 1500 or earlier (e.g. Ertman 1997, Acemoglu et al. 2005, 2012, Hough and Grier 2015, among others).[8] And it is certainly true that the Iberian economies failed to industrialize or enjoy modern economic growth until the twentieth century.

[8] By Spanish institutions we mean, to be rigorous, Castilian institutions (Castile corresponds to about three-quarters of Spain), though from the early eighteenth century, institutional differences within Spain become considerably less marked. Additionally, it was Castile that served as an institutional blueprint for the Spanish empire (Elliott 2002, 2006). On a similar note, by "the Netherlands" we mean what the territories of what would become the United Provinces, i.e. the Dutch Republic, which – except for matters related to land reclamation – roughly coincides with the territory of the Kingdom of the Netherlands today. This is more than the province of Holland, as it includes regions such as Friesland, Groningen or Utrecht (only excluding the southern territories which would eventually become Belgium).

Our view is that Iberian institutions were not particularly absolutist; certainly, they were not worse than those of England or the Netherlands around 1500 (Henriques and Palma 2019). The earlier literature is impressionistic and influenced by Black Legend (*Leyenda Negra*) propaganda, rather than based on systematic quantitative analysis using contemporary sources. By contrast, Henriques and Palma (2019) build a new dataset which allows for a comparison of institutional quality across England, Spain and Portugal over time. They consider the frequency and nature of parliamentary meetings, the frequency and intensity of extraordinary taxation and coin debasement, and real interest rate spreads on public debt. They find no evidence that the political institutions of Iberia were worse any time before the English Civil War. In Castile, parliaments met about as frequently as in England until the second half of the seventeenth century (see Figure 9). From the rest of the period, their function was mostly ceremonial with sporadic meetings. In Portugal, parliaments met less frequently but continued to curb executive power. In all cases, the parliaments limited the incidence of extraordinary taxes requested by the rulers until 1700 (Henriques and Palma 2019).

Since there was no difference in the quality of institutions of Iberia vis-à-vis England or the Netherlands in 1500, and given that by 1750 there clearly was, something must have happened during the early modern period itself which changed the nature of the institutions. Spain – in particular, Castile – suffered from the political resource curse. This is a situation characterized by state capture from special interests, with consequences for domestic and foreign policy. The special interests were both mercantile (and largely foreign) (Stein and Stein 2000), and internal, associated with the expansion of the non-tradable sector, with an overambitious foreign policy, and with the growth of a tax-sheltered nobility (Drelichman 2005b, 2007, Drelichman and Voth 2008). Spanish parliaments declined because the emperor had no need to ask them for revenues before beginning military adventures. Rather, he could use American silver to finance the commitment of Spanish forces and then dare the Cortes to cut them off. As American presidents later discovered, this was a very effective way of undercutting legislative authority. The parliament later attempted to regain some authority over spending but it never succeeded; after 1663 the few parliaments that were called into sessions were purely ceremonial. In addition, the pressures of war—enabled by American silver—prompted the Spanish state to encourage the activities of the Inquisition and ultimately engage in later rounds of expulsions of converted Jews and Muslims. (Vidal-Robert 2013.)

Figure 9. Years with a parliament meeting



Source: Henriques and Palma (2019)

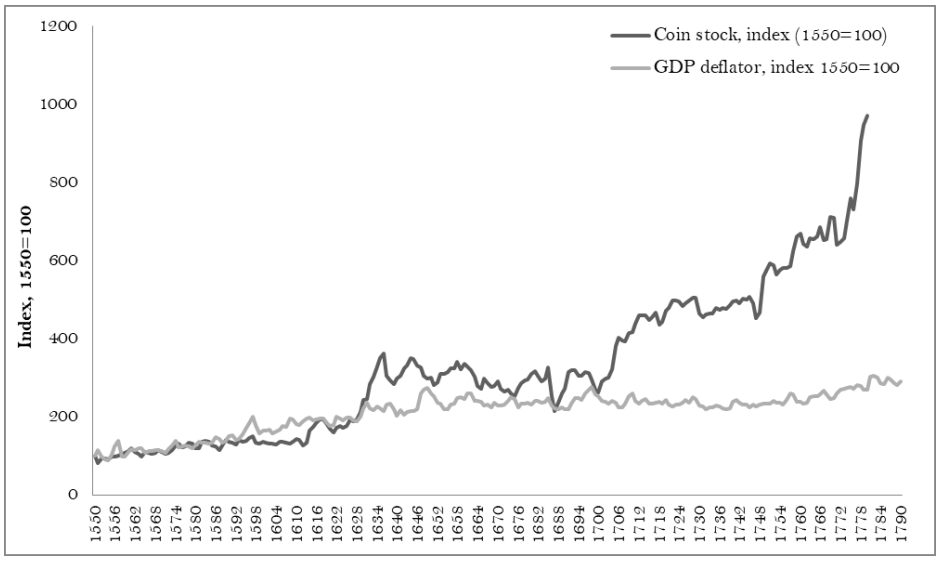
When the Crown needed to convince the Cortes to raise resources from domestic taxation, it was generally capable of doing so. Those efforts were sporadic and easily abandoned, but they were successful. The implication is that the Spanish state could have developed a more efficient fiscal system had it not been for its access to American silver.

