

# Political regimes and sovereign credit risk in Europe, 1750–1913

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This article uses a new panel data set to perform a statistical analysis of political regimes and sovereign credit risk in Europe from 1750 to 1913. Old Regime polities typically suffered from fiscal fragmentation and absolutist rule. By the start of World War I, however, many such countries had centralized institutions and limited government. Panel regressions indicate that centralized and/or limited regimes were associated with significant improvements in credit risk relative to fragmented and absolutist ones. Structural break tests also reveal close relationships between major turning points in yield series and political transformations.

## 1. Introduction

This article examines the relationship between political regimes and sovereign credit risk over the long run. The chosen period, 1750–1913, captures key transformations to European political institutions. Study of the process of financial development in Europe is also valuable because countries around the world have implemented its forms of fiscal governance.<sup>1</sup> An understanding of the European growth experience thus translates into useful lessons for emerging economies today.

Our framework for analysis follows Dincecco (2009a) and consists of two core elements. The first comes from North and Weingast (1989). They claim that institutional reforms with the Glorious Revolution of 1688 allowed the English crown to make a credible commitment to responsible debt service.<sup>2</sup> Since the new constitution gave parliament a regular right to monitor spending decisions, the executive could keep promises to execute

<sup>1</sup> See, for instance, La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997, 1998, 1999) and La Porta, Lopez-de-Silanes and Shleifer (2008).

<sup>2</sup> Also see Dickson (1967), Jones (1972), Stone (1979) and Hill (1980). It is debatable whether political changes associated with the Glorious Revolution actually improved property rights protections. Clark (1996) argues that secure property rights existed in England from 1600 while O'Brien (2001) claims that England implemented key constitutional and administrative structures in the 1640s. Moreover, Sussman and Yafeh (2006) find that the reforms of 1688 did not significantly lower British capital costs over the next century. Yet scholars often use North and Weingast's work as a point of departure.

fiscal plans in time-consistent ways.<sup>3</sup> The second part comes from Epstein (2000). He argues that institutional fragmentation within countries and not fiscal abuse by rulers was the fundamental cause of fiscal distortions prior to the 1800s.<sup>4</sup> In fragmented polities, there was a close relationship between local tax control and political autonomy. Thus, elites had strong incentives to oppose structural reforms that threatened traditional rights. The result was a classic public goods problem, since each locality wished to free ride on the tax contributions of others. Dincecco (2009a) finds that per-capita revenues collected by fragmented sovereignties were low. A lack of resources made it difficult for national governments to repay debts. Centralized from medieval times, England – the example that North and Weingast proffer – was exceptional.<sup>5</sup>

I argue that the political transformations identified by North and Weingast and Epstein were complementary rather than competing elements of sound fiscal policy. By 1913, many European countries had struck an institutional balance that allowed national governments to gather enough in tax revenues while limiting executive discretion over expenditures. To evaluate my hypothesis, I adopt a systematic approach that examines the effects of political reforms on sovereign credit risk both within and across European polities. My investigation thus complements case study texts by Hoffman and Norberg (1994), Bonney (1999), Bordo and Cortés-Conde (2001) and others.<sup>6</sup>

I first construct a new panel data set on government bond yields for 11 European countries. Long yearly series of relevant fiscal data characterize group 1, which includes many of the largest and/or most important players

See, among others, Frey and Kucher (2000), Sussman and Yafeh (2000, 2006), Quinn (2001), Stasavage (2003, 2005) and Summerhill (2004).

<sup>3</sup> Several works use the concept of credible commitment to explain macroeconomic differences between eighteenth-century rivals Britain and France. These include Mathias and O'Brien (1976), Weir (1989), Hoffman and Norberg (1994), Rosenthal (1998), O'Brien (2001) and White (2001).

<sup>4</sup> Also see Brewer (1989), Henshall (1992), Hoffman and Norberg (1994), Hoffman and Rosenthal (1997), Rosenthal (1998) and O'Brien (2001).

<sup>5</sup> Brewer (1989), Sacks (1994), Epstein (2000) and O'Brien (2001).

<sup>6</sup> Qualitative comparative studies of European fiscal history include Tilly (1990), Bonney (1995) and O'Brien (2001). There exists a 'sister' cross-country literature on the political economy of international bond markets during the classic gold standard era. See, for instance, Flandreau and Zumer (1994), Bordo and Rockoff (1996), Obstfeld and Taylor (2003), Ferguson (2006) and Ferguson and Schularick (2006). By the 1870s, however, most European governments were administratively centralized democracies. For an earlier era, Stasavage (2005) also examines the politics of sovereign debt in Europe. One advantage of the present work is that it employs market-determined rather than nominal yields, which provide direct measures of investor perceptions of credit risk. Other papers that use historical bond series to measure the impact of economic and political factors on fiscal performance include Mauro, Sussman and Yafeh (2002), Mitchener and Weidenmier (2005) and Brown, Burdekin and Weidenmier (2006).

in Europe at the time: England, France, the Netherlands, Prussia, and Spain. The second group (Austria-Hungary, Belgium, Denmark, Italy, Portugal, and Sweden) has shorter data series. I then classify political regimes according to Dincecco (2009a). Fiscal centralization was typically the result of French conquest from 1789 to 1815. Limited government generally took place decades after centralization during the 1800s.

The statistical framework that I use is innovative in that it consists of two components not often employed together: regressions on the panel data set and structural break tests. The regressions incorporate a relevant set of control variables (violent conflict, economic growth, and fiscal and monetary policy) to assess the effects of political regimes on sovereign credit risk. For robustness, I include structural break tests that assume no a priori knowledge of major turning points. The statistical inquiry supports the argument that political transformations towards centralized and limited regimes led to significant creditworthiness improvements.

The rest of the paper proceeds as follows. Section 2 examines the relationship between political regimes and creditworthiness. Section 3 describes the data and sample countries. Section 4 examines the data on a case-by-case basis. Section 5 discusses the statistical framework. Section 6 presents the statistical results. Section 7 concludes.

## **2. Political regimes and sovereign risk**

### *2.1. Historical overview*

This section describes the relationship between political arrangements and sovereign credit risk. The classification of political regimes follows Dincecco (2009a), who argues that national governments completed the process of fiscal centralization the year that they began to secure revenues by way of a tax system with uniform rates throughout the country. Dincecco claims that limited government emerged the year in which parliament gained the constitutional right to control the national budget on an annual basis. For stability, parliament's power of the purse had to hold for at least two consecutive decades.

Tables 1 and 2 reproduce Dincecco's dates for fiscal centralization and limited government. The first table indicates that fiscal centralization took place swiftly and permanently throughout much of the Continent from 1789 onwards. The National Assembly transformed the tax system in France by eliminating traditional exemptions and privileges. Napoleon completed this process after his coup in 1799. French conquest of Belgium, the Dutch Republic and several Italian polities led to significant tax reforms. After defeat in battle by France in 1806, Prussia also made major fiscal innovations. The second table indicates that limited government reforms began during

Table 1. *Fiscal centralization in Europe*

		Year	Event
<i>Group 1</i>	England	1066	Norman conquest and subsequent erosion of provincial authority
	France	1790	Administrative reforms after Revolution of 1789
	Netherlands	1806	Administrative reforms under French control (1795–1813)
	Prussia	1806	Administrative reforms after defeat in battle by French in 1806
	Spain	1844	Administrative reforms during ‘Moderate’ decade of 1840s
<i>Group 2</i>	Denmark	1688	Establishment of official cadastre system
	Belgium	1795	Administrative reforms after French annexation in 1795
	Portugal	1832	Administrative reforms during Revolutionary era (1820–51)
	Sweden	1840	‘Departmental’ reforms
	Austria–Hungary	1848	Administrative reforms during Year of Revolutions
	Italy	1861	Establishment of Kingdom and subsequent fiscal unification

*Source:* Dincecco (2009a).

*Notes:* The first column lists sample countries by group. Long annual data series over a variety of political regimes characterize group 1, which includes the largest and/or most important players in Europe at the time. Group 2 has shorter data series. The second column displays the year that fiscal centralization was completed. The final column offers brief ‘explanations’ for the dates.

the 1830s and 1840s, several decades after centralization. A second wave occurred in the 1860s and 1870s.

Some exceptions bear mention. At one extreme, England had centralized institutions and parliamentary government long before most Continental regimes. At the other, the French failed in their attempts to make administrative changes in Iberia: fiscal centralization in Portugal and Spain did not happen until 1832 and 1844, respectively. Though political risks and instability dominated the peninsula over the 1800s, stable limited regimes were established in Portugal in 1851 and in Spain in 1876.

