Guano, Credible Commitments, and State Finances in Nineteenth-Century Peru

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Catalina Vizcarra
Assistant Professor
Department of Economics
University of Vermont
Tel: (802) 656-0694
Fax: (802) 656-8405
Catalina.Vizcarra@uvm.edu

Abstract

A main result in the literature on credible commitments and sovereign finance in the modern period is that financial credibility and political stability go hand-in-hand. Peruvian public finance in the nineteenth-century is an exception. This paper explains how, in spite of Peru's chronic political instability, the unique characteristics of the guano trade and a web of contracts linking guano export revenues to interest and sinking fund payments made the establishment of credible contractual relations with foreign interests possible. The paper demonstrates that a sufficiently large penalty for default can produce an equilibrium with positive lending, even in highly unstable polities.

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Introduction

Chronic political instability can hamper economic development if it interferes with establishment of consistent rules that firms and individuals need in order to have the confidence to invest. Political instability can also wreck havoc with public finance. A recent dramatic example was that the Mexican peso crisis in the early 1990s was affected in no small measure by the assassination of a presidential candidate and the Zapatista rebellion. The capital flight that ensued was only stemmed when an international lender of last resort restored confidence.

In the 19th century there was no such creditor country cooperation to assure investors in the sovereign debt of unstable countries. Much of Latin America spent the first sixty to eighty years of the 19th century in a cycle of dictatorships and civil wars. Nearly all had issued debt in the years immediately following their independence, and all but Brazil defaulted almost immediately after issuing the debt. Most of those countries could not regain access to international credit markets until they had achieved some degree of stability. Peru was an exception. Although it was plagued by civil wars like the rest, it settled its debt in 1849 and for the next quarter century was one of the most prolific sovereign borrowers in the world. Massive per capita foreign obligations were obtained by hypothecating returns from the state monopoly of guano, a valuable natural fertilizer in large demand in world markets.

This paper examines how Peruvian governments persuaded foreign creditors of their willingness and ability to service their debt faithfully. A central issue in the literature on sovereign debt is the incentives that a sovereign government has to fulfill its debtor obligations. This can be explained in the context of a simple game. Imagine in stage one, a potential creditor decides whether or not to make a loan to a sovereign government, and the size of the loan. In stage two, the sovereign decides whether or not to repay the loan. If the sovereign repudiates the loan, in stage three the lender can decide whether or not to retaliate, as well as the scope of the retaliation. It is clear that in a game that is not repeated, any sub-game perfect equilibrium in which lending actually occurs must involve a credible threat by the creditor to levy a penalty of sufficient size as to induce the sovereign not to default. This is true because a simple promise not to default by the borrower is no more than cheap talk.

The literature contains a number of variations of this basic framework, including different information structures, and dynamic repeated games versus one-shot games. Following seminal papers by Eaton and Gersovitz, and Bulow and Rogoff, a vigorous debate has emerged about whether reputation effects or sanctions are more important for the functioning of the sovereign debt market.[1] Reputation effects imply that a default is penalized either through a future credit boycott, strict limits on future credit, or higher interest rates on future loans reflecting a default risk premium. Sanctions could imply the seizure of government assets, impediments to trade credits that could seriously hamper foreign commerce, or the actual removal of the sovereign if he should violate his agreements. Sanctions could also take the form of foreign (creditor) government diplomatic or military pressure.

Surprisingly, little research has been done on the impact of political instability on sovereign debt contracts. When referred to at all, it is typically taken for granted that instability contributes to debt repudiation and "zero credit" equilibrium because it

[1] Eaton and Gersovitz, "Debt with Potential Repudiation," and Bulow and Rogoff, "Sovereign Debt."

shortens the time horizon of the government. Any government facing a violent threat to its survival has extraordinarily powerful incentives to abrogate property rights and default on his financial obligations. Short-sighted governments generally do not care about building a reputation because the threat of a credit boycott in the distant future is unlikely to suffice as a deterrent.