The case for the negative impact of precious metals is further supported by the experience of Portugal. This country experienced good economic performance until the mid-eighteenth century (Palma and Reis 2019). Large quantities of gold were found in Brazil from the 1690s. This, as had happened in Spain a century and a half earlier, led to a boom lasting about half a century. Income per capita grew until the 1750s, then entering a period of stagnation approximately from the time of the 1755 earthquake, which was in turn followed by a period of secular decline which continued into the nineteenth century, contrasting with the rise of other European economies at the same time (Palma and Reis 2019; Palma 2019b; Macedo 1982; Boxer 1962, pp. 320-21, 323). As with the case of Spain, there is evidence of state capture and institutional deterioration (Madureira 1997).

2.4 Long-term consequences for other European countries

American precious metals traveled to other European economies. England and the Netherlands benefited the most (other European economies appear to have benefitted less, though more research on this matter is needed). In the Netherlands and England, the influx of precious metals led to gains in income per capita. Contrary to the Quantity Theory of Money, money supply increases did not fully translate into inflation (see Figure 10). With no long-run changes in the velocity of money, the influx of money led to sustained economic growth. No other means existed that could have led to the observed growth in the money supply; debasement was constrained and paper money developed only from the late eighteenth century (O'Brien and Palma 2019).

Figure 10. Coin stock and GDP deflator in England, 1550-1790



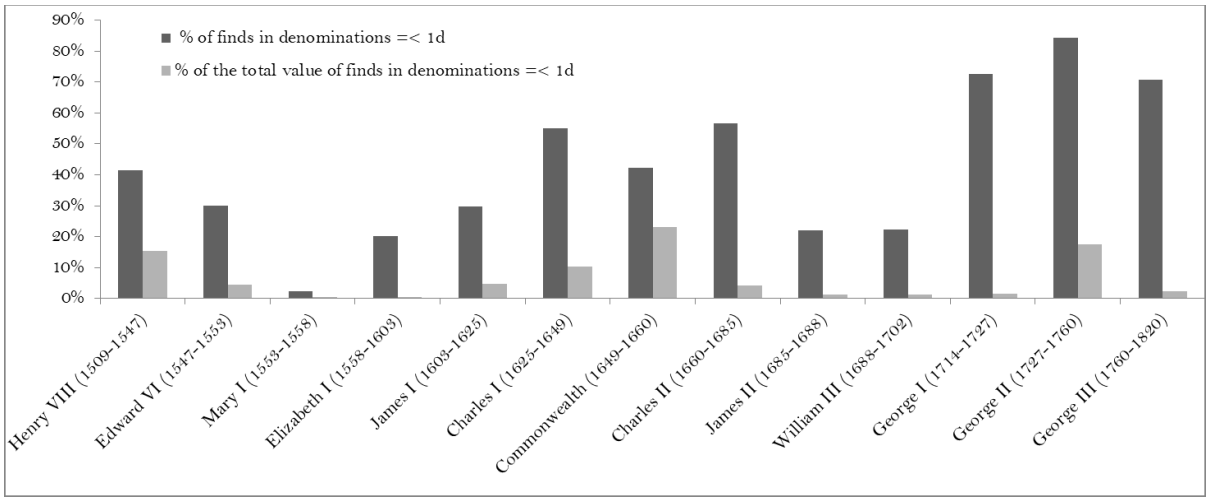
Sources: Palma (2018b) and Broadberry et al. (2015).
Note: England here corresponds to England until 1700 and Britain thereafter.

Monetization greased the wheels of economic activity. From the mid-seventeenth century, England's economy enjoyed deep monetization.[9] First, people had access to an adequate money supply for daily payments as evidenced by the sizable share of smaller change present in the English economy (see Figure 11).[10] Second, by 1630-1670 denominations equal to one hour of waged work existed in large quantities to serve the population (see Figure 12). The widespread availability of money overall and in small change encouraged market participation and facilitated tax collection (Palma 2018b).

[9] Much of the American silver and gold ended up in England, especially after the 1631 Cottington treaty with Spain and the 1703 Methuen treaty with Portugal, both having geopolitical origins which benefited England (Challis 1992, Fisher 1971, Francis 1966, Palma 2018b).
[10] See Lucassen (2014) for the case of the Netherlands.

At the intensive margin, increased market participation meant that people worked additional days and hours (an industrious revolution). At the extensive level, it took the form of structural change and urbanization (deVries 2008; Palma and Silva 2016). This inflection point coincides with England's take-off in the mid-seventeenth century.[11] The expansion in the money supply engendered by American silver had a positive long-run effect on economic growth (Palma 2018b).