## 2.2. *Theoretical implications*

By establishing parliament’s power of the purse, limited government reduced the likelihood of poor spending choices by executives. *Ceteris paribus*, it should have improved sovereign credit risk, as expressed by a reduction in yield spreads over benchmark British consols, relative to absolutist regimes. The relationship between fiscal centralization and credit risk is less

Table 2. *Limited government in Europe*

		Year	Event
<i>Group 1</i>	Netherlands	1572	Formation of Dutch Republic (1572–1795)
		1848	Implementation of new constitution
	England	1688	Establishment of constitutional monarchy
	Prussia	1848	Establishment of constitutional monarchy
	France	1870	Establishment of stable constitutional regime
	Spain	1876	Establishment of stable constitutional monarchy
<i>Group 2</i>	Denmark	None	Absolutism restored (1866) after short-lived constitutional regime
	Belgium	1831	Established as a constitutional monarchy
	Portugal	1851	Establishment of stable constitutional monarchy
	Italy	1861	Established as a constitutional monarchy
	Sweden	1866	Dissolution of Estates and introduction of bicameral legislature
	Austria–Hungary	1867	Establishment of constitutional monarchy

*Source:* Dincecco (2009a).

*Notes:* The first column lists sample countries by group, which Table 1 describes. The second column displays the year that limited government emerged. The final column offers brief ‘explanations’ for the dates.

straightforward. On one hand, centralization generated a significant increase in per-capita revenues (see Dincecco 2009a), which made it easier for crowns to follow sound fiscal policies. Thus, credit risk should have fallen. On the other hand, consolidation of fiscal powers by monarchs may have aggravated problems of executive control. There was always the danger that executives would waste new revenues on ill-advised wars. If so, then credit risk should have increased after centralization.

Table 3 summarizes the sovereign credit risk characteristics of the four possible political regimes: fragmented and absolutist, centralized and absolutist, fragmented and limited, and centralized and limited. Note that there was only one example of the fragmented and limited regime among sample countries.<sup>7</sup> Credit risk under centralized and limited regimes should have been lower than under fragmented and absolutist ones. By eliminating local free riding, fiscal centralization implied an increase in public funds. Similarly, limited government established spending constraints on executives. The combination of greater revenues and parliamentary control should have improved credit risk.

By the same logic, credit risk should have decreased under fragmented and limited regimes in comparison with fragmented and absolutist ones. Theory cannot predict if there was an improvement in credit risk under centralized

<sup>7</sup> This was the Dutch Republic (1572–1795). For additional details, see Section 4.

Table 3. *Sovereign credit risk characteristics of political regimes*

Regime	Government bond yields
Fragmented and absolutist	High due to local free-riding and lack of credible commitment
Centralized and absolutist	Decrease due to resolution of local free-riding but still no credible commitment
Fragmented and limited	Decrease due to credible commitment but still local free-riding
Centralized and limited	Low due to resolution of local free-riding and credible commitment

*Sources:* See text.

and absolutist regimes in comparison with fragmented and absolutist ones, since fiscal centralization generated additional funds that executives may have used to repay debts or spent recklessly. However, we may say definitively that credit risk under centralized and limited regimes should have been the lowest of all, since both sorts of fiscal problems had been resolved.

### 3. Data and sample countries

I assembled a database on long-term government bonds in Europe from 1750 to 1913. Appendix 1 documents the data sources and construction methods for each sample country. Since bond prices often exhibited high volatility, the use of annual data (i.e. one observation per year) increases the likelihood of misrepresenting yield trends. To avoid this possibility, I calculated yearly averages of weekly or monthly data. The yield series came in large part from secondary sources such as the *Global Financial Database* (GFD), which offered high-frequency data. For accuracy, I compared the GFD series that I computed with annual data from Homer and Sylla (1991).

The historical nature of the yield series merits special attention. To begin, demand for sovereign bonds was not integrated or elastic. Governments faced different domestic and international opportunities to market their debts. As Appendix 1 describes, bonds for group 1 countries were typically traded on home exchanges, whereas bonds for group 2 countries were traded on the London Stock Exchange. Prior to 1815, most governments did not offer a public asset comparable to the British consol (i.e. perpetual, dominant, easily negotiable and relatively risk-free), but instead issued a multitude of debt instruments, each subject to different terms and conditions. In such cases, I chose the sovereign bond that best captured long-term yield levels. Appendix 1 provides the details.

The sample was divided into two groups based on data availability and historical importance. Annual published series of nearly a century or more for government bonds as well as for a variety of controls typically existed for the five polities (England, France, the Netherlands, Prussia and Spain)

that comprised the first set. Not only were these countries among the largest and/or most powerful players in Western Europe at the time, but for them data were also available over a variety of political regimes.

Shorter published time series existed for the six countries (Austria-Hungary, Belgium, Denmark, Italy, Portugal and Sweden) in the second group. Data for Belgium and Italy only began after they were founded as constitutional monarchies in 1831 and 1861, respectively. Annual series for Austria-Hungary, Portugal, and Sweden did not start until after the establishment of centralized and limited regimes during the 1800s.<sup>8</sup> Since Denmark did not achieve a stable form of constitutional government by 1913, it functioned as an additional ‘absolutist’ control in the regressions. Though data prior to political transformations were not available for the second set of countries, their inclusion enriched the sample by expanding the range of institutional experiences.

#### 4. Case studies

Table 4 displays the summary statistics for the yield panel.<sup>9</sup> In total, there are 864 observations, 62 for fragmented and absolutist regimes, 294 for centralized and absolutist ones, and 492 for centralized and limited ones; 16 observations characterize the lone fragmented and limited regime. One immediately notices that average yields associated with centralized and absolutist regimes (5.41 percent) and centralized and limited ones (4.52 percent) were low relative to fragmented and absolutist ones (7.20 percent). Average yields for the fragmented and limited regime (3.09 percent) were also much lower.<sup>10</sup>

Before moving on to the statistical analysis, it is worthwhile to study France and the Netherlands, two sample polities for which long data series are available. Figure 1, which plots yield spreads between French long-term government bonds and British consols from 1750 to 1913, indicates that yield

<sup>8</sup> Though Ferguson (2006) collected yield data for Austria-Hungary from 1844 onwards, the series was discontinuous through 1870. My yield series for Austria-Hungary began in 1874. Following Dincecco (2009a, 2009b), I designated Portugal as a group 2 country. However, it differed from other group 2 countries because its yield series began in 1823, before fiscal centralization and limited government. In Section 4, I analyze the Portuguese case in the same way as for group 1 countries. I also perform the structural break tests for Portugal in Section 6. Continuous Portuguese revenue and expenditure series did not begin until 1852. Since the regression analysis used budgetary data as an economic control, Portuguese yield observations prior to political transformations were lost. Yet econometric specifications that excluded budgetary data and hence used the entire Portuguese yield series did not significantly alter the findings.

<sup>9</sup> I followed Ferguson and Schularick (2006) and excluded 16 observations with yields of 20 percent or more from the econometric analysis. These were the Netherlands, 1811, 1813, and Spain, 1824–33, 1876–9. However, the regression results were robust to specifications that included all observations.

<sup>10</sup> This was the Dutch Republic, which I discuss below.

Table 4. *Summary statistics of yield data (as percents per year)*

	Obs.	Mean	St. dev.	Min	Max
All regimes	864	4.76	1.95	2.41	16.19
Fragmented and absolutist	62	7.20	3.09	3.34	15.65
Centralized and absolutist	294	5.41	2.10	3.27	16.19
Fragmmented and limited	16	3.09	0.53	2.41	4.33
Centralized and limited	492	4.52	1.43	2.45	16.15

Sources: See Appendix 1.

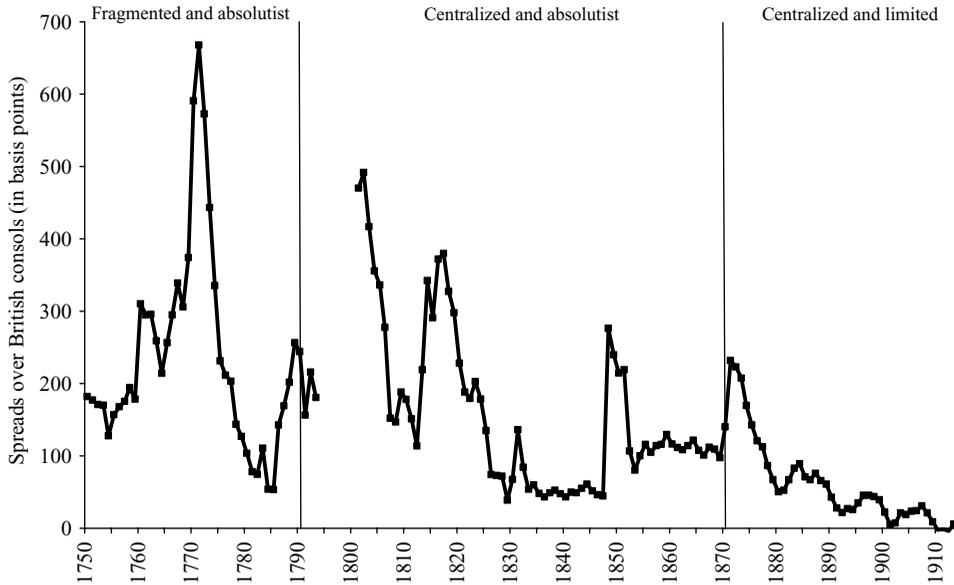


Figure 1. *Yield spreads, France, 1750–1913*

Sources: See Appendix 1.

spreads were typically 200 basis points or more under the fragmented and absolutist regime. The French Revolution (1789–99) led to the establishment of a national tax system with uniform rates. Spreads remained high through the end of the Napoleonic Wars. Unlike the eighteenth century, however, France no longer defaulted on its debts.<sup>11</sup>

French yield spreads decreased after 1815. The short-lived constitutional ‘July’ regime (1830–47) saw spreads that were less than 50 basis points.<sup>12</sup> Under the authoritarian regime of Napoleon III (1851–70), however, they doubled to over 100 basis points. Spreads fell steadily after the establishment

<sup>11</sup> Defaults prior to 1789 occurred in 1715, 1759 and 1770. See Sargent and Velde (1995).