The Peruvian experience constitutes, in this sense, an exceptional episode for expanding our knowledge of sovereign debt. Contrary to the existing literature, Peru's re-access to financial markets was not reliant on political stability. Financial credibility in the British case heavily depended on the stability of political institutions and the Whigs' dominance in parliament.[2] The expansion of credit in the case of Hapsburg Spain, Imperial Brazil, and nineteenth-century Mexico was also achieved under the spell of a stable ruler.[3] In contrast, Peru's early republican period was marked by the dominance of *caudillos* (military leaders). The guano windfall had transformative effects on the Peruvian economy and society but it did not result in the formation of a stable polity. Guano revenues allowed the central government to buy off rivals through patronage by maintaining a bloated military and bureaucracy. Paradoxically, the promise of such power also offered an incentive for ambitious rivals to seek control of the central government in Lima at all costs. Thus, nineteenth-century Peru remained highly unstable. How could the bonds of a chronically unstable government like Peru find a ready market in Europe? How could foreign investors trust such a government to honor its financial obligations?

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[2] North and Weingast, "Evolution of Institutional Governing," Stasavage, *Public Debt.*

[3] Conklin, "Theory of Sovereign Debt," Maurer, "Internal Consequences," Maurer and Gomberg, "When the State is Untrustworthy," Marichal, "Construction of Credibility," Summerhill, *Inglorious Revolution*.

The paper explores how the unique characteristics of the guano trade and a web of contracts linking guano export revenues to interest payments due to foreign bondholders made the establishment of credible contractual relations possible. In my argument, the government's credibility rested on a web of self-enforcing contracts involving the Peruvian government, the guano consignees and the bondholders. The link between guano revenues and debt service was simple and effective. Peru relied on a reputable British merchant house for the commercialization of guano. Consignees, in particular Gibbs & Sons, who dominated the trade for two decades, were appointed as the state's <u>financial agent</u> and were responsible for withholding a large portion of government's guano income (originally 50% of proceeds from the British market) for debt servicing. Guano revenues were collected by Gibbs in Britain and distributed shortly thereafter to the bondholders. The operation was clean and did not involve the meddling of the Peruvian government. Peruvian governments, irrespective of their origin, respected the guano-debt contracts because default would interrupt the foreign trade in guano, their lifeline. Impatient "myopic" Peruvian governments could not afford losing such a vital source of income (between 70 and 80% of government revenues) for that could jeopardize their grip on power.

The paper proceeds as follows. In the next section I describe the conditions that determined Peru's poor financial standing prior to the guano boom. Then I present evidence on the scale of the guano deposits and the revenues that they generated so as to demonstrate the immense improvement in the Peruvian government's financial capabilities. The economic pre-requisites for debt settlement and lending resumption were in place, but there remained the issue of the government's credibility as a good faith borrower. In section five I review the theoretical literature on sovereign debt lending that highlights the credible commitment problem and discuss how to interpret the Peruvian experience in this context. In sections six and seven, I discuss the settlement and lending resumption process and show how the unique characteristics of the guano export trade made it possible to construct contractual relationships that persuaded creditors that the Peruvian government was committed to paying off its current and any future loans. The nature of the loan security and the contractual terms meant that the risk associated with internal political instability could be largely overcome. Section eight presents quantitative evidence in support of these arguments through a statistical analysis of a newly collected series of bond prices. The final section concludes.

2. Peru before Guano: Weak and Unstable

During the late colonial period, Peru's economy was dominated by mineral extraction, primarily for export, and agriculture, which was largely for domestic consumption. By the time of its independence in 1825, mining, although still important relative to other industries was a shadow of its former self.[4] The new republic had a population of approximately two million, but the majority of the population consisted of Indian peasants who lived in the highlands and relied on subsistence agriculture. A small elite resided primarily on the coast, particularly in the capital, Lima. The elite specialized in plantation agriculture, mining and commerce. There was no banking system, and credit markets were thin, and dominated by personal connections. Foreign commerce consisted of the exchange of minerals for luxury manufactures with Europe, and agricultural trade with Chile and Bolivia.

