The Sustainable Debts of Philip II: A Reconstruction of Spain's Fiscal Position, 1560-1598[*]

Mauricio Drelichman
The University of British Columbia
and
CIFAR

Hans-Joachim Voth
ICREA/Universitat Pompeu Fabra
and
CEPR

Abstract: The defaults of Philip II have attained mythical status as the origin of sovereign debt crises. The king failed to honor his debts four times during his reign. In this paper, we reassess the fiscal position of Habsburg Spain. New archival evidence allows us to derive comprehensive estimates of debt and revenue. These show that primary surpluses were sufficient to make the king's debt sustainable for most of his reign. Spain's debt burden was manageable up to the 1580s, and its fiscal position only deteriorated for good after the defeat of the "Invincible Armada." We also estimate fiscal policy reaction functions, and show that Spain under the Habsburgs was at least as "responsible" as the US in the 20th century or as Britain in the 18th century. Our results suggest that the outcome of uncertain events such as wars may have more influence on a history of default than strict adherence to fiscal rules.

JEL Classification Codes: H62, H63, F34, N24, N44

[*] For helpful comments, we thank Brian A'Hearn, Daron Acemoglu, Fernando Broner, Albert Carreras, Xavier Debrun, Marc Flandreau, Caroline Fohlin, Regina Grafe, Viktoria Hnatkovska, Alberto Martin, Paolo Mauro, David Mitch, Kris Mitchener, Joel Mokyr, Lyndon Moore, Roger Myerson, Kevin O'Rourke, Sevket Pamuk, Richard Portes, Angela Redish, Nathan Sussman, Alan M. Taylor, Francois Velde, Jaume Ventura, Marc Weidenmier, and Eugene White. Seminar audiences at American University, Harvard, Sciences Po, Hebrew University, UBC, UPF, UC Irvine, HEI Geneva, NYU-Stern, and Rutgers, as well as the EHA meetings in Austin, the CREI / CEPR Conference on "Crises – Past, Policy, and Theory", CIFAR, NBER, CEPR –ESSIM, the BETA Workshop, and the Utrecht Workshop on Financial History offered advice and constructive criticism. Diego Pereira and Germán Pupato provided outstanding research assistance. Financial support from the Spanish Education Ministery, CREI, SSHRCC, UBC Hampton Fund, and TARGET/INE is gratefully acknowledged.

I. INTRODUCTION

Spain under the Habsburgs ruled an empire on which the sun never set. Her financial troubles appear to have stretched every bit as far. Habsburg Spain was the first "serial defaulter" in history (Reinhart, Rogoff, and Savastano 2003). Philip II failed to honor his debts four times, in 1557, 1560, 1575 and 1596. Fernand Braudel (1966) famously argued that only the indulgence of irrational bankers allowed Spain to incur towering debts at a time when her fiscal position was deteriorating. When *The Economist* writes about the origins of debt crises and the dangers of fiscal profligacy, it refers to sixteenth century Spain.[1] Fighting a series of expensive wars in a bid for European hegemony, Spain's public finances were heavily strained. Eventually, Spain went on to hold the record for the total number of state bankruptcies. She failed to meet her obligations 13 times between 1500 and 1900.[2] There is also a widespread belief that 'imperial overstretch' led to Spain's poor economic performance after 1600 (Kennedy 1987).[3]

Contrary to the received wisdom, we show that Philip II's debts were sustainable for most of his reign. The fiscal position did not deteriorate decisively until the defeat of the 'Invincible Armada' in the late 1580s. Far from being undermined by reckless spending and weak fiscal institutions, Spain's finances suffered from unexpected, large, negative shocks to her military position. Philip's first three bankruptcies were caused by temporary liquidity shocks, not structural revenue shortfalls.

---

[1] "The dark side of debt", The Economist, 21.9.2006.

[2] Reinhart, Rogoff and Savastano (2003).

[3] Spain's poor long run economic performance has been most recently documented by Alvarez Nogal and Prados de la Escosura (2008).

Overall, Habsburg Spain's fiscal discipline was similar to that of other hegemonic powers, such as eighteenth-century Britain or twentieth-century America.

We provide the first comprehensive account of Philip II's finances. Our yearly estimates of fiscal variables, stretching from 1566 to 1596, are the earliest constructed for a sovereign state in history. We start with a new data series on the Crown's short-term debts compiled from the Archive of Simancas. When combined with other existing data, this series serves as the linchpin with which we reconstruct Philip II's overall financial position. We derive yearly estimates of revenues, debt service, primary surplus, budget deficit, short-term borrowing and the stock of long-term debt. We also present new estimates of the cost of financing for the Crown in several periods.

We use our estimates of Philip's fiscal position to evaluate debt sustainability, exploring the evolution of debt relative to GDP. Next, we estimate fiscal policy functions in the style of Bohn (1998), and compare the results for Spain with those for 18th century Britain and 20th century US. In combination, our findings suggest that earlier assessments of Philip's finances have been too pessimistic. We show that Habsburg Spain passes several tests of fiscal sustainability, and actually conducted a more fiscally responsible policy than the UK under Pitt. During the first three decades of Philip's reign, Spanish fiscal policy was even more 'virtuous' than that of the US between Woodrow Wilson and Bill Clinton.

How could Philip II default so often and yet keep borrowing so much? Braudel (1966) emphasized the role of gullible bankers. Conklin (1998) interpreted the availability of funds in the style of the classic paper by Bulow and Rogoff (1989), arguing that the ability of bankers to impose sanctions on the king was key. Genoese

lenders could stop the transfer of funds from Spain to the battlefields in the Netherlands, forcing the king to settle his debts or risk the mutiny of unpaid armies. We do not question that the ability to punish may have facilitated borrowing at certain critical junctures. Rather, we argue that it was the overall health of Habsburg Spain's fiscal position and the responsiveness of the Crown's taxing and spending behavior to rising debt levels that made the continued flow of funds possible.

Our attempt to shed new light on the history of fiscal policy is related to a wider research effort in recent years to expand our knowledge of early modern European state finances. Reinhart, Rogoff and Savastano (2003) carefully reconstruct the long-run history of debt and defaults since 1500. Bonney's European State Finance Database (Bonney 1995-2007) and the associated papers (Bonney 1999) represent a major effort to compile a comprehensive overview of existing data sources. Other important contributions in the same spirit include Hoffman and Norberg (1994), and W. M. Ormrod et al. (1999). In combination, they offer insights into the "sinews of power" of almost every nascent European national state. Spain, as one of the major players in the European scene throughout most of modern history, has also attracted her share of scholarly attention.[4]

We proceed as follows. In section II, we present our summary of Philip II's fiscal position, as it emerges from our new archival data. The sustainability of the debt path is assessed in section III, using the traditional analytical tools such as the primary surplus required to stabilize debt. Next, we estimate fiscal policy functions in the style of

[4] For the sixteenth century, the classic works are Ruiz Martín (1965; 1968), Ulloa (1977), and Artola (1982). More recently Thompson (1994), Gelabert (1999), Marcos Martín (2000), Tortella and Comín (2001), Yun Casalilla (2002; 2004), and Alvarez Nogal and Prados de la Escosura (2008), have contributed much to our understanding of Spanish economic and fiscal history.

Bohn (1998), and offer some comparisons across time and space. The concluding section discusses our main findings and puts them in context.

II. DATA

While her numerous defaults are widely cited in the literature on sovereign debt crises, we know remarkably little about Spain's overall fiscal position in the sixteenth century. Existing evidence on tax revenues, expenditure, and debt is fragmentary. This is a consequence of the decentralized nature and rudimentary information collection of early modern states. Philip II himself – like most early modern rulers – did not have access to consolidated figures of revenue, expenditure, or debt. Any attempt at estimating them requires the painstaking assembly of disaggregated data sources and the careful use of assumptions regarding the nature of missing data.

We first construct new revenue estimates by aggregating data from published sources, and compare them with existing benchmark estimates. We then review the characteristics of Spanish debt instruments, and introduce our new series of short-term debt, constructed entirely from archival sources. Combined with existing estimates on long-term bonds, we obtain yearly estimates of outstanding debt and the budget deficit. Next, we use data on debt service costs to derive measures of revenue growth and primary surplus for four different sub-periods. Finally, we feed these results into a simple fiscal accounting framework to obtain yearly estimates of the fiscal position of Spain between 1566 and 1596.[5]

[5] Technically speaking, all our estimates use data on the kingdom of Castile. While Philip II ruled over many territories, it was Castile that financed his military enterprises and overseas empire. Philip also had

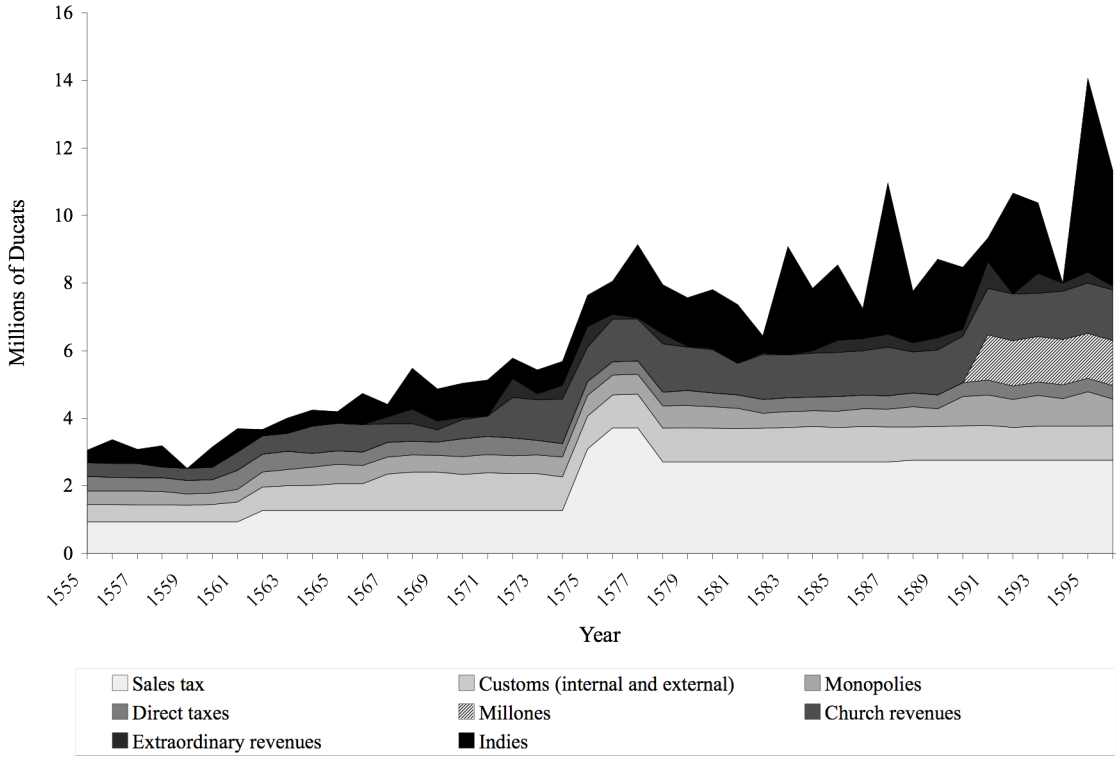
Revenues

Figure 1 shows the evolution of Crown revenues by type between 1555 and 1596. While fragmentary data for individual tax streams are reported by Ulloa (1977) and Thompson (1976), this is to our knowledge the first time that the different series have been aggregated to produce a comprehensive annual series of fiscal income for this period. For many revenue streams, data are incomplete. We impute missing observations by assuming that, in years for which there is no information, revenues were equal to the lower of the two closest years for which data was available. We have also incorporated information on the frequency with which different taxes were collected when available.[6] Table A1 in the appendix reports the data used in Figure 1.

much wider discretion over the use of Castilian revenues than over the resources of his other possessions (Drelichman and Voth 2008). For the remainder of the paper, we will use Castile and Spain interchangeably.