<sup>12</sup> The 1830 regime was not classified as limited because it endured for less than two decades. However, I categorized it as such for one of the robustness checks in Section 6.

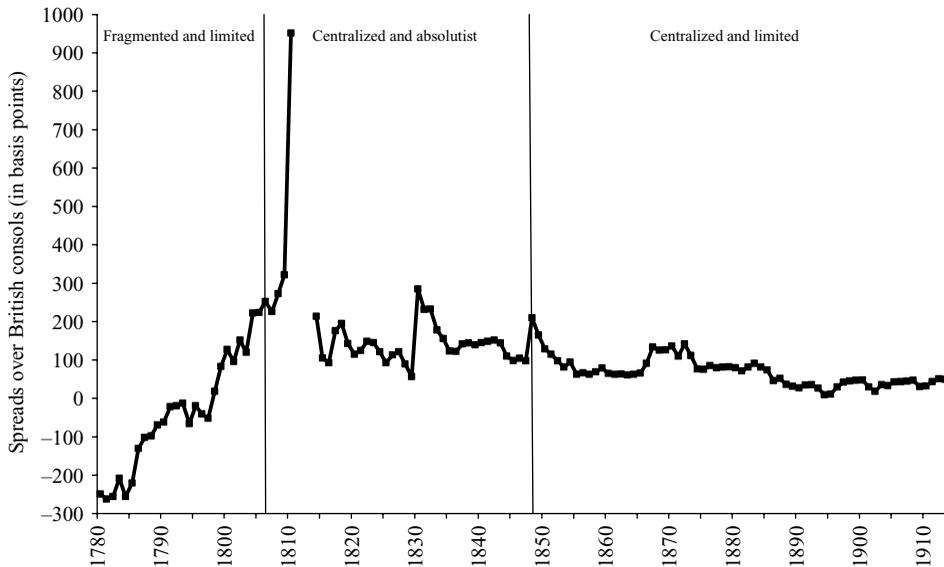


Figure 2. *Yield spreads, Netherlands, 1780–1913*

Sources: See Appendix 1.

of a stable centralized and limited regime in 1870. By the start of the 1890s, they neared zero.

Figure 2 plots yield spreads in basis points between Dutch long-term government bonds and British consols from 1780 to 1913. I followed Dincecco's (2009a) classification of the political regime in the Dutch Republic (1572–1795) as fragmented and limited. By investing heavily in government bonds, ruling elites aligned lender and borrower incentives and provided a credible commitment to repay debts. Figure 2 highlights the success of this mechanism. Since the Republic received loans at lower rates of interest than Britain, spreads at the start of the 1780s were negative. Van Zanden and van Riel (2004), however, argue that widespread fiscal fragmentation hindered the ability of the Republic to raise funds and service debts. Indeed, spreads rose quickly in the years before the French conquered the Netherlands in 1795.<sup>13</sup>

The 1815 constitution granted absolutist control to King Willem I, who came to power at the end of the Napoleonic era. Parliamentary budget authority, promulgated at 10-year intervals, was ineffective. Spending heavily on the military, on infrastructure, and on the monarchy itself, Willem was unable to balance the national accounts, though fiscal centralization

<sup>13</sup> Also see Fritschy and van der Voort (1997), t'Hart (1997), Fritschy, t'Hart and Horlings (2001), van Zanden and van Riel (2004), van Zanden and Prak (2006) and Fritschy (2007).

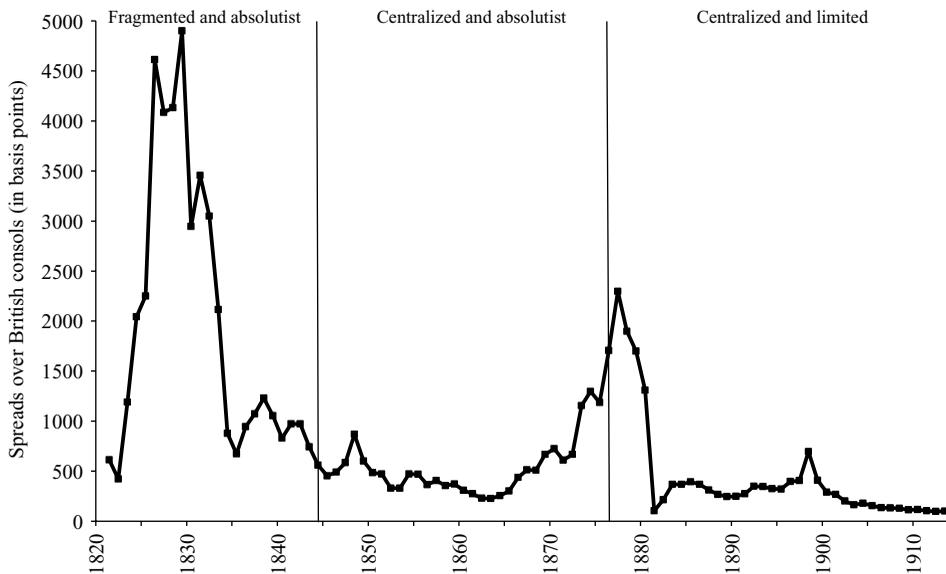


Figure 3. *Yield spreads, Spain, 1821–1913*

Sources: See Appendix 1.

in 1806 had roughly doubled the size of the Dutch tax base and Europe was politically stable. Dincecco (2009b) argues that rapid growth in Dutch deficits from 1815 onwards reflected the reckless policies that Willem pursued. Yield spreads rose with the Belgian Revolt of 1830 and subsequent War of Independence (1830–1833).<sup>14</sup> In hope of reclaiming Belgium, Willem continued to spend great sums on the military. During the 1830s, Dutch spreads remained around 150 basis points higher than spreads under the constitutional ‘July’ regime in France. When Dutch fiscal troubles finally became public in 1839, parliament vetoed the upcoming decadal budget and Willem abdicated his throne. As parliament’s power of the purse increased over the 1840s, spreads fell to 100 basis points. After the Revolutions of 1848, which saw the establishment of a stable centralized and limited regime, spreads typically remained less than 100 basis points through the start of World War I.

To supplement the French and Dutch cases, it is useful to examine the rest of the data. Figure 3, which plots yield spreads between Spanish long-term government bonds and British consols from 1820 to 1913, indicates that spreads fell by roughly 500 basis points after fiscal centralization in 1844. The establishment of a stable form of limited government in 1876 also led to a sizeable reduction in Spanish spreads.

<sup>14</sup> The loss of tax revenues from southern provinces also aggravated Dutch finances. See Fritschy, t’Hart and Horlings (2001).

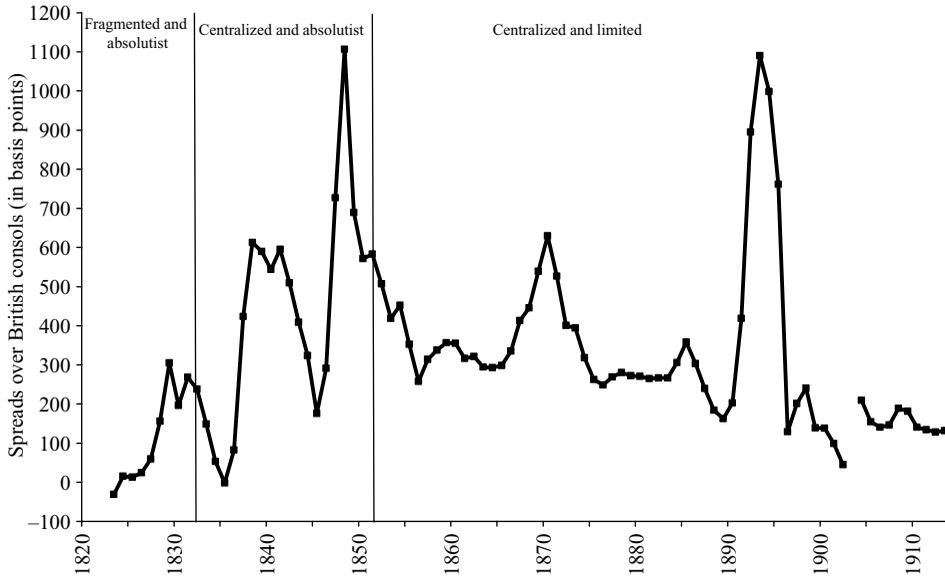


Figure 4. *Yield spreads, Portugal, 1823–1913*

Sources: See Appendix 1.