[4] Peru declared independence in 1821 but became effectively independent only in 1825.

There are few quantitative estimates of the size of the Peruvian economy at the time. An often cited metric of economic activity is Paul Gootenberg's estimate of business revenues and prices in the province of Lima.[5] According to his estimates, real business revenues in Lima in the mid 1840s were 15% *below* levels in 1830.[6] More is known about foreign commerce. Shane Hunt's estimates of export quantum are widely considered the best available. Here the picture is slightly better -exports grew at an average annual rate of about nine percent during the 1830s, principally driven by the rejuvenation of silver mining and the rapid growth of wool exports. But export growth slowed considerably during the early 1840s. The general view in the historiography is that the period preceding the guano boom was one in which the economy was weak and unstable.[7]

The economic conditions were mirrored by a high degree of political instability. Despite the early adoption of a written constitution blending elements of American and French models, the early republican period was marked by the dominance of *caudillos*.[8] From 1821 until 1845, Peru had 50 changes in government, five constitutions, countless internal rebellions, and five foreign wars, including wars with each of its neighbors except Brazil.[9]

The economic and political environment was hardly conducive to the development of sound government finance. In addition, Peru at independence was

[5] Lima, the richest region, included the major Peruvian port (Callao) and concentrated not only the most important fraction of the local elite, but also a large artisanal sector.
[6] Paul Gootenberg, *Between Silver and Guano,* p.166.
[7] For an overview of the Peruvian economy at the time see Carlos Contreras, "La economía peruana," pp. 277-309.
[8] See Aljovín, *Caudillos y constituciones*.
[9] The most severe conflicts were in the late 1830s when a Peruvian-Bolivian confederation was defeated by Chile, and an exceptionally violent period of civil war from 1841-1845 in which the presidency changed hands nine times.

burdened with large foreign and domestic debt contracted to finance its five-year long revolutionary war. The lion's share of the debt consisted of two large external bond issues, totaling £1.816 million pounds sterling. As described by Carlos Marichal, British financiers made a series of loans to the newly independent states and revolutionary governments of South and Central America in the years 1822-1825. Virtually all of these governments defaulted by 1826, with the exception of Brazil.[10]

Reflecting the turbulent political atmosphere, statistics on government revenue and expenditures are scarce. Customs revenue and an Indian head tax – a holdover from the colonial era – were the two largest sources of revenue. Expenditures exceeded revenues throughout the period.[11] In particular, military expenditures of the government of the moment could run into £450,000 of pounds sterling a year.[12] According to Gootenberg, however, budget deficits were often covered through "emergency loans" from domestic merchants. Although these were promised to be repaid from future customs and other revenue, many of these loans remained unpaid until the 1860s. The exact amount of this credit will probably never be known, but estimates have put them at around $3 million pesos (£600,000 pounds) between 1821 and 1845.[13] It was against this backdrop of political chaos and financial ruin that guano emerged as an unlikely savior.

[10] Marichal, *Century of Debt Crisis,* and Neal, "Financial Crisis,"discuss possible reasons for this early "debt crisis."
[11] For a discussion of the ruinous state of government finances in the period see Gootenberg, *Between Silver and Guano,* and his "Merchants, Foreigners and the State."
[12] There are no systematic data available on such expenses until the first public budget was issued under Castilla in 1845. Military expenditures in his first year in office was around $2.239 million pesos (£450,000), the lowest of the guano era.
[13] Gootenberg *Between Silver and Guano*, pp. 169-171.