[6] This procedure and Ulloa's methodology bias the series downwards, yielding a lower bound of actual revenue. Since most of the revenue streams do not change for long periods, the actual impact of missing data turns out to be limited. Data for Indies revenue, the most volatile series, are available for every year throughout the period

Figure 1: Crown revenues, 1555-1596



Source: Ulloa (1977), Thompson (1976, p. 288), authors calculations.

Our new series broadly agrees with existing estimates for particular years.[7] With the exception of silver remittances (the topmost category in the chart), revenues were very stable as a result of being farmed out or contracted upon with the cities. Tax farmers or city councils agreed to fixed yearly payments and became the residual claimants. Almost the entire volatility of the series is driven by the treasure revenues, as both the nature of mining operations and the logistics of transferring the silver from the Bolivian plateau to Seville caused wild fluctuations in remittances.

Taxes were raised sharply twice. First came the increase in the sales taxes (*alcabalas*) in 1576-7, followed by the creation of the *millones* excises in 1591. Both

[7] For a more detailed comparison, see Appendix B.

were introduced in the face of dire financial and military emergencies. The jump in sales taxes followed the default of 1575 and the rapidly deteriorating situation in the Netherlands. The hefty increase, front-loaded in the first two years, allowed Philip to negotiate a settlement with his bankers, restart borrowing on a large scale, and resume payments to his armies.[8] The *millones*, a variety of new excises administered by the cities, were introduced in response to the disaster of the Armada in 1588. They were supposed to provide a one-time boost in revenue, spread over six years, to rebuild the fleet and defuse the British threat. Nonetheless, they were renewed time and again and became a permanent feature of Crown revenue. In both cases the king had to negotiate with the Cortes, an assembly composed by representatives of the urban elites. In 1590 he actually had to agree to a number of conditions imposed by the cities in order to obtain their consent.[9]

Debt

The Spanish Crown borrowed using two main instruments: *asientos* and *juros* (short and long-term loans, respectively). Since our reconstruction of the Spanish fiscal position in the second half of the sixteenth century hinges on the relationship between these instruments, we describe them in more detail.

[8] For an account of the king's negotiations with the Cortes of 1576 that led to the increase in the *alcabalas* see Jago (1985).

[9] The Cortes nonetheless failed to transform their temporary bargaining strength into permanent political gains. For a thorough discussion of the effect of silver revenues on the interaction between king and Cortes see Drelichman and Voth (2008).

Characteristics and chronology

Asientos were short-term loans contracted with individual bankers or companies. Their term typically ranged from six months to three years. When the contracts called for disbursements abroad, usually to pay and supply warring armies and fleets, the stipulated exchange rate was normally used to increase the effective interest rate while circumventing usury laws. During Philip's reign, *asientos* usually included a license to export bullion from Castile, as well as clauses protecting the bankers against variations in the metallic content of the currency.

Juros were long-term bonds secured against a particular revenue stream, such as the sales taxes of the city of Seville. *Juros* were normally perpetual, although lifetime bonds were not uncommon. While interest on *juros* could only be collected by the person in whose name they had been issued, a secondary market of sorts in them existed. The Crown was all too willing to grant licenses to transfer them in exchange for fees, loans or other favors. Since their annual or semi-annual interest payments were directly disbursed by the treasurer or tax farmer in control of the revenue stream that guaranteed the bond, the value of a *juro* was directly related to the liquidity and reliability of that particular revenue stream.[10]

While Charles V assiduously serviced his loans with German bankers, Philip did not go to the same lengths. Barely a year after ascending to the throne, he defaulted on outstanding *asientos*. His first debt rescheduling unfolded in two stages in 1557 and 1560. The settlement, which included handing over control of several Crown monopolies

[10] The market for *juros* remains a fertile area for research. A good overview is provided by Toboso Sánchez (1987).

to the Fugger bank, was not fully negotiated until 1566. In that year lending resumed in earnest. 1566 also marked the resumption of large military commitments abroad. The Dutch Revolt flared up, and Spain began to build up the Mediterranean fleet that would defeat the Ottomans at Lepanto in 1571. The Genoese *asientos* that financed these and other expenses differed from those previously extended by German bankers. Many were collateralized through *juros*. In the first few years after 1566 the bankers held onto these *juros* (called *de resguardo*, or safeguards) until the *asiento* was repaid. Soon, however, many *asientos* allowed the bankers to sell the collateral on the secondary market, even when the *asiento* guaranteed by it was in good standing.[11] When an inventory of the outstanding *asientos* and *juros* was taken prior to the negotiations to settle the suspension of payments of 1575, it was found that about two thirds of outstanding short-term loans were collateralized by *juros*.[12]

The crisis of 1575 is possibly the single most studied episode in sixteenth century Spanish financial history.[13] The Dutch Revolt and the Mediterranean campaign had put severe strain on the royal finances. These were compounded by the cost of the gigantic palace-monastery at El Escorial. When Philip asked for a threefold increase in the sales taxes that were the mainstay of fiscal revenue, the Cortes, in the first show of force in half a century, refused to oblige.[14] While the king eventually managed to obtain a large increase in revenues, it came too late to avoid a suspension of payments on

---

[11] For a description of the interplay of *asientos* and *juros* see Ruíz Martín (1965).

[12] This number emerges from our calculations based on the full text of the final settlement with the bankers. *Asiento y Medio General de la Hacienda*. Archivo General de Simancas; Consejo y Juntas de Hacienda; Libro 42. See Appendix B for a detailed analysis.

[13] For a meticulous description of the suspension and ensuing settlement see Lovett (1980; 1982).

[14] Jago (1985).

asientos, as well as on collateral *juros* still held by the bankers. The total outstanding amount was roughly 15 million ducats, or two years' worth of revenue. Five and a half million ducats had been collateralized through standard *juros*, while 4.3 million were backed by *juros* guaranteed by the *Casa de Contratación* that had failed to perform as expected and were already trading at a heavy discount.[15]

Two years of negotiations with the bankers produced a comprehensive settlement, known as a *medio general*, which converted all the outstanding short-term loans to low interest perpetuities. Appendix C details the restructuring based on the original text of the settlement. On average, the king repaid 62 cents on the dollar. The bankers also agreed to immediately provide a new loan of five million ducats. Fresh lending started quickly, in 1578.

Lending proceeded briskly in the last quarter of the century. Philip's fourth suspension of payments, in 1596, was mild when compared to the 1575 default. The *medio general* of 1597 rescheduled 7.04 million ducats, about two thirds of yearly revenue. Two thirds of outstanding debt was converted to 5% *juros*, and the rest was repaid in full through a *juros* swap. On average the king repaid 81 cents on the dollar.[16]

A new series of asientos

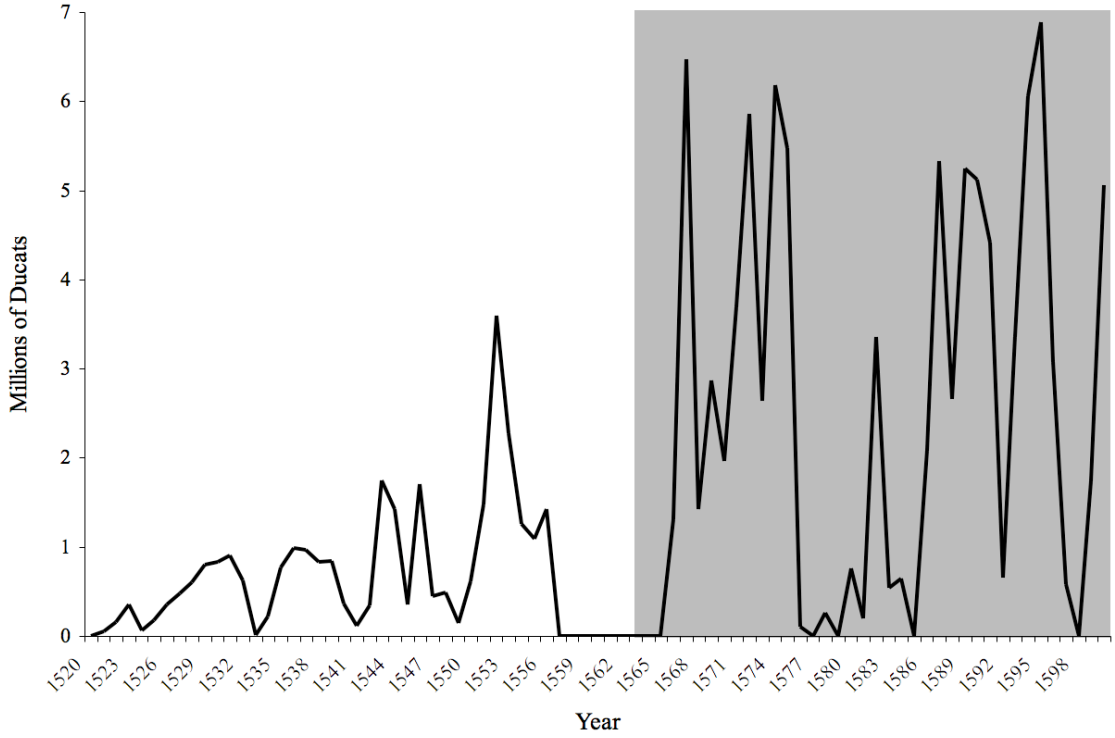
Figure 2 shows the value of new *asientos* contracted by the Crown between 1520 and 1600. The data for 1520-1555 comes from Ramón Carande's three-volume *Carlos V y sus banqueros*, which pioneered the study of sixteenth century Castilian debt

[15] *Juros* guaranteed by the House of Trade, perhaps the most spectacular case of financial mismanagement during Philip's reign, were thoroughly studied by Ruíz Martín (1965).