Figure 4, which plots yield spreads between Portuguese long-term government bonds and British consols from 1823 to 1913, indicates that spreads were higher after fiscal centralization in 1832 than beforehand. The period from 1821 to 1851, however, was one of civil war as well as colonial conflict.<sup>15</sup> Portuguese spreads fell with the establishment of a stable form of limited government in 1851. Moreover, during much of the 1850s and 1860s, spreads in Portugal were typically 100 to 200 basis points lower than those of Spain, its absolutist counterpart on the Iberian Peninsula.

Figure 5, which plots yield spreads between Prussian long-term government bonds and British consols from 1815 to 1913, indicates that spreads rose in the decades after the establishment of limited government in Prussia in 1848. Infrequent observations from 1842 to 1869, however, may misrepresent Prussian yield trends. Since weekly or monthly data was not available, I used annual data (taken from the last day of trading each year) from Homer and Sylla (1991).<sup>16</sup> Military conflicts also played a role. Though it did not participate in any major wars from 1815 to 1847, Prussia entered four such conflicts from 1848 to 1871.<sup>17</sup>

<sup>15</sup> See Birmingham (1993), Mata and Valerio (2002) and Clodfelter (2002).

<sup>16</sup> For additional details, see Appendix 1.

<sup>17</sup> These were the first and second Schleswig-Holstein Wars (1848–9, 1864), the Austro-Prussian War (1866) and the Franco-Prussian War (1870–1). Also see Appendix 2.

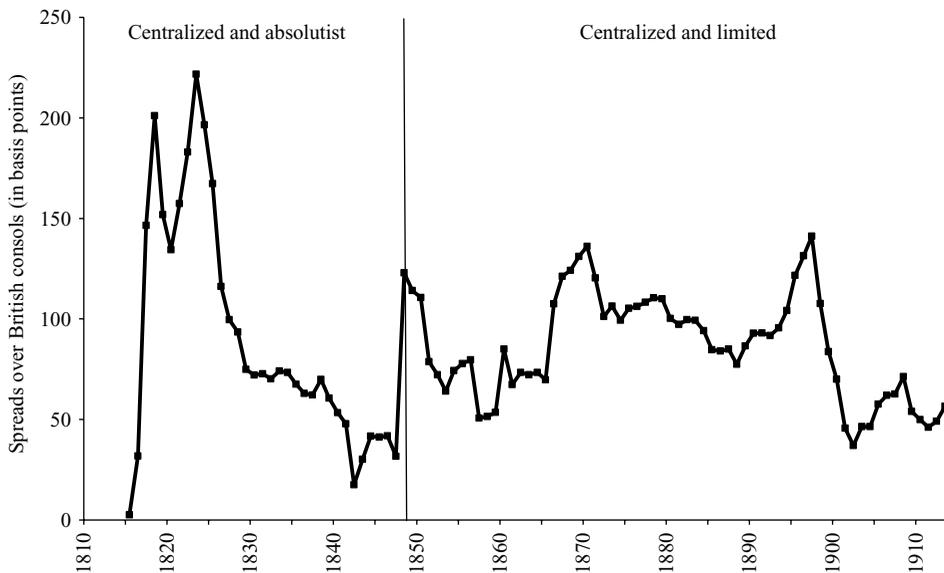


Figure 5. Yield spreads, Prussia, 1815–1913

Sources: See Appendix 1.

Indeed, qualitative accounts suggest a positive relationship between limited government and public finances in Prussia. According to Ferguson (1998), Rothschild lenders urged King Frederick William II (1786–97) to implement constitutional reforms as a credible way to improve sovereign credit risk. Tilly (1966, 1967), moreover, argues that the constitutional reforms of 1848 strengthened the ability of the Prussian parliament to follow sound fiscal policies. Finally, the quantitative analysis by Dincecco (2009a) finds that limited government in Prussia led to a significant increase in per-capita tax revenues.<sup>18</sup>

Though the evidence presented so far suggests that political transformations had important effects on sovereign credit risk, it is not definitive. Figure 6, which plots yield spreads for group 2 countries from 1820 to 1913, highlights the importance of controls for factors besides political regime. By the 1870s, for instance, it is difficult to distinguish between deficit ratios associated with the absolutist regime in Denmark and those associated with limited regimes elsewhere. To account for the effects of violent conflict,

<sup>18</sup> Southern Germany polities like Bavaria adopted constitutions at the start of the 1800s. To compare Bavarian and Prussian yield spreads from 1815 to 1848, I used annual data provided by Homer and Sylla (1991). The results indicated that spreads under the limited government regime in Bavaria were consistently lower than spreads under the absolutist one in Prussia.

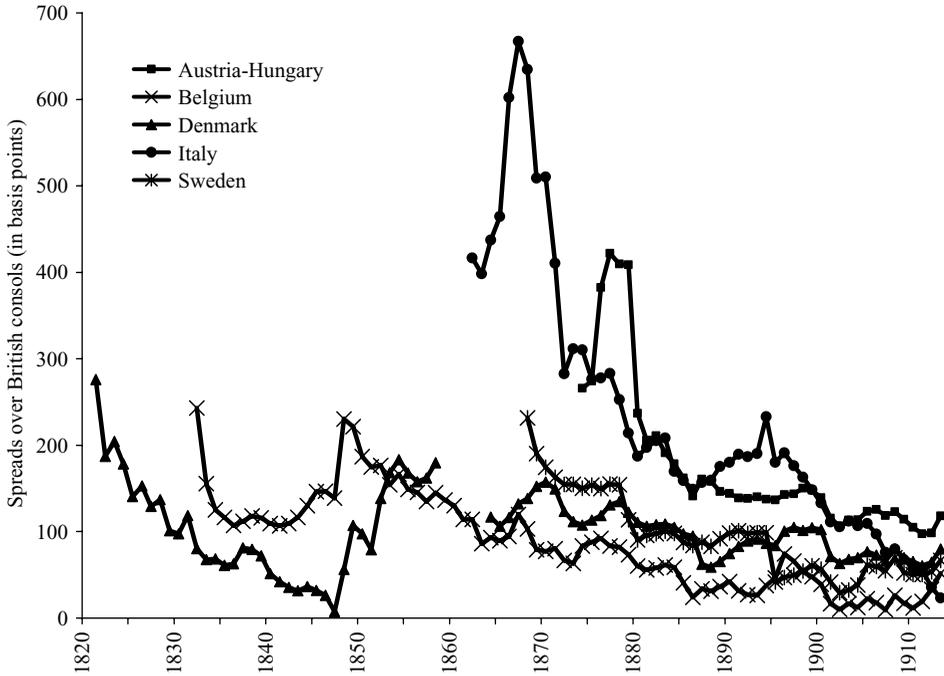


Figure 6. Yield spreads, group 2 countries, 1820–1913

Sources: See Appendix 1.

economic growth, fiscal and monetary policy, and other elements, I now turn to a more rigorous quantitative analysis.