3. The Growth of Peruvian Guano Exports

The existence of deposits of guano on islands near the Peruvian coast had been noted by travelers for some time. Agricultural chemists conducted experiments with Peruvian guano and found it contained significant quantities of nitrogen and phosphorus that made it an especially useful fertilizer, with major advantages over other manures, as well as bone and dried blood.[14] Large deposits were found on the Chincha islands, a group of three uninhabited islands about 20 kilometers off the coast of Peru, and less than 200 kilometers from Callao, the main port of Lima. Under Peruvian law, they were property of the state, and because of their isolated location, with a modicum of naval presence they were not difficult to protect from poachers. Thus, legal tradition and geography made the enforcement of a government monopoly possible.

The extraction of guano required very little capital investment. It mainly involved digging the guano and transporting it to chutes that led from the island's cliffs into the holds of ships that were anchored nearby. However, it could take over one month to load a ship, and during the heyday of the trade in the 1850s and 1860s, there were often more than fifty ships loading at any given point in time. The length of loading time and the voyage meant that the cost of transport was substantial.[15] Procurement of vessels and coordination of sales, foreign warehousing and marketing were also costly and demanded a certain degree of expertise that the Peruvian government lacked.

[14] Mathew, "Peru and the British Guano Market," p.113.
[15] Transport of guano to foreign markets was estimated at about £4 17s per ton, around 70% of total costs. See Mathew, *House of Gibbs,* p.29 and "Primitive Export Sector." See also Levin, *Export Economies.*

As a consequence, the state contracted with "consignees" who managed the export to and marketing in the various foreign markets.[16] The largest and most lucrative contract was for the British market, and the consignee was a highly reputable British merchant house, Anthony Gibbs and Sons, until 1862. Gibbs earned commissions as well as a cost-plus arrangement for freight, loading and storage.[17] After 1862, the consignment system was modified so as to permit Peruvian nationals to enjoy more of the rents, but the key role in Britain remained in the hands of a U.K. firm of high standing, this time Thomson, Bonar and Co., which had connections to Prime Minister Gladstone.[18]

As stated above, the principal foreign market for guano was Great Britain, but the United States, and France were also important markets. Figure 1 shows Peruvian guano exports between 1845 and 1878. The erratic nature of the data series is deceptive – the flow of revenues to the Peruvian government was much less variable because of the holding of stocks by consignees in the importing countries. Unfortunately, outside of some data for Britain, little direct evidence exists on actual guano sales.

The value of Peruvian guano exports to Britain, which was the destination for between 1/2 and 2/3 of all Peruvian guano exports, rose dramatically between 1847 and 1860, and it routinely exceeded two million pounds sterling per year. There was a high degree of price stability. The Peruvian government set a minimum sales price that was usually binding.[19] As a consequence, fluctuations in guano export revenues mirrored fluctuations in the quantity exported. Because Peru did not publish trade statistics

[16] A summary of the main terms of all Peruvian guano export contracts during the guano age is available in Rodríguez "Historia de los contratos." The actual contracts are available in Dancuart, *Anales,* various volumes.
[17] See Levin, *Export Economies,* and Mathew, *House of Gibbs.*
[18] Thomson & Bonar remained in the trade until the expiration of their contract in the early 1870s.
[19] For most of the period guano was priced at around 12 £ per ton. See Mathew, "The guano trade and the Peruvian government," p.359 and "The House of Gibbs," p.29.

between 1847 and 1877, the value and relative importance of guano exports can only be estimated. Charles Fenn estimated Peru's total exports at 2.92 million pounds sterling, of which 1.56 was estimated as guano. Estimates based upon United Kingdom trade statistics indicate that between 1854 and 1871, the height of the guano boom, guano constituted on average sixty percent of the value of all Peruvian exports to Britain.[20]

4. The Significance of Guano for State Finances

The Peruvian state's guano monopoly was a revolution for government finance. As is shown in Table 1, guano exceeded customs revenue beginning in the early 1850s, from then until the late 1860s it accounted for two-thirds or more of total government revenue. In the mid 1850s, when guano income was well over two million pounds sterling per year, Peru reduced import tariffs and abolished the Indian head tax. Tariff revenue still grew because imports were growing rapidly during the period. Real government revenues nearly doubled between 1847 and 1852, and doubled again by the early 1860s.