[16] For details, see Appendix C.

instruments (Carande 1987). We add the second (shaded) half of the series collected from the Royal Archive in Simancas.[17] The gaps in the series correspond to the hiatus in lending after each default and hence reflect exclusion from capital markets, not missing data. Table A2 in the Appendix A reports the entire series.

Figure 2: Asientos



Source: Artola (1982, pp. 86-87), Archivo General de Simancas, Contadurías Generales, Legajos 84-92.

Philip's borrowing dwarfed the loans taken out by Charles V. The series also shows that the second lending stop was much shorter than the first. While the 1557

[17] Earlier series based on documents from the archive suffer from a number of deficiencies. Ulloa (1977, p. 775) constructed a series from a variety of sections of the Archive of Simancas. However, because the primary sources were scattered across the archive, a number of *asientos* are missing from his series. Furthermore, his series double-counted some *asientos* that were contracted by the military commanders in the Netherlands and later consolidated into larger contracts in Madrid. The archivists at Simancas have since painstakingly reconstructed the holdings of the section *Contadurías Generales*, which originally included a copy of every *asiento* subscribed by the Crown from 1566 on. Our series of *asientos* was built using these newly collated files. We have also controlled for the loans that were documented twice. Our series is therefore lower than Ulloa's in most years, and higher in those years where Ulloa missed *asientos*.

default resulted in nine years of exclusion from capital markets, most of the debt suspended in 1575 was rescheduled through the *medio general* by late 1577.

The amounts borrowed through *asientos* during Philip's reign also show very large year-to-year variations relative to trend. *Asientos* were convenient as a short-term borrowing device; they allowed the Crown to obtain money quickly and transfer it to virtually any point in its European dominions. They were also expensive. It was not uncommon for the cost of an *asiento* to climb into the double digits, with some possibly yielding more than 20% per annum.[18] As soon as it could, the Crown sought to convert the outstanding amount into *juros*, which could be placed at interest rates around 7%. The interest rates paid by Philip II are not dissimilar to those prevalent for contracts with the same maturities elsewhere in Europe (Homer and Sylla 2005, p. 119). The series of *asientos* can be interpreted as reflecting the flow of new borrowing; to estimate outstanding debt, one needs to look at *juros*.[19]

[18] Establishing the cost of borrowing is no trivial matter, as it involves estimates of the value of export licenses, hidden interest rate charges for transfer services, and the like. We are currently engaged in a large-scale project that will produce detailed estimates of the cost of each *asiento*. The following are examples of this coding endeavor: in an *asiento* underwritten by Niccoló and Vincenzo Cattaneo on December 5 1567 for a disbursement of 75,000 ducats, the king agreed to repayments in cash and *juros*, as well as *juro* swaps, that represented a total cost of financing of 40.77%. In another *asiento* underwritten by Juan Curiel de la Torre on December 15 1567 for a total of 200,000 *ecús* to be delivered in Anvers, the king agreed to exchange and interest charges and to the concession of lifetime *juros* that amounted to a total cost of financing of 29.44%. (Archivo General de Simancas, Contadurías Generales, Legajo 84). While in many cases the cost of financing was much lower, *juros* could be normally placed at around 7% and their capital was never due, representing a much more attractive option if revenues to guarantee them could be found.

[19] The borrowing system shares some similarities with the Navy and Army bills used in 18th century Britain, which were used for (expensive) short-term borrowing, and were later consolidated into long-term consols (Dickson 1967).

Constructing estimates of outstanding debt

Because there are no reliable expenditure data, obtaining estimates of total outstanding debt is crucial for reconstruction Spain's fiscal position. We begin by compiling all the available hard data on *juros*, shown in Table 1.

Table 1: Juros and their service (in millions of ducats)

Year	Juros service	Outstanding Juros
1560	1.468	19
1565		25
1566	1.861	
1573	2.752	
1575	2.730	36
1584	3.273	
1598	4.634	68

Source: Artola (1982, pp. 88-9), Ruíz Martín (1965, p. 71), Ulloa (1977, pp. 828-9).

The only figures for outstanding *juros* are supplied by Artola (1982), and they were obtained as part of the same research that yielded his revenue data for the same benchmark years. Ulloa (1977) and Ruíz Martín (1965) provide information on the service of *juros* for six benchmark years, three of which overlap with Artola's. With the exception of the consecutive years 1565 and 1566, however, there was enough variation in the structure of outstanding *juros* between benchmark years to strongly caution against using interest payments as a way of estimating outstanding debt. Our strategy will instead involve calculating the percentage of *asientos* that were converted into *juros*, and use the variation in the *asientos* series to estimate the addition to outstanding debt each year. We now illustrate the methodology in detail using our *asientos* series and then present several results obtained using different sets of assumptions and data sources.

We begin with the period 1565 – 1575. Artola's data tells us that in 1575, just before Philip's third bankruptcy, the royal auditors found 36 million ducats in outstanding *juros*. These included the *juros de resguardo* that collateralized a fraction of the outstanding *asientos*. From the text of the settlement implemented through the *medio general* we also know that in 1575 there were 4,644,139 ducats of outstanding *asientos* that were not collateralized by *juros*.[20] The total outstanding debt in 1575 was therefore 40.6 million ducats.

The next step is to calculate what percentage of *asientos* were repaid on average, and what fraction were converted into *juros*. We know that in 1565 there were few or no outstanding *asientos*, as short-term lending had not yet resumed. From our series, we also know that between 1565 and 1575, the Crown borrowed a total of 37.852 million ducats through *asientos*. Finally, by taking the difference in the stock of outstanding *juros* between 1575 and 1565, we know that 11 million ducats worth of *asientos* were converted into *juros*, while the rest were repaid. This implies that, on average, 29.06% of *asientos* were converted into *juros* in this period. We estimate the outstanding debt each year by adding 29.06% of the *asientos* underwritten the previous year to the existing stock of *juros*. Our assumption is therefore that in each year the conversion ratio equaled the average for the entire period. This reduces the volatility in the true path of debt; however, it will not introduce persistent deviations from the true value of outstanding debt, as the series must always converge to the benchmark year observations.

[20] *Asiento y Medio General de la Hacienda*. Archivo General de Simancas; Consejo y Juntas de Hacienda; Libro 42.

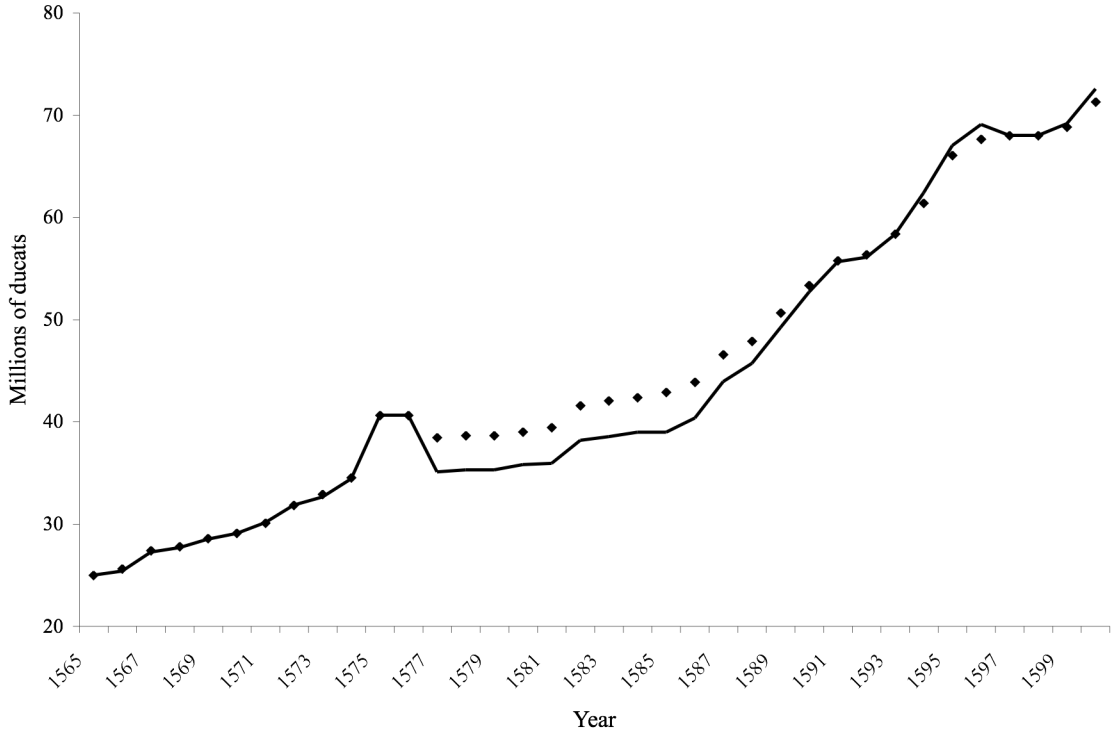
To calculate the path of debt between 1575 and 1598 we employ the same methodology, taking care to account for the effects of the 1575 and 1596 defaults. The path of debt also depends on how one calculates the write-off imposed on bankers in each default. We employ two different strategies. The first (face value) approach consists in valuing debt conversions at face value, much like it would have appeared in official books; the second (market value) approach estimates the reduction in the market value of debt imposed through reductions in the annuity rate, that is, the opportunity cost incurred by the bankers. Since the defaults always implied a swap of debt instruments of equal face value (but often with different maturities and annuity rates), the face value approach implies that, at least on paper, there were no haircuts.[21] Under the market value approach outstanding debt was reduced by 5.5 million ducats in the 1575 default and by 1.4 million ducats in the 1596 bankruptcy. Appendix C discusses the settlements in detail and shows how we obtain the value of the write-offs necessary to calculate the path of debt using the market value approach to defaults.