Figure 11. Distribution of denominations in England

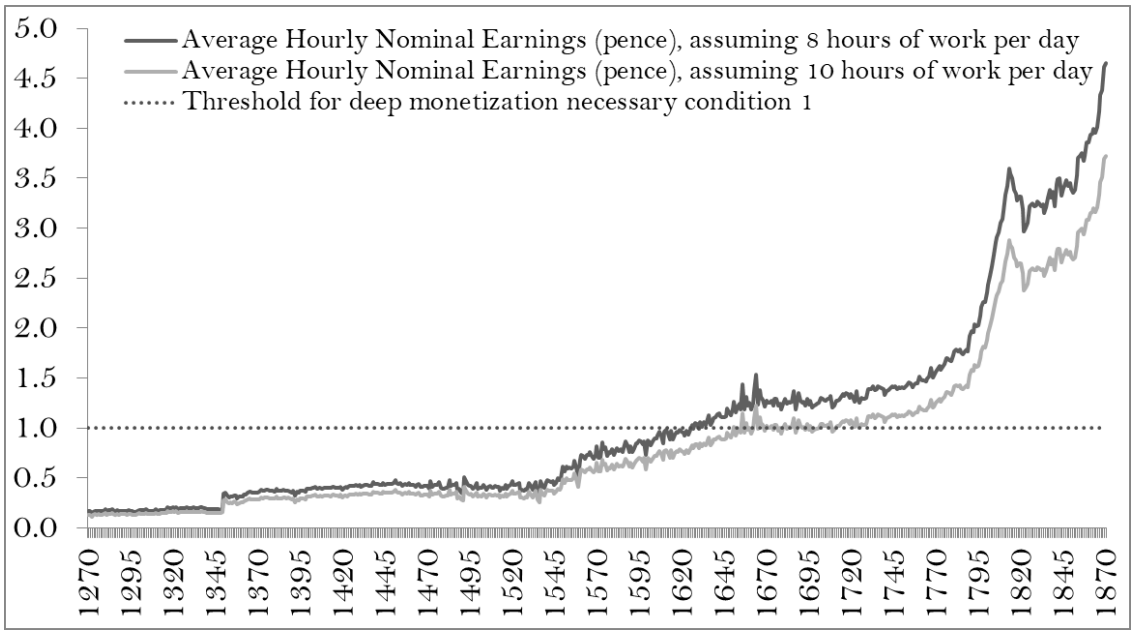


Source: Palma (2018b)

For other parts of Europe, we do not know much about the long-term impact. Northern Italy and Germany benefited from financing the Spanish Crown. That was, however, a very risky business given its propensity to default. Germany also participated in the trade circuit, especially supplying mercury to Spain (Álvarez-Nogal 1997). France exported textiles and other goods to Spain (much of which was re-exported to the Americas; see Stein and Stein 2000). In more remote parts of Europe, barely any American silver arrived (e.g. Kotilaine 2005).

[11] The timing holds whether we take into account structural change, real wages, or income per head (Wallis et al 2018, Humphries and Weisdorf 2019, Broadberry et al. 2015).

Figure 12. Deep monetization



Source: Palma (2018b)

3. Impact on Latin America

The search for new trade routes to Asia fueled Spanish westward exploration. But it was the discovery of precious metals in the Americas that shaped its imperial expansion.[12] From gold in the Caribbean to silver in Cerro Rico, the search for *El Dorado* drove both imperial expansion and the need to cement control over vast new territories. In this section, we consider how the production of precious metals shaped labor institutions, the fiscal apparatus, and economic activity. In our view, the weight of the evidence suggests that the Americas would have looked radically different in the absence of gold and silver. Without precious metals the Iberian empires in the Americas would have been substantially smaller in both geographic scope and institutional depth.[13]

The Spanish faced three challenges in exploiting the gold and silver riches of the Americas. First, they needed labor to exploit these resources. Indigenous labor was the answer, but the Spaniards faced a demographic collapse caused by Eurasian diseases,

[12] The division of the Spanish and Portuguese empires was also affected by this process. The search – and eventual discovery – of gold in Brazil from the 1690s was the main responsible factor for the pushing of the border with Spanish America many hundreds of miles westward (Boxer 1962, p. 270). The final borders were much to the west of the 1494 Tordesillas treaty, a fact to which the difficulty of measuring longitude accurately also contributed.
[13] For an alternative view, see Dobado and Marrero (2011).

social disruption, and war. The Caribbean islands were decimated while other locales with abundant indigenous labor — such as Mexico and Peru — experienced death tolls between one-third and nine-tenths of their pre-contact populations.[14] As a result, various sorts of labor coercion became the norm. Second, the Spaniards needed to control labor over a large territory. The Spaniards therefore founded a vast network of settlements based on their political, economic, and military needs. Finally, financing this enterprise was expensive. As a result, the Spaniards developed a fiscal system to capture rents and distribute revenues across the different corners of the empire.