## 5. Statistical tests

### 5.1. Panel regressions

Estimations of panel data increase informative content by combining variations across time and country. I followed Beck and Katz (1995) and employed ordinary least squares with ‘panel-corrected’ standard errors (PCSE), which corrects for contemporaneously correlated errors and panel heteroskedasticity. To control for serial correlation, I included a common AR1 term.<sup>19</sup>

The basic fixed effects specification is:

$$\text{Spread}_{it} = \beta_0 + \beta_1 \text{CA regime}_{it} + \beta_2 \text{FL regime}_{it} + \beta_3 \text{CL regime}_{it} + \gamma \mathbf{X}_{it} + \mu_i + \varepsilon_{it}$$

<sup>19</sup> Beck and Katz (1995) also show that use of a common  $\rho$  to control for serial correlation is superior to that of unit-specific ones.

where  $\text{Spread}_{it}$  is the yield spread with British consols in basis points for country  $i$  in year  $t$ ,  $\mathbf{X}_{it}$  is a vector of control variables to be described,  $\mu_i$  represent country-specific fixed effects, and  $\varepsilon_{it}$  is the disturbance term.<sup>20</sup> I used dummy variables for centralized and absolutist (CA), fragmented and limited (FL), and centralized and limited (CL) regimes relative to fragmented and absolutist ones as a clear and simple method to measure the effect of political arrangements on sovereign credit risk.<sup>21</sup>

Hoffman and Rosenthal (1997) claim that early modern monarchs valued warfare above all else. For the 1800s, Ferguson (2006) argues that political events were more important to investors than economic ones since there was a greater amount of regular information available about them. Sussman and Yafeh (2000, 2006) also find that financial markets responded quickly to wars and civil unrest. One might expect that the total effect of warfare on sovereign credit risk was negative because it decreased tax revenues and increased public expenditures. Over the long run, however, Kindleberger (1984), Tilly (1990), Hoffman and Norberg (1994), Epstein (2000), O'Brien (2001), Rosenthal and Wong (2007) and others argue that military competition fostered financial innovations that allowed sovereigns to reduce credit risk. Whether a country won or lost a conflict also influenced public finances. To evaluate the impact of warfare on yield spreads, I included a dummy variable that identified each year from 1750 to 1913 in which sample countries were engaged in military conflicts in Western or Eastern Europe according to Clodfelter (2002). Appendix 2 documents the details.

Though debt figures would also be useful to measure the effects of warfare on public finances, continuous series were not available prior to the 1870s (see Ferguson 2006). One unique source of data that exists from the 1700s onwards is budgetary figures as assembled by Dincecco (2009b). To scale estimates across time, Ferguson and Schularick (2006) claim that sophisticated analyses of government finances typically employed public revenues. Cain and Hopkins (1994) also argue that budget deficit-to-revenue ratios were the statistic most preferred by investors to evaluate macroeconomic policies.<sup>22</sup> In accordance with the 'gentlemanly capitalists' of London, I used this variable as a measure of fiscal prudence. Table 5

<sup>20</sup> Britain went off the gold standard from 1797 to 1821 and France adhered to a bimetallic standard for much of the 1800s. To avoid risk elements that reflected exchange rate regimes, I also tested alternative specifications that used natural logarithms of average annual yields as the dependent variable. The results were unaffected.

<sup>21</sup> I did not use yearly fixed effects because the number of annual observations for group 1 countries typically exceeded 120. Both Greene (2000) and Wooldridge (2003) argue that the large cost in terms of lost degrees of freedom makes it difficult to justify yearly fixed effects in such cases. Instead, I implemented time controls that captured widespread shocks such as systematic risk and warfare. However, the findings were also robust to the inclusion of annual time dummies.

<sup>22</sup> Also see Davis and Huttenback (1986) and Flandreau and Zumer (2004).

Table 5. Summary statistics of non-binary control variables

	Mean	St. Dev.	Min	Max
Budget deficit-to-revenue ratios	0.19	0.32	-0.89	2.93
Urbanization rate	0.15	0.08	0.04	0.43
Average annual yield spreads	226	185	-101	948

Sources: See Appendix 2.

indicates that the average deficit ratio was 0.19. The lowest deficit ratio was -0.89 for Spain in 1803 and the largest was 2.93 for France in 1790.

There also exists systematic information for debt default, an extreme reaction to fiscal crisis that caused widespread damage to the financial sector as well as the economy as a whole.<sup>23</sup> Indeed, early modern executives often resorted to default as a way to handle large debt burdens accumulated during wars.<sup>24</sup> To measure this effect, I introduced a dummy variable that identified all years of partial or full defaults on publicly held debts from 1750 to 1913 according to Reinhart, Rogoff and Savastano (2003) and Dincecco (2009b). Appendix 2 provides the details.

Since internal conflict caused disruptions that increased sovereign credit risk, we must consider the impact of domestic turmoil as well. To measure this effect, I included a dummy variable that identified all civil wars, coups and revolutions that occurred within sample countries from 1750 to 1913. Appendix 2 describes the details.

One might also suppose that economic growth increased tax bases and enabled sovereign governments to repay debts. Since reliable GDP figures are difficult to come by before 1820, many studies of the late nineteenth century employ measures of foreign trade as approximates of national output (e.g. Mauro, Sussman and Yafeh 2002; Obstfeld and Taylor 2003; Ferguson and Schularick 2006). However, systematic trade deficit and export series from the 1700s onwards were not available. Hohenberg and Lees (1985), Bairoch (1988) and Acemoglu, Johnson and Robinson (2002, 2005) argue that there was a close relationship between urbanization rates and income growth. To proxy for per-capita GDP, I constructed a yearly variable that calculated urban populations as fractions of total populations for each country. Appendix 2 describes the details.<sup>25</sup> Controls for national income also help account for different rates of technological innovation and adoption across countries (see Mokyr 1998, 1999). Table 5 indicates that on average urban populations comprised 17 percent of total populations. The lowest

<sup>23</sup> Currency debasement was another form of government 'misbehavior', but systematic data across sample countries were not found.

<sup>24</sup> For example, two of the three defaults that Sargent and Velde (1995) describe for France during the century prior to 1789 involved military conflicts: the 1715 episode after the War of Spanish Succession and the 1759 one during the Seven Years' War.

<sup>25</sup> I used Maddison's (2003) per-capita GDP figures as a robustness check.

urbanization rates were 4 percent for Prussia during the second half of the 1700s and the largest were over 40 percent for the Netherlands at the start of the 1900s.

Bordo and Rockoff (1996) and Obstfeld and Taylor (2003) claim that adherence to the classic gold standard was a valuable signal of financial integrity. To measure the effect of monetary policy, I included a dummy variable that took a value of one for each year that a country was on gold from the 1870s to the start of World War I. Since polities such as Spain ‘shadowed’ the gold standard while never making an official commitment, coding was at times subjective. I relied on Meissner’s (2005) dates at which a currency became *de facto* and *de jure* convertible into gold. Appendix 2 documents the details.

Lastly, to control for systematic risk across European asset markets, I computed an average yield spread in basis points for all available sample countries over the ‘safe’ British consol each year in the spirit of Bordo and Rockoff (1996), Obstfeld and Taylor (2003) and Ferguson and Schularick (2006). Use of a GDP-weighted benchmark spread or a CAPM-style variable that interacted country fixed effects and country-specific risk premiums did not significantly alter any of the results.<sup>26</sup> Table 5 indicates that systematic risk averaged 226 basis points. Fueled by the Dutch Republic, the lowest ‘world’ spreads occurred in the 1780s and were negative. The largest (948 basis points) occurred in 1811 at the height of the Napoleonic Wars.

The econometric set-up assumes that it is possible to disentangle political regimes from factors such as violent conflicts and economic fundamentals. Since political arrangements influenced all of these characteristics, coefficients on the control variables rather than those on the regime ones themselves may capture some of the positive effects of institutional reforms. Hence, regime coefficients are likely to underestimate the total impact of political arrangements on sovereign credit risk.

### 5.2. *Structural break tests*

Structural break tests, which assume no a priori knowledge of major turning points in the revenue series for group 1 countries, supplement the PCSE regression analysis by letting the data ‘speak’ for themselves.<sup>27</sup> I use the methodology proposed by Bai and Perron (2003) that identifies multiple structural changes in means while allowing for serial correlation. It thus improves upon the ‘moving windows’ technique that relies upon sequential single structural change methods.

<sup>26</sup> Data were not available to produce a debt-weighted average spread.

<sup>27</sup> Historical applications include Willard, Guinnane and Rosen (1996), Brown and Burdekin (2000), Sussman and Yafeh (2000), Mauro, Sussman and Yafeh (2002) and Dincecco (2009a, 2009b).

A program created for the Regression Analysis of Time Series (RATS) software performs the Bai–Perron procedure, which estimates the following regression for each sample country:

$$\text{Spread}_t = \beta_0 + \sum_{l=1, \dots, L} \beta_l \text{Spread}_{t-l} + \varepsilon_t$$

where  $\text{Spread}_{it}$  is the yield spread with British consols in basis points in year  $t$ ,  $\beta_0$  and  $\beta_1$  through  $\beta_L$  are parameters to be estimated, and  $\varepsilon_t$  is the disturbance term. I allowed up to five significant yearly lags of the dependent variable ( $L = 5$ ). The RATS routine, which uses a dynamic programming algorithm to evaluate which final partitioning of the time series data achieves a global minimization of the overall sum of squared residuals, returns the optimal set of break points.

The RATS procedure calls for the selection of a maximum number of ‘best’ turning points in the time series for each country subject to a minimum number of observations between data segments. As Willard, Guinnane and Rosen (1996) point out, there is always a trade-off in determining parameter values. A minimum space of two observations eliminates the chance of confounding the effects of different events but ends up analyzing blips (false positives that characterize certain events as ‘long-lasting’ that really were not) rather than turning points. Longer periods of analysis, however, increase the likelihood of missing important shifts (false negatives).