In order to assess the effects of our assumptions and data, we combine the face value and market value approaches with three different series of *asientos*. The first series is our own, the second is Ulloa's, and the third is constructed by taking the maximum value between our series and Ulloa's for each year. This yields six different estimates for the path of debt, which we report in Table A3 in appendix A. Figure 3 shows the estimates that yield the highest and lowest paths of debt; the dotted line is obtained using

[21] This difficulty is common to many historical estimations of the debt burden (Barro 1987). While the face value approach might appear a less convincing way of estimating debt, it has two ready uses. The first one is to provide an upper bound for the true value of debt. More importantly for our purposes, it also provides a debt path that does not reflect the haircut imposed on bankers. This will be crucial in our estimation of fiscal response functions, where interpreting a haircut as a sign of fiscal responsibility would bias the results in our favor.

the maximum *asientos* series and the face value approach to defaults; the solid line is derived from our own series of *asientos* and the market value approach.

Figure 3: Upper and lower bound estimates of outstanding debt (millions of ducats)



Source: see the text.

The paths differ in the 1577 – 1591 period. At its 1585 maximum, the difference is almost 4 million ducats, or 10% of outstanding debt.

Budget deficit

Our estimates of outstanding debt allow us to calculate a series for the budget deficit, which by definition is the increase in the stock of debt. Figure 4 shows the deficit series based on the debt path calculated using our own data and the market value approach to defaults.

Figure 4: Budget deficit

Source: see the text

One striking feature of the deficit series is the prelude and effect of the 1575 default. The deficit increased dramatically in the year before the suspension of payments. This points towards a sudden downturn in the financial fortunes of the Crown. As a result of the suspension and the tax increase of 1576 the budget swung into surplus, allowing the Crown to negotiate the 1577 settlement. Deficits following the default did not differ much from their previous path, suggesting that the financial difficulties of 1575 were temporary.

Interest rates

We derive implicit interest rates from the debt accumulation equation in Aizenman and Pinto (2005), which yields them as a by-product:

$$\Delta d_t = -ps_t + \frac{(r_t - g_t)}{(1+g_t)} d_{t-1} \quad (1)$$

where Δd is the change in the debt to GDP ratio, *ps* is the primary surplus as a percentage of GDP, *r* is the (nominal) rate of interest, and *g* is the growth rate of GDP.

Estimates of 16th century Spanish GDP differ enormously. We interpolate Albert Carreras' (2003) estimates for Castile, the fiscal unit of interest.[22] We will focus on four periods: 1560-65, 1565-75, 1577-84 and 1584-96. This will allow us to use only hard data for debt service (the six benchmark observations reported in Table 1) as well as to control for the effects of the 1575 default. Table 2 summarizes the data we use as a starting point and offers some simple indicators of the fiscal position.

Table 2: Data for benchmark years (millions of ducats)

	GDP	Consolidated Debt	Debt Service	Debt as % of GDP	Debt service as % of GDP	Revenues
1560	94.307	19.000	1.468	20.15%	1.56%	3.035
1566	103.624	25.380	1.861	24.49%	1.80%	4.379
1575	113.083	40.644	2.730	35.94%	2.41%	7.093
1577	115.049	35.106	1.024	30.51%	0.89%	7.850
1584	124.006	38.969	3.273	31.43%	2.64%	8.005
1596	144.331	69.059	4.634	47.85%	3.21%	10.197

Source: see the text.

Since we have no direct data on expenditure, we cannot calculate the primary surplus as revenues minus non-interest expenditures. We adopt an alternative approach –

[22] To be precise, we use Carreras' estimates as converted into silver grams by Alvarez Nogal and Prados de la Escosura (2008), and then convert them into nominal GDP using Hamilton's (1934) silver price index. While Alvarez Nogal and Prados de la Escosura (2008) offer newer estimates of economic growth for early modern Spain, their results include GDP for the Crown of Aragon and other minor territories over which the king exercised only limited fiscal control. Crucially, he could not use these revenue streams as collateral for debt. We therefore choose to use Carreras' estimates instead, as they reflect more closely the GDP of the territory from which the resources to repay the debt had to be generated. Using early modern GDP estimates presents considerable problems, and hence we shall repeat parts of our analysis scaling the relevant variables by fiscal revenues when warranted.

adding interest expenditures to the total surplus. For each period we calculate interest expenditure as the average of debt service in the beginning and end benchmark years, and we obtain the fiscal surplus as the negative of the increase in total debt.[23] As a by-product, we also obtain estimates of average yearly expenditures.

Table 3: Primary surplus and expenditures (millions of ducats)

	Average yearly fiscal surplus (from change in outstanding debt)	Average yearly revenue	Average yearly debt service	Average yearly primary surplus (debt service + surplus)	Average yearly expenditures (revenue – primary surplus)
1560-1566	-1.063	3.707	1.665	0.602	3.106
1566-1575	-1.696	5.736	2.296	0.600	5.136
1577-1584	-0.429	7.928	2.149	1.719	6.208
1584-1596	-2.508	9.101	3.954	1.446	7.655

Source: see the text.

We are now in a position to calculate the implied interest rate using equation 1. Table 4 reports our estimates for all the terms of the equation. The last column contains the implied interest rate for each of our four periods of interest.

Table 4: Implied interest rates

	GDP growth rate (g)	Debt as % of GDP at beginning of period (d_{t-1})	Primary surplus as % of GDP (ps)	Annualized change in debt as % of revenue (Δd_t)	Implied interest rate (r)
1560-1566	1.58%	20.15%	0.61%	0.72%	8.30%
1566-1575	0.98%	24.49%	0.55%	1.27%	8.50%
1577-1584	1.08%	30.51%	1.44%	0.13%	6.27%
1584-1596	1.27%	31.43%	1.08%	1.37%	9.16%

Source: see the text.

Interest rates were quite stable. Between 1560 and 1565, they fell in the 8.3% to 8.50% range. After the 1577 settlement they dropped to 6.27%, reflecting the lower bond

[23] In the years 1560, 1566, 1577 and 1596 there were no outstanding *asientos*, and hence the data on *juros* service represents the total interest paid on debt.

yields imposed by the *medio general*. From then on rates rose markedly, reflecting the overall deterioration of the monarchy's finances in that period.

Spending and the fiscal balance

Since the implied interest rates do not vary much from period to period, we use them to construct a yearly series of interest expenditures. To do this, we first estimate the interest rate for each year through a linear smoother of our benchmark period estimates in Table 4. We then multiply the resulting series by our yearly estimates of outstanding debt (column 4 in Table A3 in Appendix A).[24]

With a series of annual debt service, it is now straightforward to complete our picture of the fiscal situation of Castile by using the following basic definitions:

$$rev - e = ps \tag{2}$$

$$ps - ds = ts = -d \tag{3}$$

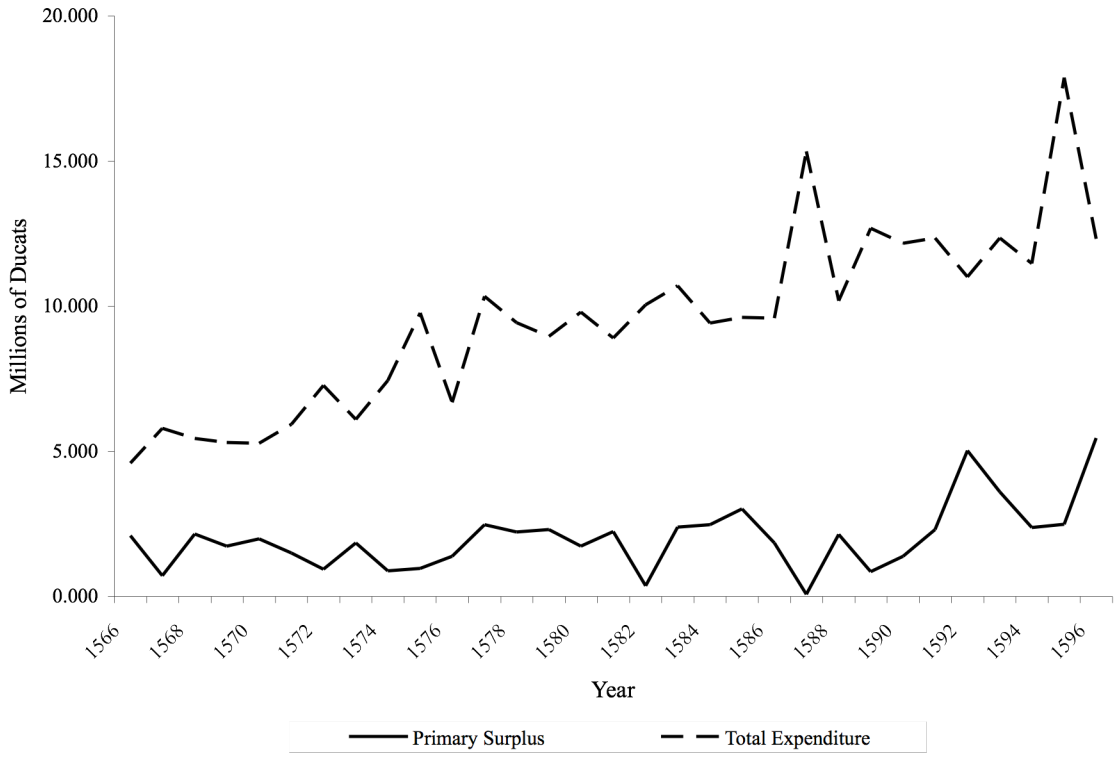
where *rev* is revenue, *e* is ordinary expenditure, *ps* is the primary surplus, *ds* is debt service, *ts* is the total surplus, and *d* is the deficit. We obtain a yearly series for the primary surplus by subtracting the budget deficit from debt service. We can then calculate ordinary expenditures as the difference between revenues and the primary surplus.