Peruvian government expenditures expanded in tandem with guano income. The chronic instability led Peruvian leaders to spend freely. There were large increases in military, naval and bureaucratic expenditures. The lion's share of the budget was directed to the armed forces, which excluding debt service represented an average of between 50 and 75% of the central government budget from the mid 1840s to the late 1860s.[21] In the 1870s, railroad construction was a massive expense. Overly optimistic and/or corrupt railroad investments were a major cause of the catastrophe that marked the

[20] United Kingdom trade statistics with Peru were taken from various volumes of Fenn's compendium, citing U.K. Board of Trade figures.
[21] The most reliable source on government expenditures is in Hunt, "Growth and Guano." Hunt series only covers selected years between 1846 and 1877.

end of the guano boom. In sum, the guano boom fueled the growth of government so that Peru still rarely had a budget surplus.

Guano also made possible the settlement of Peru's revolutionary war debt, and enabled successive Peruvian governments to tap into credit markets for a variety of purposes –debt conversion, general expenses, war finance and railway construction. Table 2 shows the total public debt for selected years between 1825 and 1875. During the entire guano period, foreign loans comprised the majority of the debt. The increase in domestic obligations was the result of the consolidation process which recognized old debts generated during the Independence Wars and forced loans of the early *caudillo* period. No further domestic debt was contracted until the 1870s, when the government intervened in the banking system and nationalized the nitrate industry.[22]

An analysis of foreign debt issues is covered in subsequent sections, but an overview of their characteristics is given in Table 3. As mentioned earlier, the initial loans amounted to 1.8 million pounds sterling. Because Peru had been in default for nearly a quarter-century, significant arrears of interest accumulated. In January 1849 the Peruvian government reached a settlement with British bondholders. Under the scheme, the principal of the old loans was converted into new bonds for a total of £1,759,100, 25% of the interest was written off, and the remainder of the accumulated interests for £1,854,700 pounds was floated as "passive" bonds, which would not begin to pay interest until April 1852.[23] Both issues were secured by up to fifty percent of government revenue from the guano monopoly.

[22] See Quiroz *Domestic and Foreign Finances,* and *Deuda defraudada,*on the corruption scandals associated with the consolidation process.
[23] Dancuart, *Anales*, vol 4, p.43. Casa Murieta was in charge of the conversion for a 0.5% interest charge over the total. Dancuart, Ibid. vol 5, chp. 5, p. 33-36. The active bonds yielded a 4% interest since April 1,

In 1853, Peru borrowed on four separate occasions. The first was a conversion operation on the 1849 bond representing the principal of the 1822 loan, which also produced a significant inflow. Two others were issued a few months later, one placed in Paris and the other in England. They effected a conversion of domestic debt into external debt. These loans were for a total of approximately 2.4 million pounds, and as is subsequently discussed, were highly unpopular with the bondholders of the main British loan of February 1853. A fourth loan was also issued for the construction of a railroad in southern Peru in the amount of 403,000 pounds. In each case the loans were formally guaranteed with guano revenues. Charles Fenn, commenting on these loans in 1855, calculated total debt service at 267,000 pounds sterling per year, and stated that *"...should the consumption of guano in this country (the U.K.) continue at the same rate, and the terms of the debt remain unaltered, the liabilities of the Peruvian Government will only amount to a little more than one-third of the proceeds of the guano [sold in the United Kingdom]."*[24]

Another conversion was undertaken in 1862, which also yielded more than two million pounds sterling to the government. Later, during war with Spain in 1865, Peru was able to place a loan in Europe for ten million pounds and another in the U.S. in 1866. In the late 1860s Peru, like many other countries around the same time, began a major campaign of railway construction. Three loans were issued, in 1869, 1870 and finally, in

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1849. The interest rate on these bonds, however, was scheduled to increase by 0.5% points annually until reaching a ceiling of 6% in April, 1853. The passive bonds, on the other hand, had interests of 1% a year starting in April, 1852. This rate was scheduled to rise by 0.5% annually up to 3% in April, 1856. In addition, sinking funds for both bonds were scheduled to start only in April, 1856. The latter was established at 1% for the active bonds and 0.5% for passives.