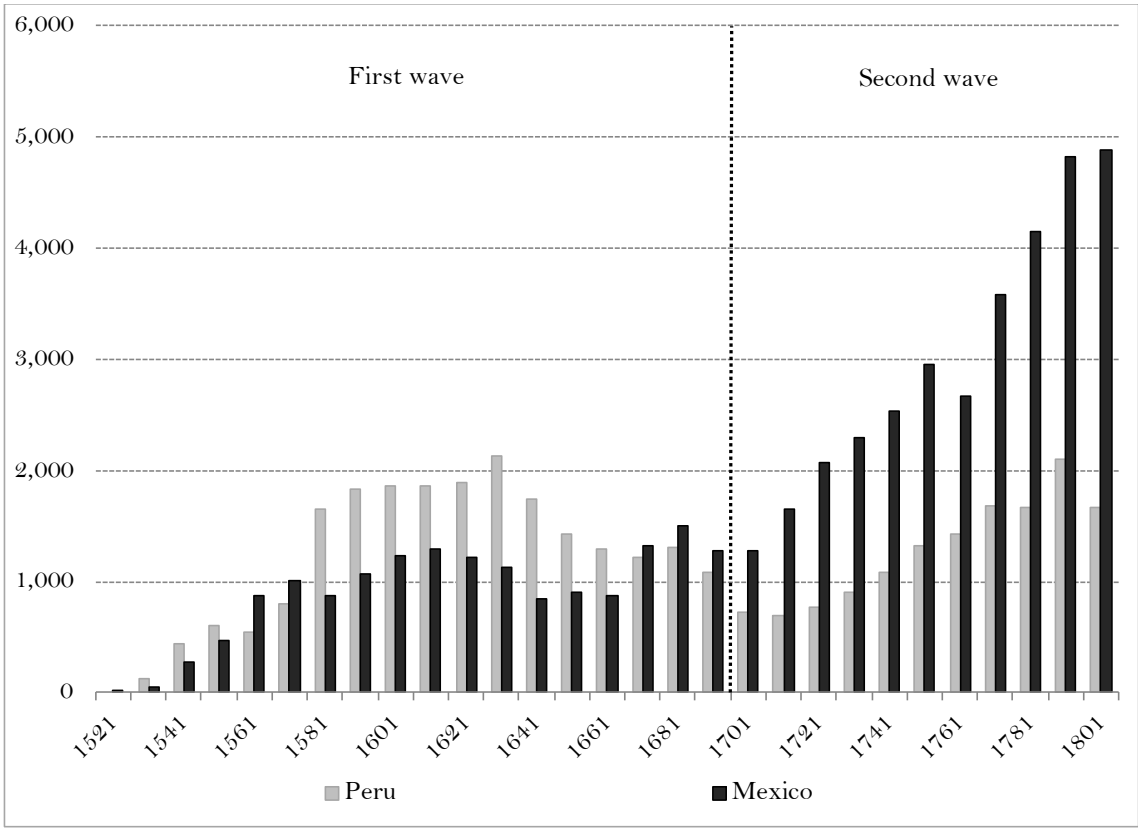
3.1. From conquest to colonization

Columbus found an unknown, but highly populated, territory. Soon after his arrival in *La Hispañola*, the newcomers spotted evidence of gold. Those mines were exhausted by the time of Columbus's death. Later, Caribbean expeditions chased the hope of precious metals. Soon after, the new colonies started to fulfill that hope. From 1492 to 1520, the Caribbean produced 162 tons of gold (TePaske 2010; Vilar 1976, ch. 7). But the above number paled in comparison to the riches that came from the main mining centers in what became Mexico and Peru. Cortés and Pizarro quickly found gold and silver. The extraction of precious metals in these new locales resulted in unprecedented yields (Figure 13). The emergence of the new mining centers reconfigured colonial economic activity, and prompted a vast expansion of the empire.

The mining operations needed labor and the Crown wanted revenue. In a world of declining populations, the solution was to coerce indigenous labor. The need to coerce existing populations over a vast area and ensure that the imperial government received its share of the revenues – particularly those related to precious metals – required a high level of state intervention and control.[15] Indeed, "In the eyes of the colonial authorities, silver production came to take precedence over all other requirements [...] As an early viceroy of Peru put it, 'if there are no mines, there is no Peru'" (Elliott 2006, p. 98). This stands in contrast with the English colonies in North America, where the labor supply came from Europe and Africa, the geographic expanses were far smaller, and the direct fiscal benefit for the Crown was almost nonexistent. As a result, the English government's control over institutional development was much laxer.

[14] The actual magnitude of the demographic collapse in the Americas is contested. For a discussion, see Livi Bacci (2008), Malvido (2006), and Newson (2006).
[15] For an analysis on labor institutions in colonial Peru, see Abad and Maurer (2019).

Figure 13. Silver production in Mexico and Peru, in metric tons



Sources: Based on Abad and van Zanden (2016).

The Spaniards generally adapted pre-existing labor institutions to secure labor. The extent and prevalence of these institutions varied considerably. The most widespread type of forced labor was the *encomienda*, or "trusteeship," adapted from the Reconquista of the Iberian peninsula.[16] Under this arrangement, Spanish settlers undertook the obligation to "protect" and Christianize indigenous people in return for tribute and labor services. Pizarro and his relatives obtained multiple *encomiendas* with thousands of people under his tutelage (Julien 2000). The *encomienda* was essential to the initial construction of the Spanish empire. Forced labor got roads built, Spanish settlers housed and fed, and initial mining exploitation pursued. The *encomienda* enabled colonial expansion at a low fiscal cost, but other costs prompted its abolition by the end of the 17th century. First, the cruel treatment of the indigenous people provoked a backlash. Second, the increasing power of the *encomenderos* posed a threat to royal power in the colonies. Nonetheless, the institution informally persisted around some of the fringes of the empire, notably in Paraguay (Service 1951, 1954).

[16] For a thorough treatment of the encomienda, see Zavala (1935).

The Spanish also introduced slavery, but not for mining. With a few short-lived exceptions—most notably the construction of the Camino de Chagres to carry Peruvian silver across Panama—the Spanish did not impose slavery on the indigenous population.[17] Mine owners in Spanish America found African slavery unprofitable due to high mortality rates (O'Toole, 2012, p. 18). As a result, slavery remained confined to plantations and urban centers.[18]

In Peru, the Spanish authorities employed the most infamous compulsory draft —the *mita minera* — to exploit silver and mercury. As indigenous peoples were not considered slaves, the Crown set a minimum remuneration. The Spanish also tried to coerce labor for mining in Zacatecas in Mexico. The problem was that the *mita* was an adaptation of an Incan practice of drafting labor and soldiers for the Inca king on a regular basis; no such practice existed in Mexico. With no pre-Hispanic institutions to co-opt, the Spanish proved unable to force the indigenous population to comply.