This simple accounting framework relies on the assumption that there is no variation in the cash reserves of the king. During normal times, this is plausible. Since the Crown continued to tap the short-term loan market, paying high rates of interest, it is

[24] Alternative assumptions to obtain yearly interest rates (for example, that interest rates are constant in each subperiod) do not produce material deviations in the final estimates.

unlikely that it maintained or increased its cash reserves. During a default, however, the king must have held cash reserves (which we do not observe) to meet his expenditure needs, as borrowing was not available. The logic of our accounting exercise lumps any increase in cash reserves together with expenditure. We thus overestimate expenditure during the year of the default, when the king is building up his cash reserves. Conversely, since we do not observe expenditure financed by running down cash reserves, we also underestimate outlays in the year of the settlement. This problem affects the values for the years 1575, 1576 and 1577. Since we have the correct value for the sum of these three years, we imputed 1/3 of the total to each of them. We then adjusted the primary surplus series to reflect the expenditure estimates for 1575-77. Figure 5 shows the expenditure and primary surplus series. Table A4 in Appendix A reports all the series.

Figure 5: Expenditure and Primary Surplus



Source: see the text.

From Figure 5 it is immediately apparent that Philip II managed to run a primary surplus in every year of his reign for which we have data. The king never borrowed to cover interest. It is also evident that, despite large fluctuations mostly related to silver revenues, the average primary surplus increased throughout the period as the Crown strove to deal with the increasing interest payments. The expenditure series displays the battle scars of Spanish financial and military policy. It is easy to distinguish the stop of interest payments in 1576, the enormous expenses to outfit the Armada in 1588, and the outbreak of the last phase of the Elizabethan war, which Spain fought against France and England between 1595 and 1598.

III. SUSTAINABILITY

Traditional sustainability analysis

What is a sustainable level of debt? According to one approach, for spending and borrowing to be sustainable, the long-run level of the debt to GDP ratio has to be stable (IMF 2003). An explosion of debt can be avoided if a government effectively does not borrow to pay interest, and reserves a substantial portion of its regular income for debt servicing. In other words, debt sustainability requires that the primary surplus be high enough to render equation 1 at least equal to zero, implying $ps \geq ps^*$. Table 5 summarizes the traditional debt sustainability analysis for sixteenth century Castile.

Table 5: Debt sustainability

	PS as a % of GDP	PS* as a % of GDP	PS as a % of revenue	PS* as a % of revenue
1560-1566	0.61%	1.33%	16.23%	8.48%
1566-1575	0.55%	1.83%	10.45%	9.73%
1577-1584	1.44%	1.57%	21.69%	27.35%
1584-1596	1.08%	2.45%	15.89%	31.76%

Source: see the text.

In columns 1 and 2 we compare the actual primary surplus as a percentage of GDP with that required to render the debt difference equation equal to zero. Debt was growing throughout the entire period as a percentage of GDP, and hence *ps* was always lower than *ps**. This result illustrates the major shortfall of traditional sustainability analysis. Because the theory does not identify a sustainable level of debt, focusing rather on its variations, any increase in debt as a percentage of GDP is labeled as unsustainable. In fact, any sovereign state that begins to borrow as part of its financing mix would be conducting an unsustainable debt policy. Castile came close to meeting this stringent standard of sustainability between 1577 and 1584. In other periods, the shortfall was in the order of 0.5 to 1.5% of GDP.

Is GDP a sensible scaling variable in the context of an early modern economy? The analytic framework relies on the assumption that states can lay claim to a relatively constant share of GDP. This clearly did not hold in an era when fiscal systems developed rapidly and, albeit temporarily, revenues grew much faster than the economy at large. As long as the maximum ratio of taxes to GDP was not reached, financiers probably cared only about the prospects of fiscal revenue growth rather than output. We also have much better data on fiscal revenues than on GDP, the numbers for which can probably only be

trusted up to an order of magnitude. We therefore conduct a modified analysis replacing GDP with revenues as the scaling variable. The results are reported in columns 3 and 4 of Table 5. By this measure, debt was clearly sustainable in the period 1560-1575. While the years 1577-1584 exhibit a shortfall, the gap could have been closed with just a 1% yearly revenue increase.

After 1585, the fiscal position deteriorated markedly. Fresh efforts to subdue the Dutch rebels, as well as the Armada, strained the Crown's finances. Both approaches show large shortfalls in the primary surplus required to keep debt under control. Using the revenue-based calculations, the Crown would have needed additional yearly income growth of 320,000 ducats, fully 4% of revenue, to keep the debt stable. Meeting the sustainability requirement would have implied collecting an additional 3,520,000 ducats per year by the end of the period, a feat that does not seem possible. However, had expenditure been curtailed – as a result of military victory, or more limited campaigns – it is still possible to imagine a scenario in which Philip could have repaid his debts.[25]

Fiscal policy reaction functions

The traditional approach to debt sustainability suffers from a number of limitations. The sustainable level of debt is not determined. Results can therefore be overly pessimistic or optimistic, depending on the particular economy at hand (Celasu, Debrun, and Ostry 2007). One alternative is to test for unit roots in the debt to GDP ratio. If the debt/GDP series is stationary, one-off shocks are eventually reversed. If a series is non-stationary, shocks last forever – neither spending nor taxes adjust to undo the rise in

[25] Arguably, Britain paying down her debts after 1815 required a similarly improbable change in political conditions.

the debt ratio. We perform non-stationarity tests in Appendix D, using both the Kwiatkowski-Phillips-Schmidt-Shin (1992) test and the Elliott-Rothenberg-Stock (1996) version of the Augmented Dickey-Fuller test. We find that, in line with our earlier discussion, the debt/GDP ratio for the whole period appears non-stationary. For the period up to 1585, we cannot reject the null of either stationarity or of non-stationarity. If we use the debt to revenue ratio instead, we cannot reject either stationarity or non-stationarity in the full sample.

The literature on sovereign debt has concluded that non-stationarity tests are a poor way of examining sustainability, not least because the power of these tests tends to be low.[26] Because of these shortcomings, Bohn (1998) develops an alternative method for determining sustainability. He estimates fiscal policy functions of the type

$$ps_t = C + \rho \bullet d_t + \varepsilon_t \qquad (4)$$

where C is a constant, and ρ indicates the strength of the fiscal reaction to accumulating debts. Sustainability requires that the primary surplus responds positively to an increase in debt levels in a linear or more than linear fashion. Our new series for annual primary surpluses and debt stocks allow us to estimate (4). In contrast to Bohn, we do not attempt to adjust for temporary expenditure shocks. This is because our sample period is relatively short, and because Philip II was at war every single year of his reign with the exception of one. Not adjusting for temporary expenditures shocks biases the coefficient on debt downwards (Bohn 1998).

Bohn's period of interest for the US does not include bankruptcies. The haircut imposed on lenders after a default causes debt to fall, and Bohn's methodology would

[26] Bohn (1998).

incorrectly interpret this as a sign of fiscal virtue. To avoid this, in the regressions we use the debt and primary surplus estimates obtained with the face value approach to defaults.[27] Because of the data concerns surrounding GDP estimates and possible structural breaks in the series, we estimate three different models (linear, log-log and quadratic) in four variants each. First, to establish a benchmark, we do not scale the variables by GDP. We estimate each equation for both the entire sample and, heeding our findings in the previous exercise, we repeat the analysis for the sub-period 1566-1584. We then redo the estimations using the data scaled by GDP estimates. Finally, we estimate linear models using UK data between 1698 and 1794 (both full sample and peace years only), and we reproduce the estimates for the US from Bohn (1998). All results are reported in Table 6.

[27] See section II above for a discussion of the face value approach to the estimation of debt during defaults.

Table 6: Response of the primary surplus to debt accumulation

Country / Period	Model	Constant	d_t	$(d_t-d_a)^2$	R^2	N
Castile, 1566-96						
Current ducats	Linear	0.367 (0.57)	0.043** (2.73)		0.20	31
	Log-Log	-4.058** (-2.18)	1.256** (2.59)		0.24	31
	Quadratic	0.119 (0.20)	0.054*** (3.55)	-0.002 (-1.27)	0.25	31
Percentage of GDP	Linear	0.004 (0.59)	0.038* (1.75)		0.09	31
	Log-Log	-2.820*** (-3.93)	1.268* (1.78)		0.12	31
	Quadratic	.002 (0.29)	0.051** (2.32)	-0.494 (-1.46)	0.15	31
Castile, 1566-84						
Current ducats	Linear	-2.125* (-1.92)	0.116*** (3.51)		0.40	19
	Log-Log	-8.910** (-2.12)	2.642** (2.23)		0.33	19
	Quadratic	-2.530* (-1.75)	0.124*** (3.20)	0.004 (0.49)	0.41	19
Percentage of GDP	Linear	-0.018 (-1.20)	0.114** (2.23)		0.23	19
	Log-Log	-0.851 (-0.48)	2.893 (1.73)		0.21	19
	Quadratic	-0.011 (-0.63)	0.097* (1.76)	-1.620 (-0.75)	0.27	19
UK, 1698-1794 *Percentage of GDP*	Linear	0.022** (2.20)	-0.06 (0.58)		0.003	95
UK, 1698-1794 Peace years only *Percentage of GDP*	Linear	0.031*** (8.30)	0.013*** (3.20)		0.15	51
US, 1916-95 † *Percentage of GDP*	Linear	-0.019*** (5.40)	0.054*** (5.99)		0.94	80

Note: t-statistics in brackets derived from Newey-West standard errors. Stars indicate significance levels at 10% (*), 5% (**) and 1% (***).

† Bohn (1998) also adds components to adjust for temporary expenditure shocks (not reported). The entry for the US is taken directly from Bohn (1998). Data for the UK is taken from Bonney (1995-2007), and combined with the GDP estimates in Officer (2006), interpolated with the industrial production index in Crafts and Harley (1992).

In all specifications, we find a strong response of the primary surplus to higher debt stocks, and the parameters are robust to scaling. In the models covering the entire period, the coefficient on debt hovers between 0.038 and 0.054, compared with a US coefficient of 0.054. If the only the sub-period between 1566 and 1584 is considered, the response almost doubles in strength. This suggests that Habsburg Spain, despite the strains of constant warfare, reacted with at least as large an increase in her primary surplus to the accumulation of debt than the US did in the 20th century. There is also no evidence that fiscal responses slowed down at higher debt levels. In the quadratic specifications, we only find insignificant coefficients on d^2.[28] Remarkably, Habsburg Spain appears to show a much stronger reaction to rising deficits than the UK during the 18th century. Since Great Britain is widely seen as a model of fiscal rectitude in the early modern era (Brewer 1988; Ferguson 2002), we conclude that the Spanish bankruptcies did not result from underlying structural weaknesses in fiscal responses.