There are also data limitations to consider. Though gaps from 1789 to 1815 in the French and Dutch yield series prevented the identification of turning points associated with fiscal centralization, it was still possible to capture post-1815 breaks for limited government. The same held for Portugal, where the yield series began just before centralization, and Prussia, where it began just afterwards. After some experimentation, I selected the best three breaks with at least 15 observations (i.e. 15 years) per segment.<sup>28</sup> A long continuous run of data set England apart from other group 1 countries. Though the English series began after the establishment of a centralized and limited regime, it remains useful to study the relationship between military conflicts, political regimes and credit risk.

## 6. Statistical evidence

Table 6, which shows the results of the panel regressions, indicates that fragmented and absolutist regimes displayed significantly higher levels of sovereign credit risk than the other regime types. These findings held for group 1 countries only (column 1) and when group 2 countries were included (column 2). *Ceteris paribus*, the move to a centralized and absolutist regime

<sup>28</sup> I also set the maximum number of breaks to 2, 4 or 5 and the minimum number of observations to 10 or 20. The findings were generally robust to such changes in parameter values.

Table 6. *Regression results for political regimes and sovereign credit risk*

	(1) <i>Group 1 only</i>	(2) <i>Groups 1 and 2</i>
Centralized and absolutist regimes	-147.99*** (2.90)	-153.12*** (5.74)
Fragmented and limited regimes	-383.46*** (7.48)	-384.74*** (14.49)
Centralized and limited regimes	-192.70*** (3.09)	-186.05*** (5.83)
Military conflicts	21.06** (2.39)	21.07*** (5.24)
Deficit-to-revenue ratios	34.45* (1.71)	30.81*** (4.41)
Defaults	61.76 (1.27)	40.89* (1.89)
Civil wars, coups, revolutions	50.66** (2.32)	44.62*** (4.19)
Urbanization rate	-317.51 (0.98)	-141.32 (0.94)
Gold standard	23.98 (0.98)	-16.26 (1.38)
Average yield spread	22.43*** (11.69)	26.19*** (21.30)
Netherlands	71.78 (1.47)	46.79** (2.21)
Prussia	1.95 (0.09)	-0.44 (0.00)
Spain	442.10*** (6.90)	432.54*** (12.34)
Austria-Hungary		110.46*** (6.71)
Belgium		34.41*** (3.08)
Denmark		12.88 (0.85)
Italy		172.20*** (12.08)
Portugal		244.15*** (6.53)
Sweden		41.72** (2.12)
Constant	245.68*** (6.90)	222.89*** (12.76)
Observations	346	652
R <sup>2</sup>	0.400	0.357
Wald $\chi^2$	621.79	3850.36

Sources: See text.

\*Significant at 10 percent level, \*\*Significant at 5 percent level, \*\*\*Significant at 1 percent level.

Notes: The dependent variable is the annual yield spread with the British consol in basis points. The estimation technique is OLS with panel-corrected standard errors (PCSE). A common AR1 term was added to correct for serial correlation. Z-statistics in absolute values are in parentheses. Group 1: France, the Netherlands, Prussia and Spain. Group 2: Austria-Hungary, Belgium, Denmark, Italy, Portugal and Sweden. For details about the regression variables, see Appendix 2.

decreased yield spreads by 148 to 153 basis points. This result suggests that the positive impact of new revenues outweighed the negative impact of executive consolidation of fiscal powers. The move to a centralized and limited regime decreased yield spreads by 186 to 193 basis points and the move to the fragmented and limited one by 383 to 385 basis points.<sup>29</sup> The findings were also robust to checks that used alternative regime classifications.<sup>30</sup>

As expected, warfare had a significant negative impact on sovereign credit risk. Common shocks to European asset markets (e.g. large-scale military conflicts) were also associated with a significant increase in yield spreads. Domestic turmoil (civil wars, coups and revolutions) significantly worsened credit risk as well. Budget deficits and defaults also had negative effects, though to a lesser extent. Urbanization rates and gold standard adherence, meanwhile, had negligible impacts.<sup>31</sup> Finally, Spain, Austria–Hungary, Belgium, Italy, Portugal and Sweden all had notably larger spreads than did France.

Table 7, which displays the results of the structural break tests, reveals close relationships between major turning points in the yield spread series and political transformations that enhanced public finances. It also highlights the link between those innovations and military competition and conflicts. In the Netherlands, the best breaks came with the start of the Belgian War of Independence (1830), near limited government (1850), and with an unidentified event (1885). Limited government, which occurred during the Year of Revolutions in 1848, led to a significant decrease in spreads (29 percent).

In France, the first turning point occurred with the July Revolution (1830) and the establishment of the short-lived constitutional regime (1830–47) that followed. Limited government led to a significant (73 percent) decrease in yield spreads. A second break coincided with the coup d'état and subsequent establishment of an authoritarian regime by Napoleon III at the start of the 1850s. As expected, it was associated with a significant (163 percent) increase in spreads. The final break (1871) came with the establishment of limited government (1870) and the Franco-Prussian War (1870–71). France's loss to Prussia appears to have offset the positive effects of limited government over the short term. Figure 1, however, indicates that French spreads fell steadily from 1872 onwards. By the 1880s, they resembled those under the constitutional 'July' regime from 50 years before.

<sup>29</sup> Recall that the Dutch Republic, characterized by 16 observations, was the sole case among sample countries of a fragmented and limited regime. Hence, the magnitude of this result should be interpreted with care.

<sup>30</sup> Parliaments may have required time to see how well executives would honor commitments. The first alternative allowed for uncertainty over how long new limited regimes would last by lagging their start dates by 5 or 10 years. The second alternative classified the 'borderline' political regime in France (1830–47) as centralized and limited rather than as centralized and absolutist.

<sup>31</sup> Use of per-capita GDP figures rather than urbanization rates did not significantly affect the findings.

Table 7. *Major breaks in yield spread series*

	Year	Percent change	Event
England (1750–1913)	1775	27.51*** (5.47)	Start of War of American Independence (1775–83)
	1798	11.36** (2.37)	Start of Napoleonic Wars (1799–1815)
	1815	–18.19*** (5.45)	End of Napoleonic Wars (1799–1815)
France (1815–1913)	1829	–73.73*** (5.75)	July Revolution (1830) / Short-lived constitutional regime (1830–47)
	1847	163.53*** (5.05)	Year of Revolutions (1848) / Coup by Napoleon III (1851)
	1871	4.11 (0.78)	Limited government (1870) / Franco-Prussian War (1870–1)
Netherlands (1815–1913)	1830	33.34*** (2.63)	Belgian Revolt (1830) / Belgian War of Independence (1830–3)
	1848	–29.16*** (3.05)	Limited government (1848) / Year of Revolutions (1848)
	1885	–60.48*** (7.93)	Unidentified event
Portugal (1823–1902)	1848	26.54 (1.19)	Limited government (1851) / Colonial Wars in Guinea (1840s)
	1863	–18.32 (1.34)	Unidentified event
	1887	31.64 (1.03)	Banking crisis (1890s)
Prussia (1815–1913)	1829	–51.58*** (4.28)	1st Zollverein customs union (1834)
	1847	56.44*** (5.39)	Limited government (1848) / 1st Schleswig-Holstein War (1848–9)
	1866	20.51*** (3.69)	Austro-Prussian War (1866)
Spain (1821–1913)	1835	–69.33*** (4.63)	End of 1st Carlist War (1833–9)
	1864	149.54*** (3.50)	Start of Naval War with Peru (1865–6)
	1879	–51.70** (2.50)	Limited government (1876) / End of 3rd Carlist War (1872–6)

Sources: See text.

\*Significant at 10 percent level, \*\*Significant at 5 percent level, \*\*\*Significant at 1 percent level.

Notes: The first column lists the relevant sample countries. The second column displays the years for the best three structural breaks over the years shown for each polity as determined by the algorithm described in the text. The third column reports the percentage change in yield spreads over the fifteen years following the break in question as compared to the fifteen years that preceded it. T-statistics in absolute values are in parentheses. The final column offers brief ‘explanations’ for the turning points, which are elaborated upon in the text. For England, yields on British consols rather than spreads were tested.

In Portugal, the turning point that occurred in 1848 coincided with the establishment of limited government in 1851 as well as the 1840s colonial wars in Guinea. By the mid 1850s, Portuguese spreads had fallen by over 300 basis points. Other Portuguese breaks were associated with an unidentified event (1863) and the 1890s banking crisis. In Prussia, we observe turning points near the first *Zollverein* customs agreement in 1834, near the establishment of a centralized and limited regime in 1848 and the first Schleswig-Holstein War (1848–9), and with the Austro-Prussian War (1866). Section 4 examines why limited government in Prussia did not result in a spread reduction.