[24] Fenn's *Compendium*, 1855, pp. 206-207.

1872, which paid off the 1865 loan but added enormously to the foreign debt. These last loans were earmarked primarily for railroads.

Peru secured those loans with guano as well as the planned railroads, but it was strongly suspected that the deposits of the Chincha Islands were nearly exhausted. Peru publicized the surveys of vast new deposits at Pabellón de Pica, Penita de Lobos and Las Huanillas. A British Parliamentary report in 1874 confirmed the near-exhaustion of the Chinchas and questioned the veracity of Peru's new claims, but the news came too late for Peru's unfortunate creditors. Further, farmers began complaining about the inferior quality of the recent Peruvian guano exports. To make matters worse, guano began to face increased competition from nitrate of soda, a mineral, and ammonium sulfate, a by-product of coke production. Under the weight of this new debt, and with the decline of guano, Peru defaulted on its foreign debt in December, 1875.

The foregoing discussion illustrates that the very significant increase in government revenue due to the guano windfall coincided with Peru's resumed access to international capital markets. Guano had transformative effects on the Peruvian economy, state finances and sovereign debt. It also transformed Peruvian politics and society, but it did not result in the formation of a stable polity. On the contrary, Peru continued to be dogged by infighting, civil conflict, coup d'etats, and foreign wars. How could the bonds of such a country find a ready market in Europe? How could foreign investors trust such a government to pay its debt? The answers to these questions require an analytical framework.

5. The Enforcement of Sovereign Debt Contracts

The problems confronted by governments in establishing credible commitments with creditors are well known. Sovereign contracts are not subject to third-party enforcement. Thus, unless lenders (often in combination with the sovereign) orchestrate a credible threat to levy a sufficiently large penalty in case of government default, the promise to repay is not credible.

Theoretically, a sovereign can commit to honor his financial obligations in two ways. One is by building a reputation so he can access credit in the future. Reputation effects imply that a default is penalized either through a future credit boycott, strict limits on future credit, or higher interest rates on future loans reflecting a default risk premium. Alternatively, the government can commit by orchestrating an increased penalty for default over and above the threat of credit restrictions. Those penalties (or sanctions) can take several forms. They can emanate from domestic political institutions that punish the ruler if he should repudiate the debt, like in the emblematic case of Great Britain; from ad-hoc contracts that explicitly link debt repayment to sanctions radiating from a complementary (nonlending) relationship, like in Hapsburg Spain, or from foreign government diplomatic or military pressure as with regard to U.S. imperialism in the Caribbean in the early 20th century.[25]

Reputation effects heavily rely on the ability of creditors to deny future credit to a defaulting sovereign. The effectiveness of such a threat, however, will depend upon the cost to creditors of imposing the penalty, as well as the unity of all creditors undertaking

[25] North and Weingast, "Evolution of Institutional Governing," Conklin, "Theory of Sovereign Debt," Mitchener and Weidenmier, "Supersanctions."

the punishment in response to a default on some subset of creditors.[26] In the extreme case when the creditor is a monopoly, this unity may be trivial. When there are many potential creditors, however, the problem is more severe. The literature has shown that banking syndicates, bondholders' committees, and regulations of creditor country governments or stock exchanges, and political institutions can all play roles in cementing that unity.[27] Even a credible threat of a credit boycott would fall short of persuading a sovereign not to default, if, for example, the debtor country is able to save in financial assets.[28] Moreover, it is unlikely that reputation effects would be effective under political instability. Any government facing a violent threat to its survival has extraordinarily powerful incentives to default on their financial obligations. Short-sighted governments generally do not care about building a reputation because the threat of a credit boycott in the distant future is unlikely to suffice as a deterrent.[29]