IV. DISCUSSION AND CONCLUSION

By combining a new series of short-term loans with existing data and a simple accounting framework, we construct the first comprehensive annual accounts of Spain's fiscal position between 1566 and 1596. These series are the earliest of their kind for any state in history. During this period, the Spanish empire was at the height of its power. The period also saw the forging of Philip II's 'grand strategy,' the onset of 'imperial

[28] In appendix E, we present the results of quantile regressions. These show that the the primary surplus reacted more strongly to more debt at higher levels, offering support for the results from the quadratic specification.

overstretch,' and the unraveling of Spanish hegemony in the wake of military setbacks.[29] Overall, Spain's finances were much healthier than earlier authors allowed. This is especially true of the years before the "Invincible Armada". While expenditures rose, revenues mostly kept pace. Remarkably, Philip II ran a primary surplus in every single year of his reign, and increased it as debt levels rose. We conclude that Philip's debt was sustainable until at least 1584. From this vantage point, the bankruptcy of 1575 appears as little more than a temporary setback. The suspension of payments seems to have been triggered by an unforeseen increase in expenditures in the two preceding years. Between 1577 and 1584, the fiscal indicators behaved as they had in earlier decades; the growing debt was met with an increased primary surplus, and the deficit was kept under control.

The fiscal situation deteriorated in the second half of the 1580s, when Philip decided to undertake the 'Enterprise of England.' The enormous cost of outfitting the Armada sent the budget deep into the red. The disaster of 1588 and the sudden threat of British invasion required high levels of military expenditure. The introduction of the *millones* and record silver remittances could not rescue the king's fiscal position. The outbreak of the Elizabethan war, a direct consequence of the Armada and of Spain's involvement in the struggle for the French succession severely undermined Castile's finances. Faced with the highest spike in expenditure yet, the Crown had no alternative but to declare another bankruptcy. By the 1590s, no plausible tax increase would have been large enough to service the existing debt. Only a prolonged period of peace and domestic austerity could have rendered the king's financial position sustainable. Unlike the 1575 episode, the 1596 suspension was clearly rooted in structural causes.

[29] See Kennedy (1987) and Parker (1998).

Our sustainability calculations may even be too cautious, as they rely only on the ex-post outcomes of uncertain events. Ex-ante, it was not clear that Philip II's strategy in the Netherlands would fail. Had it succeeded, the vast military expenditures necessary to subdue the rebels could have been saved. In addition, the rich cities of the Low Countries would have been taxed heavily. Had the Armada not been destroyed, the Crown would have saved the expense of building a second fleet, and possibly gained additional tax revenue. The defeat of 1588 dealt a shattering blow to Spain's military and financial position. Hopes of repaying all debts did not founder on the rocks of fiscal recklessness and ineptitude, as suggested by earlier scholarship. They sank together with the Armada's ships in the English Channel.

Our findings suggest that bankers lending to Philip II may ex-ante have been no less rational than investors in British consols in the early 19th century. At that point, British government debt stood at more than 200 percent of GDP (Barro 1987). That Spain would eventually hold the record for serial default, and that Britain would emerge as a textbook example of fiscal probity, may owe more to success or misfortune on the battlefield than to fiscal policy itself. In this sense, our results shed additional light on the nature of serial defaults. Reinhart, Rogoff and Savastano (2003) argue that countries go bankrupt repeatedly because deeper parameters in their political and social environment make repayment difficult. Borrowing, for these countries, is unsafe at almost any level. Default episodes may have important negative knock-on effects on growth and the quality of fiscal institutions. Sims (2003) points out that even serial defaults may be an efficient equilibrium outcome, and that there is only limited evidence that bankruptcies harm fiscal institutions. Spain's history of 13 defaults between 1500 and 1900 serves a

prime example in the work of Reinhart, Rogoff and Savastano (2003). Our results suggest that Philip's first suspensions occurred at a time of fiscal probity and reasonable financial health, and reflected temporary liquidity shortfalls. While it is possible that the cumulative effect of Philip's bankruptcies eventually undermined the fiscal and economic position of Spain, the evidence in our period does not suggest that the quality of fiscal institutions suffered markedly. If anything, since the king used the defaults as a negotiating device to raise taxes on the cities, suspensions probably strengthened the tax powers of the monarch. This implies that it took an accumulation of random shocks – mostly after the death of Philip II – to eventually lead to serial defaults with negative economic and institutional consequences.

REFERENCES

Aizenman, Joshua, and Brian Pinto. 2005. *Managing Economic Volatility and Crises: A Practitioner's Guide*. Cambridge: Cambridge University Press.

Alvarez Nogal, Carlos, and Leandro Prados de la Escosura. 2008. The Decline of Spain (1500-1850): Conjectural Estimates. *European Review of Economic History* (forthcoming).

Artola, Miguel. 1982. *La Hacienda del Antiguo Régimen*. Madrid: Alianza.

Barro, Robert J. 1987. Government Spending, Interest Rates, Prices, and Budget Deficits in the United Kingdom, 1701-1918. *Journal of Monetary Economics* 20 (2):221-247.

Bohn, Henning. 1998. The Behavior of US Public Debt and Deficits. *Quarterly Journal of Economics* 113 (3):949-963.

Bonney, Richard. 2007. *European State Finance Database* 1995-2007 [cited August 23 2007]. Available from http://www.le.ac.uk/hi/bon/ESFDB/.

———. 1999. *The Rise of the Fiscal State in Europe, c. 1200-1815*. Oxford: Oxford University Press.

Braudel, Fernand. 1966. *The Mediterranean and the Mediterranean World in the Age of Philip II*. Second Revised Edition ed. Glasgow: William Colins & Sons.

Brewer, John S. 1988. *The Sinews of Power*. Cambridge: Harvard University Press.

Bulow, Jeremy, and Kenneth Rogoff. 1989. A Constant Recontracting Model of Sovereign Debt. *Journal of Political Economy* 97 1:155-78.

Carande, Ramón. 1987. *Carlos V y sus banqueros*. 3. ed. 3 vols. Barcelona: Crítica.

Carreras, Albert. 2003. Modern Spain. In *The Oxford Encyclopedia of Economic History*, edited by J. Mokyr. New York: Oxford University Press.

Celasu, OYa, Xavier Debrun, and Jonathan Ostry. 2007. Primary Surplus Behavior and Risks to Fiscal Sustainability in Emerging Market Countries: A "Fan-Chart" Approach. *IMF Staff Papers* 53 (3).

Conklin, James. 1998. The Theory of Sovereign Debt and Spain under Philip II. *Journal of Political Economy* 106 3:483-513.

Crafts, N. F. R., and C. Knick Harley. 1992. Output Growth and the British Industrial Revolution: A Restatement of the Crafts-Harley View. *Economic History Review* 45:703-730.

Dickson, P. G. M. 1967. *The Financial Revolution in England. A Study in the Development of Public Credit.* London: Macmillan.

Drelichman, Mauricio, and Hans-Joachim Voth. 2008. Institutions and the Resource Curse in Early Modern Spain. In *Institutions and Economic Performance*, edited by E. Helpman. Cambridge: Harvard University Press.

Elliott, G., T. Rothenberg, and J. H. Stock. 1996. Efficient Tests for an Autoregressive Unit Root. *Econometrica* 64:813-836.

Ferguson, Niall. 2002. *The Cash Nexus: Money and Power in the Modern World, 1700-2000*. New York: Basic Books.

Gelabert, Juan. 1999. Castile, 1504-1808. In *The Rise of the Fiscal State in Europe, c. 1200-1815*, edited by R. Bonney. Oxford: Oxford University Press.

Hamilton, Earl J. 1934. *American Treasure and the Price Revolution in Spain, 1501-1650*. Cambridge: Harvard University Press.

Hoffman, Philip T., and Kathryn Norberg. 1994. *Fiscal Crises, Liberty, and Representative Government, 1450-1789.* Stanford: Stanford University Press.

Homer, Sydney, and Richard Sylla. 2005. *A History of Interest Rates*. Fourth ed. Hoboken: John Wiley & Sons.

IMF. 2003. *World Economic Outlook.* Washington: IMF.

Jago, Charles. 1985. Philip II and the Cortes of Castile: The Case of the Cortes of 1576. *Past and Present* 109:22-43.

Kennedy, Paul M. 1987. *The rise and fall of the great powers : economic change and military conflict from 1500 to 2000*. New York, NY: Random House.

Kwiatkowski, Denis, Peter C. B. Phillips, Peter Schmidt, and Yongcheol Shin. 1992. Testing the null hypothesis of stationarity against the alternative of a unit root : How sure are we that economic time series have a unit root? *Journal of Econometrics* 54:159-178.

Lovett, A. W. 1980. The Castilian Bankruptcy of 1575. *The Historical Journal* 23:899-911.

———. 1982. The General Settlement of 1577: An Aspect of Spanish Finance in the Early Modern Period. *The Historical Journal* 25 (1):1-22.

Marcos Martín, Alberto. 2000. *España en los siglos XVI, XVII y XVIII*. Barcelona: Crítica.

Neri, Erica. 1989. *Uomini d'affari e di governo tra Genova e Madrid*. Milano: Vita e Pensiero - Pubblicazioni dell'Università Cattolica.

Officer, Lawrence. 2006. The Annual Real and Nominal GDP for the United Kingdom, 1086-2005: Economic History Services.

Ormrod, W. M., Richard Bonney, and Margaret Bonney. 1999. *Crises, Revolutions, and Self-Sustained Growth. Essays in European Fiscal History*. Stamford: SHAUN TYAS.

Parker, Geoffrey. 1998. *The Grand Strategy of Philip II*. New Haven and London: Yale University Press.

Reinhart, Carmen M., Kenneth S. Rogoff, and Miguel A. Savastano. 2003. Debt Intolerance. *Brookings Papers on Economic Activity* 2003 (1):1-74.

Ruiz Martín, Felip. 1965. Un expediente financiero entre 1560 y 1575. La hacienda de Felipe II y la Casa de Contratación de Sevilla. *Moneda y Crédito* 92:3-58.

Ruiz Martín, Felipe. 1968. Las finanzas españolas durante el reinado de Felipe II. *Cuadernos de Historia, Anexos de la Revista Hispania* 2:181-203.

Sims, Chris. 2003. Comments on 'Debt Intolerance". *Brookings Papers on Economic Activity* 2003v (1):63-74.

Thompson, I. A. A. 1976. *War and Government in Habsburg Spain*. London: The Athlone Press - University of London.

———. 1994. Castile: Polity, Fiscality, and Fiscal Crisis. In *Fiscal Crises, Liberty, and Representative Government, 1450-1789*, edited by P. T. Hoffman and K. Norberg. Stanford: Stanford University Press.