The most radical institutional development was the introduction of free labor (Abad, Davies, and van Zanden 2012). Mining in Mexico was made possible by using free workers. As time went on, the same became more true for the mines in colonial Peru. While the Potosí *mita* did initially provide much-needed labor, the institution lost its bite throughout the colonial period. Demographic collapse, mass migration, and avoidance became commonplace, resulting in more reliance on free workers. Moreover, both migration and avoidance became far easier as the colonial economy became more sophisticated and outside options for workers expanded, especially in the ever growing urban network.

3.2 Building the backbone of the empire

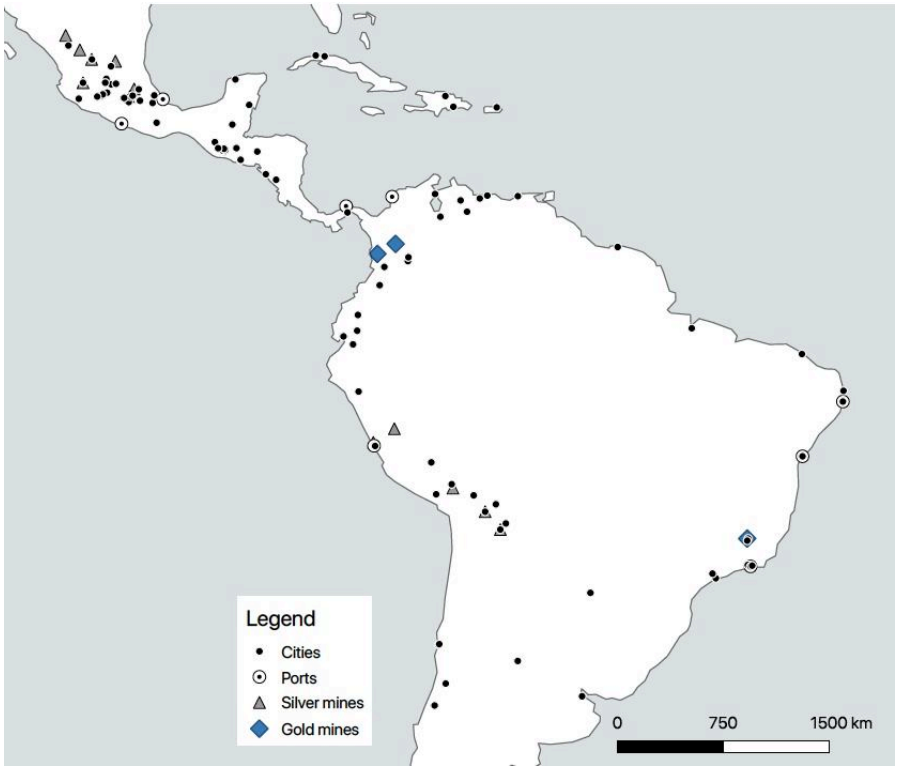
Mining was the backbone of the colonial enterprise. Labor, trade, and the administrative system were geared towards the extraction of precious metals. Mining centers attracted people and urban centers proliferated (Map 1). Sparsely populated lands transformed rapidly. Potosí (in today's Bolivia) was the most extreme case.

[17] For a discussion of the Nicaraguan slave trade in Panama, see Maurer and Yu (2010, pp. 17-21).
[18] This is not to say that the presence of massive precious metal deposits did not increase the prevalence of slavery in Latin America. It did; see later in this paper for details.

Located in a high desert, the site attracted 120,000 people by 1620s. The population ebbed and flowed with the mining cycle (Figure 14). Other, more permanent settlements emerged elsewhere, notably in the northwest reaches of Mexico. In Brazil a similar pattern ensued. The discovery of the mines in Ouro Preto in Minas Gerais prompted migration to the Portuguese frontier.

The transportation of precious metals shaped trade routes. Both the Spanish and the Portuguese empires created an institutional framework to centralize trade between the colonies and the metropolis (Álvarez-Nogal 2003). Shipping was left to private hands but cargo ships were heavily guarded by military escorts (e.g. the Spanish Armada) to defend against pirates and hostile nations. In the Spanish empire, only six ports were authorized to trade with Spain: Veracruz and Acapulco in Mexico, Cartagena in Colombia, Portobelo in Panama, El Callao in Peru, and Manila in the Philippines. It was not until the post-1771 Bourbon reforms that more ports were opened for business.

Map 1: Main cities, authorized ports, and mines



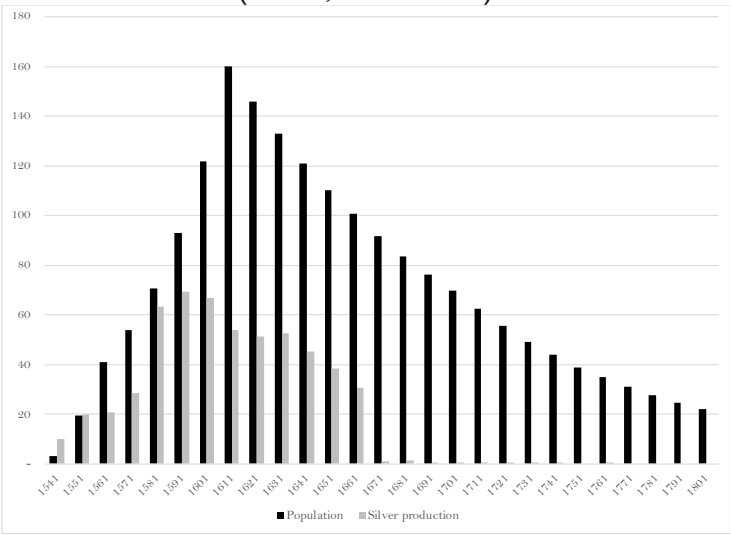
Note: Cities that reached at least 5,000 inhabitants until 1750, and mines that produced at least 100 and 1,500 tons of gold and silver, respectively.
Sources: Based on Abad and van Zanden (2016) and Palma (2019a)

Sustaining mining required mobilizing food and supplies from other locales. Salta in Argentina supplied mules for Potosí, Spain supplied luxury textiles and iron, and a wide array of foodstuffs made their way from Peru and Bolivia. In Mexico, south of Zacatecas, mining prompted the development of lands for grain production and other supplies (including textiles) were drawn from more distant locales. This mercantile circuit shows an important degree of market integration (Bakewell 1971; Assadourian 1982).