The best three turning points for Spain occurred at the end of the first Carlist Civil War (1833–9), near the start of the Naval War against Peru (1864), and near limited government (1879). Limited government, established at the end of the third Carlist Civil War (1872–6), was associated with a large decrease in yield spreads (52 percent). Curiously, fiscal centralization, which occurred in 1844 during a decade of reforms, was not included as one of the top Spanish breaks. Figure 4, however, shows that yield spreads fell by roughly 500 basis points in the decade or so that followed this political change.

Turning points in the English yield series, which began after the establishment of a centralized and limited regime, further highlight the role of military conflicts. The top three breaks came at the start of War of American Independence (1775) and near the start (1798) and finish (1815) of the Napoleonic Wars. In each case, we observe a significant increase in consol yields at the conflict's outbreak (1775, 1798) and a significant decrease at war's end (1815).

## **7. Conclusion**

This article examines the relationship between political regimes and sovereign credit risk in Europe from 1750 to 1913. Panel regressions indicate that centralized and/or limited regimes were associated with significant creditworthiness improvements relative to fragmented and absolutist ones. Structural break tests that assume no a priori knowledge of possible turning points in the yield series support these conclusions.

Historical analysis reveals general patterns in the evolution of political regimes and public finances. Prior to the 1800s, the most urgent problem facing most polities was fiscal fragmentation. Since Old Regime monarchs were already 'constrained' by local tax authorities, it was not until after centralization that national parliaments became 'the' mechanism by which to hold crowns accountable.

We lose sight of this point when studying English financial history, which was exceptional. By managing to avoid the problems of severe fragmentation that hampered Continental countries for so long, England was in a better

position for development. Our key lesson from history, then, is simple but powerful. Today's emerging economies must try to adopt fiscal structures that not only limit the power of executives to behave recklessly, but that also lend enough authority to central governments to collect sufficient tax funds.

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### Appendix 1. Sources for the yield data

The abbreviation GFD denotes the *Global Financial Database*. For additional details, see the text.

*Austria–Hungary*. Austrian data on 10-year government bonds were drawn from the GFD. For 1874–9, the silver 5s bond was used; for 1880–1913, the gold 4s bond. For 1874–9, monthly data were used to compute yearly

averages; for 1880–1913, weekly data. Yields were for bonds traded in London.

*Belgium.* Belgian data on 10-year government bonds were drawn from the GFD. For 1832–44, the 5 percent Belgian bond was used; for 1845–58, the 4.5 percent bond; for 1859 onwards, the 3 percent bond. For 1832–84, monthly data were used to compute yearly averages; for 1885–98, biweekly data; for 1889–1913, monthly data. Note that the resulting yield series matched up closely with annual observations (taken from the last day of trading each year) from Homer and Sylla (1991). Yields were for bonds traded in Brussels.

*Denmark.* Danish data on 10-year government bonds were drawn from the GFD. For 1821–5 and 1852–8, the 5s bond was used; for 1825–52, the 3s bond; for 1864–94 the consolidated 4s bond. In 1895 the consolidated 4s bond was converted into 3.5 percent consols, which were used through 1913. Data were unavailable for 1859–63. Monthly data were used to compute yearly averages from 1821 to 1913. Yields were for bonds traded in London.

*England.* The British series on perpetual government bonds were drawn from the GFD. For 1750–3, the 3 percent yield on annuities was used. For 1754 onwards, the British consol was used, which paid 3 percent until 1888, 2.75 percent from 1889 to 1906, and 2.5 percent from 1907 to 1913. For 1750–1879, monthly data were used to compute yearly averages; for 1880–1913, weekly data. Note that the resulting yield series matched up closely with annual observations (taken from the last day of trading each year) from Homer and Sylla (1991). Yields were for bonds traded in London.

*France.* No single debt instrument akin to the British consol existed in France prior to the nineteenth century, making it difficult to identify ‘the’ interest rate paid on government loans. Indeed, bonds could be perpetual or finite, redeemable or not, and repudiated when revenues ran thin. The eighteenth-century yield data that I used were collected by Velde and Weir (1992), who chose the *October* loan as the French asset that best captured yields on long-term government bonds from 1750 to 1793. Prior to 1770, the *October* loan was a private debt of the *Compagnie des Indes*. From 1770 onwards, it was a perpetual debt of the French government. From 1793 to 1796, the Paris Stock Exchange was closed off and on. Data for 1794–1800 were unavailable, though a perpetual 5 percent consolidated bond was issued in 1798. It continued to trade until 1825, when the French central government refunded it and issued a perpetual 3 percent bond, which became the primary government bond until 1949. Note that a new bond paying quarterly interest replaced the previous 3 percent one in 1862. French data for the nineteenth and twentieth centuries were supplied courtesy of Jean-Laurent Rosenthal for 1801–72 and drawn from the GFD for 1873–1913. For 1750–1879, monthly data were used to compute yearly averages; for 1880–1913, weekly data. Yields were for bonds traded on the Paris Stock Exchange.

*Italy.* Italian data on long-term government bonds were drawn from the GFD. The average maturity was six years. For 1862–99, the consolidated 5 percent bond was used; for 1900–13, the 3.5 percent consol bond. Monthly data were used to compute yearly averages from 1862 to 1913. Yields were for bonds traded in London.

*The Netherlands.* Public bonds in the Dutch Republic were issued by several authorities, including the Union itself, provinces, and cities. Joost Jonker, Oscar Gelderblom and Heleen Kole collected the Dutch data for 1780–1810. Prior to 1780, too little data existed to form a comprehensive series. For 1780–95, the source was the Dutch newspaper *Maandelyksche Hollandsche*, which reported yields on various government bonds from securities auctions in Amsterdam. The Holland and Westfriesland perpetual 2.5 percent bond was selected. Like the *October* loan in eighteenth-century France, this asset best captured long-term yield levels. For 1796–1813, the source was the Dutch newspaper *Prijscourant der Effecten*. In this case, perpetual 2.5 percent national bonds were used. Data were unavailable for 1812. In 1814, the entire national debt, with interest rates ranging from 1.25 to 7 percent, was converted into a single one at a rate of 2.5 percent. The data source for 1814–1913 was the GFD. For 1780–96, monthly data were used to compute yearly averages; for 1797–1812, biweekly data; for 1814–81, monthly data; for 1882, biweekly data; for 1883–1913, weekly data. Note that the resulting nineteenth-century yield series matched up closely with annual observations that came from the Dutch National Accounts. Nineteenth- and twentieth-century bonds were also traded in Amsterdam.

*Portugal.* Portuguese data on 10-year government bonds were drawn from the GFD. For 1823–95 and 1903–13, the 3 percent bond was used. Data were unavailable for 1903. Monthly data were used to compute yearly averages for 1823–1913. Note that the resulting yield series matched up closely with monthly observations gathered by hand from *Le Moniteur Universel* and *The Economist* for all available years from 1835 to 1870. Yields were for bonds traded in London.

*Prussia.* Prussian data on 10-year government bonds from 1815 to 1841 were drawn from the GFD. For 1842–69, however, this source used Bavarian bonds. Prussian data on 10-year government bonds were thus drawn from Homer and Sylla (1991) during those years. 4s bonds were used, except for 1844–52, when 3.5s bonds were used due to a lack of data. The Prussian data on 10-year government bonds for 1870–1913 were also drawn from the GFD. Prussian 4 percent consols were used for 1870–97 and German 3 percent Imperial loans for 1898–1913. For 1815–41, monthly data were used to compute yearly averages; for 1842–69, annual data (taken from the last day of trading each year); for 1870–80, monthly data, for 1881–1913, weekly data. Note that the resulting

yield series taken from the GFD matched up closely with annual observations (taken from the last day of trading each year) for 1815–41 and 1870–80 from Homer and Sylla (1991). Yields were for bonds traded in Berlin.

*Spain.* As in Old Regime France, the Spanish crown issued a variety of disparate debt instruments prior to 1815 (see Tortella and Comin 2001). However, the Spanish yields series did not begin until 1821. Data were for 10-year government bonds drawn from the GFD. For 1823–36, 5s bonds were used. For 1836–81, 3s bonds were used. In 1881, the 3s were converted into a 1 percent bond. In 1882, the 1 percent bond was converted into a 1.25 percent one, and later into a 4 percent one. The 4 percent bond was used from 1882 to 1913. Monthly data were used for 1821–1913 to compute yearly averages. Note that the resulting yield series matched up closely with monthly observations gathered by hand from *Le Moniteur Universel* and *The Economist* for 1823–70. London yields were used for the entire series except for 1913 when the Madrid yield was used.

*Sweden.* Swedish data on 10-year government bonds were drawn from the GFD. For 1868–78, the 5s bond was used; for 1878–94, the 4s bond; for 1894–1913, the 3s bond. Monthly data were used to compute yearly averages for 1868–1913. Note that the resulting yield series matched up closely with annual observations (taken from the last day of trading each year) from Homer and Sylla (1991) for all available years from 1855 to 1913. Yields were for bonds traded in London.