Toboso Sánchez, Pilar. 1987. *La deuda pública castellana durante el Antiguo Régimen (juros) y su liquidación en el siglo XIX*. Madrid: Instituto de Estudios Fiscales.

Tortella, Gabriel, and Francisco Comín. 2001. Fiscal and monetary institutions in Spain (1600-1900). In *Transferring Wealth and Power from the Old World to the New. Monetary and Fiscal Institutions in the 17th through the 19th Centuries.*, edited by M. D. Bordo and R. Cortés Conde. Cambridge: Cambridge University Press.

Ulloa, Modesto. 1977. *La hacienda real de Castilla en el reinado de Felipe II*. [2. ed. Madrid: Fundación Universitaria Española, Seminario Cisneros.

Yun Casalilla, Bartolomé. 2002. El Siglo de la Hegemonía Castellana (1450-1590). In *Historia Económica de España, Siglos X-XX*, edited by F. Comín, M. Hernández and E. Llopis. Barcelona: Crítica.

———. 2004. *Marte contra Minerva. El precio del imperio español, c. 1450-1600.* Barcelona: Crítica.

Appendix A: Data and estimates

Table A1: Revenues by Type, 1555-1596 (millions of ducats)

Year	Sales tax	Customs (internal and external)	Monopolies	Direct taxes	Millones	Church revenues	Confiscation	Indies	Total
1555	0.933	0.513	0.399	0.432	0.000	0.411	0.000	0.372	3.061
1556	0.933	0.513	0.405	0.404	0.000	0.411	0.000	0.704	3.369
1557	0.939	0.500	0.404	0.404	0.000	0.411	0.000	0.425	3.083
1558	0.939	0.497	0.404	0.404	0.000	0.307	0.000	0.644	3.195
1559	0.939	0.490	0.330	0.404	0.000	0.360	0.000	0.000	2.523
1560	0.939	0.515	0.331	0.404	0.000	0.360	0.034	0.573	3.155
1561	0.939	0.585	0.375	0.565	0.000	0.530	0.000	0.704	3.698
1562	1.277	0.690	0.440	0.537	0.000	0.531	0.000	0.199	3.674
1563	1.277	0.720	0.483	0.537	0.000	0.533	0.000	0.455	4.005
1564	1.277	0.737	0.542	0.404	0.000	0.807	0.000	0.474	4.241
1565	1.277	0.781	0.575	0.404	0.000	0.807	0.000	0.352	4.197
1566	1.277	0.791	0.532	0.404	0.000	0.807	0.000	0.921	4.732
1567	1.277	1.076	0.501	0.432	0.000	0.554	0.202	0.368	4.411
1568	1.277	1.132	0.505	0.404	0.000	0.522	0.427	1.210	5.477
1569	1.277	1.136	0.484	0.404	0.000	0.360	0.260	0.949	4.870
1570	1.277	1.064	0.520	0.537	0.000	0.554	0.079	1.010	5.041
1571	1.277	1.115	0.537	0.537	0.000	0.597	0.008	1.068	5.139
1572	1.277	1.083	0.527	0.537	0.000	1.200	0.554	0.605	5.782
1573	1.277	1.090	0.549	0.432	0.000	1.200	0.181	0.708	5.437
1574	1.277	0.985	0.587	0.404	0.000	1.316	0.411	0.700	5.680
1575	3.091	0.975	0.616	0.404	0.000	1.018	0.619	0.917	7.639
1576	3.715	0.978	0.579	0.404	0.000	1.260	0.135	0.988	8.059
1577	3.715	1.000	0.583	0.404	0.000	1.233	0.040	2.168	9.143
1578	2.715	0.994	0.661	0.404	0.000	1.431	0.301	1.448	7.953
1579	2.715	1.006	0.652	0.444	0.000	1.290	0.025	1.437	7.568
1580	2.715	0.992	0.636	0.404	0.000	1.286	0.042	1.739	7.813
1581	2.715	0.983	0.592	0.404	0.000	0.933	0.000	1.737	7.364
1582	2.715	0.994	0.442	0.404	0.000	1.336	0.049	0.498	6.437
1583	2.715	1.014	0.472	0.404	0.000	1.274	0.000	3.200	9.078
1584	2.715	1.037	0.472	0.404	0.000	1.299	0.067	1.857	7.850
1585	2.715	1.018	0.472	0.439	0.000	1.310	0.359	2.226	8.539
1586	2.715	1.038	0.533	0.404	0.000	1.314	0.350	0.890	7.243
1587	2.715	1.028	0.524	0.404	0.000	1.432	0.382	4.472	10.957
1588	2.755	0.993	0.595	0.404	0.000	1.211	0.281	1.519	7.757
1589	2.755	0.999	0.529	0.404	0.000	1.338	0.356	2.322	8.703
1590	2.755	1.020	0.869	0.404	0.000	1.384	0.202	1.836	8.469
1591	2.755	1.033	0.896	0.444	1.338	1.378	0.788	0.697	9.329
1592	2.755	0.974	0.825	0.404	1.338	1.380	0.000	2.985	10.660
1593	2.755	1.008	0.912	0.404	1.338	1.283	0.592	2.089	10.381
1594	2.755	1.015	0.816	0.404	1.338	1.438	0.230	0.000	7.996
1595	2.755	1.017	1.010	0.404	1.333	1.476	0.325	5.738	14.058
1596	2.755	1.026	0.784	0.404	1.333	1.501	0.108	3.418	11.328

Table A2: Asientos

Year	Ducats	Year	Ducats
1520	4,454	1566	1,308,635
1521	55,834	1567	6,465,559
1522	156,502	1568	1,427,573
1523	348,103	1569	2,862,427
1524	60,858	1570	1,957,884
1525	172,415	1571	3,691,306
1526	358,224	1572	5,853,273
1527	472,917	1573	2,636,034
1528	599,668	1574	6,177,371
1529	794,567	1575	5,472,220
1530	830,467	1576	106,666
1531	904,406	1577	0
1532	620,638	1578	263,325
1533	5,225	1579	0
1534	222,473	1580	760,480
1535	764,733	1581	195,466
1536	981,600	1582	3,358,708
1537	970,004	1583	539,529
1538	830,655	1584	640,000
1539	842,334	1585	0
1540	366,100	1586	2,072,763
1541	110,609	1587	5,327,485
1542	343,936	1588	2,660,480
1543	1,742,301	1589	5,241,068
1544	1,424,778	1590	5,120,747
1545	353,182	1591	4,408,931
1546	1,708,020	1592	655,505
1547	451,026	1593	3,354,716
1548	484,811	1594	6,052,300
1549	147,370	1595	6,880,807
1550	615,933	1596	3,074,943
1551	1,470,195	1597	582,265
1552	3,595,147	1598	0
1553	2,271,108	1599	1,734,471
1554	1,258,368	1600	5,056,161
1555	1,091,813		
1556	1,427,433		

Table A3: Estimates of outstanding debt (millions of ducats)[30]

Year	(1) Ulloa FV	(2) Ulloa MV	(3) Our series FV	(4) Our series MV	(5) Max series FV	(6) Max series MV
1565	25.000	25.000	25.000	25.000	25.000	25.000
1566	25.654	25.654	25.380	25.380	25.630	25.630
1567	27.511	27.511	27.259	27.259	27.421	27.421
1568	27.845	27.845	27.674	27.674	27.799	27.799
1569	28.664	28.664	28.506	28.506	28.589	28.589
1570	29.213	29.213	29.075	29.075	29.118	29.118
1571	29.976	29.976	30.148	30.148	30.094	30.094
1572	31.796	31.796	31.849	31.849	31.850	31.850
1573	32.896	32.896	32.615	32.615	32.910	32.910
1574	34.599	34.599	34.410	34.410	34.553	34.553
1575	40.644	40.644	40.644	40.644	40.644	40.644
1576	40.644	40.644	40.644	40.644	40.644	40.644
1577	38.440	35.106	38.440	35.106	38.440	35.106
1578	38.654	35.355	38.592	35.283	38.646	35.346
1579	38.654	35.355	38.592	35.283	38.646	35.346
1580	38.918	35.662	39.031	35.793	39.015	35.775
1581	39.364	36.180	39.143	35.924	39.445	36.275
1582	41.587	38.765	41.082	38.178	41.592	38.770
1583	42.079	39.336	41.394	38.539	42.066	39.321
1584	42.079	39.336	41.763	38.969	42.376	39.682
1585	42.603	39.945	41.763	38.969	42.882	40.270
1586	43.371	40.838	42.959	40.360	43.887	41.437
1587	46.164	44.084	46.034	43.934	46.583	44.571
1588	47.164	45.247	47.570	45.719	47.872	46.070
1589	50.065	48.618	50.595	49.235	50.672	49.325
1590	52.853	51.859	53.551	52.671	53.364	52.453
1591	55.332	54.740	56.096	55.629	55.757	55.235
1592	55.967	55.479	56.474	56.068	56.371	55.948
1593	58.039	57.887	58.411	58.319	58.371	58.273
1594	61.145	61.498	61.904	62.380	61.370	61.759
1595	65.982	67.119	65.876	66.996	66.040	67.186
1596	67.651	69.059	67.651	69.059	67.651	69.059
1597	68.000	68.000	68.000	68.000	68.000	68.000
1598	68.000	68.000	68.000	68.000	68.000	68.000
1599	68.871	69.012	69.001	69.164	68.840	68.977
1600	71.408	71.962	71.920	72.556	71.291	71.825

[30] It bears repeating that "face value" and "market value," represented by the letters FV and MV in the table, do not refer to the valuation of outstanding debt, but rather to the methodology for computing the size of the haircut in each default.