3.3. Imperial fortunes

The controls on trade had a tangible impact on the cost of living in the colonies. Imported goods from Spain, in particular, were significantly more expensive. In Lima, for instance, paper was up to 800% more expensive than in Castile in the early 18th century.[19] The regulated trade system spurred regional development for selected sectors, such as textiles. The regional economies hence became increasingly more integrated. An illustrative case is intercolonial trade between Chile and Peru. After the 1687 earthquake in Lima, Peru started importing wheat and Chile imported tobacco and textiles in return (Gallo and Newland 2004). That said, some goods were only available through trade with the motherland, or via contraband.

Figure 14. Population and silver production (in metric tons) in Potosí (index, 1611=100)



Sources: Abad and van Zanden (2016) and Palma (2019a)

[19] The relative price of paper between Lima and Castile ranged from 2.31 to 9.51 in the 1660-1800 period (Gallo and Newland 2004, p. 581).

It would be simplistic to think that the trade monopoly determined prices in Spanish Latin America. Transaction costs raised prices in America, but silver had a sizable independent effect on price and wage levels. Our results in Table 1 suggest that silver production increased price and nominal wage levels. This is in line with existing scholarship. For instance, for Mexico, Garner (1993, p. 19) notes, "An expanding mining industry obviously created an increase in demand for agricultural and manufactured goods [...]. It could also boost inflation because it increased the money supply."

Table 1: Silver production and Prices

Dependent variable: natural logarithm of Price Level and Nominal Wages

	Prices					
	Peru			Mexico		
	(1)	(2)	(3)	(4)	(5)	(6)
Lag of production	0.105**	0.140**	0.04	0.319***	0.252***	0.024
	(0.037)	(0.047)	(0.074)	(0.053)	(0.056)	(0.253)
R^2	0.244	0.581	0.009	0.44	0.503	0.303
N	187	86	101	243	130	113
Sample	1564-1810	1564-1697	1698-1810	1525-1810	1525-1697	1698-1810
	Nominal wages					
	Peru			Mexico		
	(7)	(8)	(9)	(10)	(11)	(12)
Lag of Production	0.071***	0.289***	0.098***	0.491***	0.409***	-0.024
	(0.009)	(0.042)	(0.019)	(0.057)	(0.043)	(0.018)
R^2	0.680	0.684	0.735	0.708	0.907	0.057
N	175	80	95	277	164	113
Sample	1597-1792	1595-1697	1698-1792	1525-1810	1525-1697	1698-1810

Notes: Annual (barebone basket) price levels and nominal wages for unskilled labor (in logs) in silver grams for Mexico City and Lima. Annual silver production (in logs, lagged one period) for the viceroyalties of Mexico and Peru. Linear trend included. Robust standard errors. (***), (**) denote levels of significance of 1% and 5% respectively.
Sources: Based on the data of Abad, Elwyn, and van Zanden (2012) and Palma (2019a).

An increase in the production of silver appears to affect nominal wages and prices more in Mexico than in Peru (Table 1). It is conceivable that the rigidity in labor markets in Peru was associated with lower availability of free-wage labor. Labor coercion was stronger in Peru than in Mexico, especially in the mining sector. As mining was mostly carried out with free labor in Mexico, the real wage increased accordingly. If we split the sample into two roughly equal periods — the first until the

end of the 17th century — we can see that these results are driven by the first silver wave in both viceroyalties.[20]

3.4 A counterfactual metal-less empire

So far we have looked at how precious metals shaped the development of the colonial economy. We have documented its remarkable imprint on the patterns of urbanization, the institutional framework, and economic activity. But the main question remains: would the nature of the colonial enterprise have changed in the absence of precious metals?

It is hard to imagine the Spanish empire in America following a similar path in the absence of rich sources of precious metals. Their existence and importance in the cargoes for Spain, "inevitably relegated other commodities, no matter how valuable, to a subordinate status in Spain's transatlantic trade" (Elliott 2006, p. 25). While we cannot speak of a typical Dutch disease situation in this case — since not much industry existed in the Americas to start with — the situation was not conductive to industrial development, regardless of Spain's mercantilist laws.

Mining shaped the economic geography of the continent. In Mexico, the center of economic activity shifted north towards what was then called New Galicia with the discovery of Zacatecas (Bakewell 1971, p. 17). In Peru, Potosí cast a wide net of influence: "[it] stimulated commercial agriculture in the valleys and turned small-scale chacareros into wholesale cereal exporters" (Larson 1998, p. 89). The metal-free corners of the empire were military outposts established in order to contain foreign encroachment or areas of modest agricultural development. The area that became Argentina, for example, was overlooked as "it offered no immediate economic or commercial rewards" (Fisher 1998, p. 25). Buenos Aires only gained some recognition with the creation of the viceroyalty of the Rio de la Plata late in the 18th century. Guatemala, similarly, developed an export trade in indigo, cacao, and hides for both European and American markets but remained overshadowed by New Spain (Elliott 2006, p. 21).