## Appendix 2. Regression variables

For additional details, see Sections 5 and 6 of the text.

The dependent variable is the spread between the average annual yield on long-term government bonds for each sample country and the average annual yield on the British consol as expressed in basis points.

The dummy variable for fragmented and absolutist political regimes takes a value of one for each year that a sample country possessed a fragmented and absolutist regime from 1750 to 1913. As the benchmark case, I omitted it from the regression specifications. The dummy variable for centralized and absolutist political regimes takes a value of one for each year that a sample country possessed a centralized and absolutist regime from 1750 to 1913. The dummy variable for fragmented and limited political regimes takes a value of one for each year that a sample country possessed a fragmented and limited regime from 1750 to 1913. There is only one such case among sample countries; for additional details, see Section 4. The dummy variable for centralized and limited political regimes takes a value of one for each year that a sample country possessed a centralized and limited regime from 1750 to 1913.

Table A1. *European military conflicts, 1750–1913*

Conflict	Year(s)	Combatants
Seven Years' War	1756–63	Ah, Fr, Ru, Sp, Sw v. En, Pt, Pr
Corsican War	1768–9	Co v. Fr
War of the Bavarian Succession	1778–89	Ah v. Pr
Russo-Swedish War	1788–90	Ru v. Sw
War of the 1st Coalition	1792–7	Ah, En, NI, Pt, Pr, Sp v. Fr
War of the 2nd Coalition	1798–1801	Ah, En, Pr, Ru, Tr v. Fr, NI
Napoleonic Wars (1803–1815)		
<i>War of the 3rd Coalition</i>	1805–7	Ah, En, Pr, Ru, Sw v. Fr, NI, Pl
<i>Peninsular War</i>	1807–14	En, Pt, Sp v. Fr, NI
<i>Austrian War</i>	1809	Ah v. Fr, NI
<i>Russian Campaign</i>	1812	Ah, Dk, Ru v. Fr, NI, Pl
<i>Leipzig Campaign</i>	1813	En, Pr, Ru, Sw v. Fr, NI
<i>Campaign in France</i>	1814	En, NI, Ru, Pr, Sw v. Fr
<i>Austrian Campaign</i>	1815	Ah v. Fr
<i>Waterloo Campaign</i>	1815	Ah, En, NI, Pt, Pr, Sp v. Fr
Russo-Swedish War	1808–9	Ru v. Sw
Riego Rebellion	1823	Fr v. Sp
Belgian War of Independence	1830–3	Be, En, Fr v. NI
Austro-Sardo War	1848–9	Ah v. Sa
1st Italian War of Independence	1848–9	Ah, Fr, Sp v. It
1st Schleswig-Holstein War	1848–9	Dk, Sw v. Pr
Crimean War	1853–6	En, Fr, Tr v. Ru
Franco-Austrian War	1859	Ah v. Fr
2nd Italian War of Independence	1859–61	Ah v. It
2nd Schleswig-Holstein War	1864	Ah, Pr v. Dk
Austro-Prussian War	1866	Ah v. It, Pr
Battle of Mentana	1867	Fr v. It
Franco-Prussian War	1870–1	Fr v. Pr
Austrian Conquest of Bosnia	1878	Ah v. Bo

Source: Clodfelter (2002).

Notes: Country abbreviations are Austria–Hungary (Ah), Belgium (Be), Bosnia (Bo), Corsica (Co), Denmark (Dk), England (En), France (Fr), Italy (It), the Netherlands (NI), Poland (Pl), Portugal (Pt), Prussia (Pr), Russia (Ru), Sardinia (Sa), Spain (Sp), Sweden (Sw) and Turkey (Tr).

The country dummy variable takes a value of one to identify individual sample countries.

Wars and war years are from Clodfelter (2002). All conflicts fought at least in part in Western Europe (as well as those fought at least in part in Eastern Europe so long as they involved at least one sample country) from 1750 to 1913 were included. Table A1 provides a complete list.

The default dummy variable takes a value of one for each year that a national government partially or fully defaulted on its publicly held debt from 1750 to 1913 according to Reinhart, Rogoff and Savastano (2003) and Dinuccio (2009b). Table A3 provides a complete list.

Table A2. *European civil wars, coups and revolutions, 1750–1913*

	Year(s)	Event
Austria–Hungary	1848	Year of Revolutions
Belgium	1789–90	Brabant Revolution
	1830	Belgian Revolution
Denmark	1848	Year of Revolutions
England		No civil war, coup or revolution from 1750 to 1913
France	1789–99	French Revolution
	1799	Coup by Napoleon I
	1815	Bourbon Restoration
	1830	July Revolution
	1848	Year of Revolutions
	1851	Coup by Napoleon III
	1870	Fall of 2nd empire
Italy	1871	Paris Comune
		No civil war, coup, or revolution from 1861 to 1913
Netherlands	1785	Batavian Revolution
	1814–15	Establishment of Dutch Kingdom
	1830	Belgian Revolution
	1848	Year of Revolutions
Portugal	1808	Revolution of 1808
	1820	Revolution of 1820
	1820–3	1st Civil War of Portuguese Revolution
	1823	Coup of 1823
	1827–8	Miguelite Insurrection
	1832–4	2nd Civil War of Portuguese Revolution
	1836	Coup of 1836
	1846–7	3rd Civil War of Portuguese Revolution
	1849	Costa Cabral Coup
	1851	Saldanha Coup
1910	Establishment of 1st Portuguese Republic	
Prussia	1848	Year of Revolutions
Spain	1820	Coup of 1820
	1823	Restoration of 1823
	1833–9	1st Carlist War
	1843	Moderate Coup
	1847–9	Matiners' (2nd Carlist) War
	1854	Rebellion of 1854
	1863	Government collapse of 1863
	1868–70	Glorious Revolution
	1872–6	3rd Carlist War (encompasses the Restoration of 1874)
	1909	La Semana Trágica
Sweden	1772	Coup of 1772
	1792	Assassination of Gustav III
	1809	Coup against Gustav IV

Source: Dincecco (2009a).

Table A3. *Defaults in Europe, 1750–1913*

	Year
Austria–Hungary	1802, 1805, 1811, 1816, 1868
England	No defaults from 1750 to 1913
France	1759, 1770, 1788, 1797
Netherlands	1810
Prussia	1807, 1813
Spain	1820, 1831, 1834, 1851, 1867, 1872, 1882
Belgium	No defaults from 1831 to 1913
Denmark	No defaults from 1815 to 1913
Italy	No defaults from 1861 to 1913
Portugal	1837, 1841, 1845, 1852, 1890
Sweden	No defaults from 1815 to 1913

Sources: Reinhart, Rogoff and Savastano (2003) and Dincecco (2009b).

The deficit variable, taken from Dincecco (2009b), is the budget deficit-to-revenue ratio for each sample country for each available year from 1750 to 1913.

The dummy variable for civil wars, coups and revolutions takes a value of one for each year of civil war, coup or revolution within sample countries from 1750 to 1913 according to Dincecco (2009a). Table A2 provides a complete list. Insurrections, massacres, riots and uprisings were generally not included.

The urbanization variable calculates the urban population as a fraction of the total population for each sample country annually. All urban population figures are from De Vries (1984). Figures for 1750 and 1800 are from appendix 3, pp. 305–37, and figures for 1850, 1890 and 1980 are from table 4.8, pp. 44–7, for cities with populations of at least 10,000 inhabitants through 1850, with at least 20,000 inhabitants in 1890, and with at least 100,000 inhabitants in 1980. All intermediate years were interpolated. De Vries provides urbanization figures for Germany rather than for Prussia and for Scandinavia rather than for Denmark or Sweden. Urbanization figures for Austria–Hungary include Bohemia. For country population sources, see Dincecco (2009a).

The per-capita GDP variable, which comes from Maddison (2003), takes the natural logarithm of per-capita GDP in 1990 international Geary-Khamis dollars for sample countries from 1750 to 1913. Data were available for 1700 and 1820–1913. All intermediate years were interpolated. Maddison provides per-capita GDP figures for Germany rather than for Prussia.

The gold variable dummy variable takes a value of one for each year that a country was on gold according to Meissner (2005), who employs a strict measure of gold adherence that chooses the year in which a currency became

*de facto* and *de jure* convertible into gold. Adoption years were England, 1821; Portugal, 1854; Prussia, 1872; Denmark, 1873; Sweden, 1873; the Netherlands, 1875; Belgium, 1878; France, 1878; and Italy, 1884. Neither Austria–Hungary nor Spain formally adopted the gold standard prior to 1913.

The average spread variable is the average yield spread in basis points for all available sample countries over the ‘safe’ British consol for each year from 1750 to 1913.