Table A4: Fiscal position

Year	(1) Revenues	(2) Ordinary expenditure	(3)=(1)-(2)=(4)-(6) Primary surplus	(4) Debt service	(5)=(2)+(4) Total expenditure	(6)=(1)-(5) Deficit
1566	4.732	2.641	2.092	2.472	5.113	0.380
1567	4.411	3.702	0.709	2.587	6.290	1.879
1568	5.477	3.334	2.143	2.558	5.892	0.415
1569	4.870	3.137	1.733	2.565	5.702	0.832
1570	5.041	3.066	1.975	2.544	5.610	0.569
1571	5.139	3.648	1.490	2.563	6.211	1.073
1572	5.782	4.854	0.928	2.629	7.483	1.701
1573	5.437	3.592	1.845	2.611	6.203	0.766
1574	5.680	4.806	0.875	2.670	7.476	1.795
1575	7.639	6.674	0.965	3.053	9.726	2.088
1576	8.059	6.674	1.385	0.000	6.674	-1.385
1577	9.143	6.674	2.469	2.463	9.137	-0.006
1578	7.953	5.742	2.211	2.388	8.130	0.177
1579	7.568	5.268	2.301	2.301	7.568	0.000
1580	7.813	6.078	1.735	2.245	8.323	0.510
1581	7.364	5.138	2.226	2.357	7.495	0.131
1582	6.437	6.075	0.362	2.615	8.690	2.253
1583	9.078	6.689	2.389	2.751	9.440	0.362
1584	7.850	5.385	2.465	2.894	8.279	0.429
1585	8.539	5.533	3.006	3.006	8.539	0.000
1586	7.243	5.403	1.839	3.230	8.633	1.391
1587	10.957	10.889	0.069	3.643	14.531	3.574
1588	7.757	5.619	2.138	3.923	9.542	1.785
1589	8.703	7.853	0.850	4.367	12.219	3.516
1590	8.469	7.081	1.388	4.823	11.905	3.436
1591	9.329	7.033	2.296	5.254	12.287	2.958
1592	10.660	5.642	5.018	5.458	11.099	0.440
1593	10.381	6.786	3.594	5.845	12.631	2.251
1594	7.996	5.624	2.371	6.432	12.056	4.061
1595	14.058	11.573	2.485	7.101	18.674	4.616
1596	11.328	5.872	5.456	7.519	13.391	2.063

Appendix B: Comparing the new revenue series with existing estimates

One obvious exercise is to contrast our estimate with existing information for benchmark years. For this purpose we use the very limited data compiled by Artola (1982). His figures are the result of Crown inquiries, called *averiguaciones*, ordered in times of crisis. Table B1 compares our revenue estimate to Artola's figures for the years of 1560, 1565 and 1577, and Ulloa's estimate 1598

Table B1: Revenue in benchmark years (in ducats)

Year	Revenue (benchmarks)	Revenue (our estimate)
1560	4,192,237	3,154,551
1565	5,600,000	4,304,591
1577	8,700,000	9,142,759
1598	9,731,408	n/a

Source: Artola (1982), Ulloa (1977), authors' calculations.

In 1577, our estimates and the benchmarks are fairly close. Our series does not reach as far as 1598, but our average estimates for the 1590s are also close to Ulloa's. In the early years, however, we are 25% below the benchmark figures. Artola's data for those years comes from Ruíz Martín (1965). The discrepancy arises because Ulloa (on whose work our estimate relies) only tabulated confirmed revenues, thus missing a number of income streams for which no data has survived; Ruíz Martín, on the other hand, worked with contracted revenues, which were almost always higher than what the Crown actually received. Ulloa's numbers are therefore a lower bound for the true revenue figures, while Artola (1982) himself cautions that Ruiz Martín's figures, and hence his own, are a high upper bound.

Appendix C: the *Medios Generales* of 1577 and 1597

The *medio general* of 1577 settled the suspension of payments of September 1, 1575. This account is taken directly from the original document subscribed by the king and the bankers, preserved in the Archive of Simancas. Its location is *Asiento y Medio General de la Hacienda*. Archivo General de Simancas; Consejo y Juntas de Hacienda; Libro 42.

The king recognized outstanding obligations for 15,184,464 ducats, divided 14,600,446 ducats of outstanding principal as of September 1, 1575, and 584,018 ducats in interest accrued between September 1 and December 1, 1575. It is not clear why this interest was added; in any event, the first provision of the settlement was to write it off. We work from the outstanding capital at the time of the suspension, 14.6 million ducats.

Of the total outstanding *asientos*, 5,580,313 ducats were collateralized by perpetual *juros* with a yield of 7.14% guaranteed by ordinary revenues. The holders of these *juros* were allowed to keep them, but their annuity rate was reduced to 5%. Assuming 7.14% represented the market interest rate a banker could obtain, the reduction in the annuity rate amounts to a write-off of 1,672,531 ducats.

A further 4,375,994 ducats worth of *asientos* were collateralized by perpetual *juros* with a yield of 5% guaranteed by the revenues of the *Casa de la Contratación*. The *Casa* had been a poster boy of inefficient administration and these *juros* were often not serviced; in the secondary market they traded at around 50% of their face value. The Crown recognized 55% of *juros de contratación* at face value by converting them to 5% perpetuities guaranteed by ordinary revenues. The remainder 45%, 1,969,197 ducats' worth, were considered uncollateralized debt.

Uncollateralized debt, which amounted to 6,613,336 ducats including the *juros de contratación*, suffered the harshest treatment. Two thirds of it was converted into perpetuities of the same face value yielding 3.3%. The remainder third was converted into tax farms on small towns (*vasallos*) with a nominal yield of 2.3%. The write-off on this portion of the debt relative to a 7.14% market rate amounts to 3,865,498 ducats.

In total, the 1575 *medio general* rescheduled a total of 14,600,446 ducats of short term debt, on which it imposed a haircut of 5,538,029 ducats, or 37.93% of the loans in default.

The 1596 bankruptcy, which we describe following Ulloa (1977, p. 823) and Erica Neri (1989, p. 109), was mild in comparison. The 1597 settlement rescheduled a total 7,048,000 ducats. Two thirds, or 4,698,667 ducats' worth, were converted into 5% perpetual *juros*. Using the same market rate assumption as for the 1575 settlement, this would imply a haircut of 1,408,284 ducats. The remaining third was guaranteed by 12.5% lifetime *juros* in possession of the bankers; these lifetime bonds had been issued in 1580, and hence were halfway through their accounting life expectancy of 33 years. The settlement stipulated that they were to be swapped by 7.14% perpetual *juros*; the bankers would be given enough perpetual *juros* so as not to alter the present value of the principal. In short, this portion of the outstanding debt suffered no write off; the king lengthened the repayment schedule at the cost of increasing the face value of the bonds. The total write-off of the 1597 settlement was therefore 1,408,284 ducats, or 19.98% of the amount defaulted upon.

Appendix D: Time Series Properties

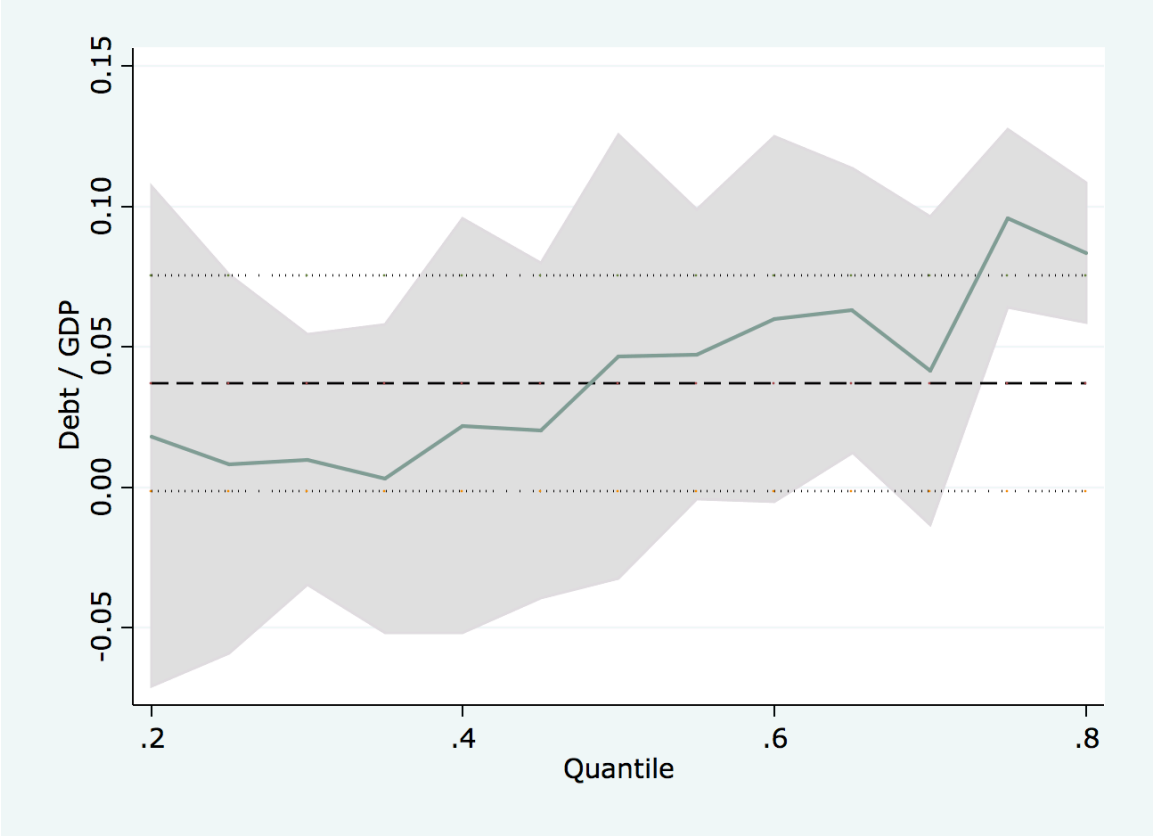
Table D1: Time-series properties of debt and primary surplus

Variable	Full sample		1566-84	
	ADF	**KPSS**	**ADF**	**KPSS**
Debt/GDP	0.214	0.42*	-0.45	0.31
Primary Surplus/GDP	-2.34*	0.25	-0.16	0.30
Debt/Revenue	-0.94	0.15	-0.75	0.26
Primary Surplus/Revenue	-2.53**	0.15	-0.30	0.29

Note: *, **, *** indicate significance at the 10%, 5% and 1% level. The null for the DF-test is non-stationarity; for the KPSS, it is stationarity. We use the Elliott-Rothenberg-Stock (1996) modified version of the Dickey-Fuller test. The lag length was chosen according to the Schwert criterion (8 lags for the full sample, and 7 for the sample before 1585). All estimation results from test against a null without trend.

Appendix E: Quantile Regression Results

Figure E.1: Quantile Regressions – Confidence Intervals



The graph shows the size of the coefficient on Debt/GDP in quantile regressions with the primary surplus as the dependent variable. The coefficient estimate and confidence interval are shown for regressions estimated for the conditional 20th percentile to the 80th percentile of the dependent variable.