[20] This periodization takes into account the first and second waves in silver production in Latin America.

Would the sun have never set in a metal-less Spanish empire? We know that it was expensive to run an empire and Spain did not profit in the early times. In fact, "the steady export from the peninsula of the basic commodities (primarily flour, oil, wine) which the settlers required for subsistence, together with tools, weapons, animals, seeds, and building materials, tended to be of greater value than the gold and tropical produce which returned" (Fisher 1998, p. 22). Without the silver influx, Spain would have likely been forced to abandon its claims over the fringes of the empire. The wide geographic scope of the Spanish empire was, in part, a product of cross-subsidies from richer to less affluent regions, carried out among regional treasuries. The degree of inter-colonial transfers was remarkable: Grafe and Irigoin (2006, p. 252) find that it was "crucial for the governance of the empire." Without the flow of resources from Mexico and Peru to the periphery, it is hard to imagine Spain maintaining claims on distant territories, leaving them up for grabs by other competing empires.

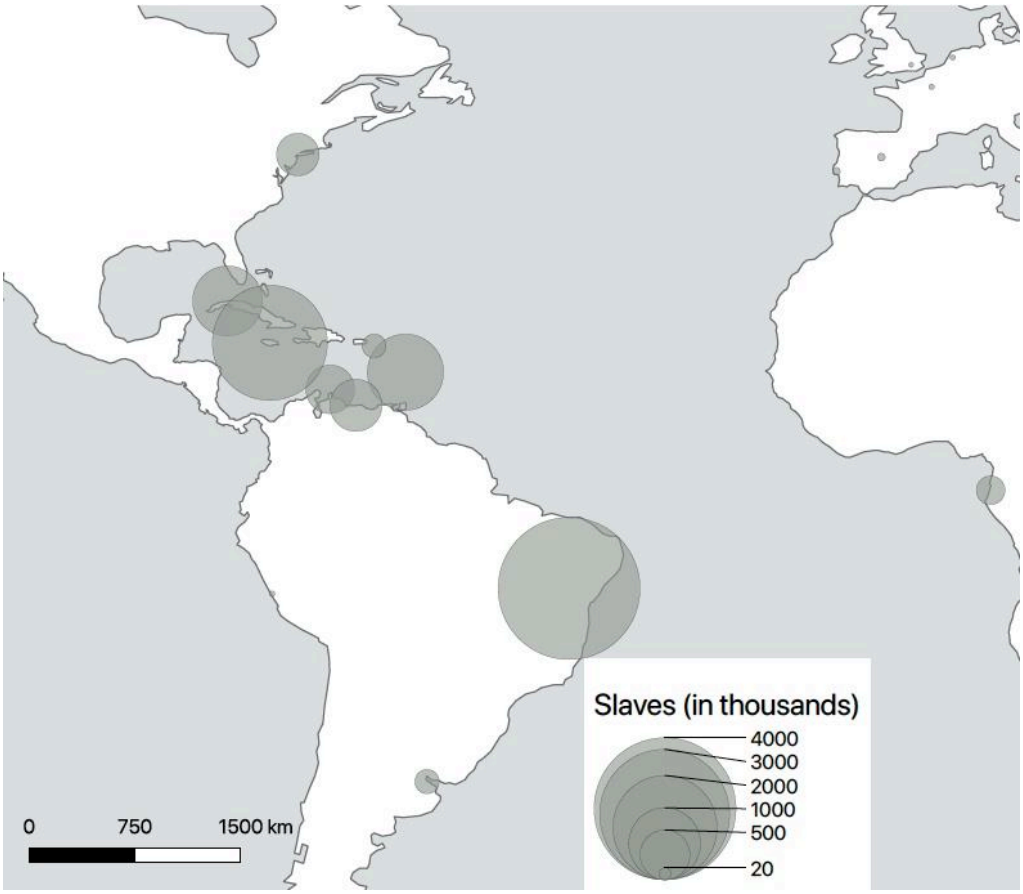
As it was, the colonists, "having at their disposal silver mines like Guanajuato and Potosí [...] found it to their advantage to specialize in mining and export specie in exchange for importable commodities. The treasure fleets sailed from Spain laden with provisions, wares and all sorts of merchandise. The return cargo comprised small quantities of colonial produce [...] and vast amounts of silver" (Hamilton 1934, p. 33). It is reasonable to conclude that in the absence of precious metals, the Spanish Crown would have attempted to develop commodity cultivation for export where possible. This strategy would have panned out in certain parts of the viceroyalty of Mexico and in the Caribbean, including Venezuela. The fate of the viceroyalty of Peru is less clear. The relatively abundant indigenous population would have been hard to ignore, but given the technology available, exporting agricultural goods would not have been profitable. It is possible that Spain would have retained its claim and let religious orders and eager Spanish colonizers run the place in exchange of tribute. This strategy is consistent with the Crown's attitude towards the Philippines and Paraguay, hence Peru might have become similar to these locations.

4. Impact on Africa and Asia

The existence of silver and gold in the Americas greatly accelerated European exploration, propelled the settlement of the New World, and stimulated trade. More fundamentally, it fueled the beginning of the largest involuntary migration in history:

slave trade. Eltis (2000, pp. 24-25) claims that the influx of precious metals translated into a demand for slaves. This was true, even though African slaves did not become the main source of labor for mining in Spanish America. At the same time, silver profits did power the importation of slaves to serve as domestic servants in urban centers. In Brazil, by contrast, African slaves were essential for the exploitation of the gold mines and alluvial deposits (Klein and Luna, 2009, p. 36).

Map 2: Slave trade by main destination of disembarkation (1511-1870)



Source: Trans-Atlantic Slave Trade Database

Much American silver ended up in Asia, and in particular, China. The Manila galleon connected El Callao in Peru, Acapulco in Mexico, and Manila in the Philippines. This route enabled the exchange of silver for silk and porcelain (Fisher 1998, p. 65). While Japan also produced some moderate quantities of silver during part of the early modern period, this was by no means sufficient for the needs to this large part of the world. The impact of the silver coins in the Chinese economy needs further research. Paper money no longer circulated by the time the Europeans arrived in the 1500s (Von Glahn 1996). Hence China depended critically of silver for transactions and tax

payments. Some scholars claim that that the slowdown silver production in the Americas around the middle of the seventeenth century caused the collapse of the Ming dynasty, while others argue that this was not the case (Flynn and Giráldez 1995, Findlay and O'Rourke 2012). What is certain is that by the early nineteenth century China was awash with Spanish dollars, which were the world's international currency. Once the Spanish Empire broke up following up Napoleon's invasion of Spain, so did the quality of coins produced in the Americas, with negative consequences for the Chinese economy (Irigoin 2013).

During the nineteenth century, Europeans began to systematically colonize much of Africa, and (de-facto) some of China, as well as other regions in Asia. The process had multiple causes, but the experience acquired via the previous history of European interaction with these regions during the early modern era was central. In turn, that previous interaction cannot be separated from the role American precious metals played, as we have argued here. The consequences of these interactions still live with us today.

5. Conclusion

"By the mid-seventeen century, silver was becoming more than a little tarnished. Observers noted how all the silver of America had failed to bring prosperity to Spain"

Elliott (2006, p. 114)

The white and yellow metals not only failed to bring prosperity to Iberia, they failed to bring long-term prosperity to Latin America. In recent years, resource-rich countries such as Angola, Nigeria, and Venezuela have become textbook versions of resource curse in both in its Dutch disease and political dimensions.[21] Early modern Spain and its empire were the poster children for these modern examples.

In Iberia, Spanish America and Brazil, industry declined or did not flourish, and special interest groups gained power as the result of the silver and gold endowments. Scholars have previously argued that this was the case for Spain (Hamilton 1934, Drelichman 2005b, 2007a) and Portugal (Macedo 1982). We have argued here that this was also true for Spanish America, although the causality is hard to test given the approximate

[21] For some cases such as São Tomé e Príncipe or Brazil, there is direct causal evidence of the mechanism (Vicente 2010; Caselli and Michaels 2013).

coincidence of the Conquest and the discovery of silver. But suggestive evidence exists, such as the fact that from the late 1550s the activities of the Spanish Inquisition in the Americas became much more severe and theatrical (e.g. Osorio 2008, p. 104). By the mid-seventeenth century, "Lima's auto de fé had become a grandiloquent ceremony with an enormous stage decked out with fine rugs, large silver candelabra, ceremonial candles, crucifixes, elaborate chairs and other seating arrangements, plants, special lighting, music, chants, powerful scents that filled the air, and participants clad in elaborate ceremonial costumes" (Osorio 2008, p. 113).

In the case of Portugal – and Brazil – the later discovery of gold permits a more credible causal attribution. As had happened with Spain (Hamilton 1934, p. 295), the discovery of "treasure" created additional demand for non-tradable sectors, leading to much land being purchased by ecclesiastical institutions. These became special interests which lobbied for policies which were often not in the common interest of society. In the words of Boxer (1962, p. 133): "During the two centuries which elapsed between the time of King João III and that of Pombal, Portugal was probably the most priest-ridden country in Christendom." Boxer (1962, p. 129 and p. 180) presents similar evidence for Brazil.

The resource curse (whether economic or political) is not inevitable. In the nineteenth century, gold discoveries happened in other parts of the world. A well-known case is that of nineteenth century California. But despite the gold rush, precious metals never dominated the well-diversified American economy, which furthermore had, by then, strong institutions (Besley 2006, Elliott 2006; Sargent 2012). The impact of the gold rush distorted neither American nor Californian institutions, and California went on to become one of the most prosperous jurisdictions on Earth.[22]

The search for *El Dorado* shaped European exploration and settlement in the New World. Who reaped the fruits of the discovery of gold and silver? Spain and Portugal, the colonizers *par excellence*, failed to profit from the conquest. It would be a mistake to conclude that the pre-existing Iberian institutions are to blame. The ultimate root cause was state capture by special interests. In contrast, England and the Netherlands benefited the most as a result of increased monetization and fiscal capacity. In the case

[22] Spanish dollars remained legal tender in the United States until 1857, which reminds us of their prior importance as the world's reserve currency.

of Latin America, the exploitation of silver became the backbone of the empire for Spain and pervaded all economic activity. For Brazil, the discovery of gold came later and displaced alternative forms of colonial expansion. Aided by a mercantilist ideology, silver and gold shaped the institutional development and trade patterns in the New World. The influence of precious metals reverberated around the world, lubricating trade from remote corners of the globe.

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