If the literature with respect to reputation effects seems disparate, it is also true that there is no consensus about the importance of sanctions. Particularly important is the role of political institutions, potential trade embargos, and military and diplomatic threats. Douglass North and Barry Weingast explored the role of domestic political institutions in building government credibility in their seminal work on British sovereign debt. The establishment of representative political institutions in the aftermath of the Glorious

[26] Weingast, "Political Foundations."
[27] With respect to the unity of potential creditors, see Bond and Krishnamurthy, "Regulating Exclusion," Conklin, "The Theory of Sovereign Debt," Johnson, "Banking on the King," Mauro and Yafeh, "Corporation of Foreign Bondholders," and Weingast, "Political Foundations." Even a monopoly creditor needs to make credible its threat of a credit boycott. This problem bears some similarities to models of predatory pricing and "tit-for-tat" strategies that maintain cooperation. Credit boycotts could occur in a repeated game in which the creditor gains by establishing its own reputation as being tough on delinquent debtors.
[28] See Bulow and Rogoff, "Sovereign Debt."
[29] One exception is Amador, who presents a model in which political uncertainty generate an equilibrium with positive lending. His model, however, assumes a democratic regime, where parties alternate in power. Incumbents have an incentive to honor their debts because they can benefit from access to financial markets in the future. See Amador, "Political Economy."

Revolution gave Parliament substantial prerogatives in the area of public finance, setting effective boundaries on the sovereign's ability to renege on her financial obligations.[30] Setting the "right" political institutions, however, is neither a necessary nor a sufficient condition for the expansion of credit. As Stasavage has shown, the role of veto players is critical in establishing such credibility. The Whigs' predominance in Parliament was essential to reassure lenders of the government's commitment.[31]

In contrast to the British case, Peru's early republican period was marked by the dominance of *caudillos*. The guano windfall had transformative effects on the Peruvian economy and society but it did not result in the formation of a stable polity. As discussed above, Peru's political atmosphere was not conducive to the establishment of sound and stable political institutions. Throughout the guano age, Peru continued to be dogged by infighting and civil wars. Table 4 describes all Peruvian chief-executives and the manner in which they were selected during the guano age. As the table illustrates, in the lapse of thirty years (from 1845 to 1876) Peru had sixteen presidents, of which ten accessed power through violent means, usually after a major rebellion or civil war.

But, what of the threat of trade embargoes and military sanctions? Some argue that such pressures on behalf of bondholders were not decisive,[32] while others are more sympathetic.[33] The evidence suggests that on some occasions such pressure was important, for example with regard to U.S. imperialism in the Caribbean in the early 20th century, or the foreign operation of Chinese customs in the 19th century. More relevant for our discussion is the extensive scholarly examination of British Foreign Office

[30] North and Weingast, "Evolution of Institutional Governing."
[31] Stasavage, *Public Debt.*
[32] Platt, *Finance,Trade and Politics,* and Tomz, "How do reputations form?"
[33] Finnemore, *Purpose of Intervention,* and Mitchener and Weidenmeier, "Supersanctions."

archives, which suggests that there was no consistent policy on the part of the British government of backing up bondholders with military, economic or diplomatic threats.[34] In particular, the records suggest that the British government did not issue any commercial, diplomatic or military threats to the Peruvian government in behalf of the bondholders –more on this later.

Thus, why and how did Peru resume payment on its debt in 1849? Why did foreign creditors grant large new loans in 1853? After twenty-seven years in default, it was not enough to show the ability to pay by publishing reports of official surveys on the size of guano deposits. Peru, unlike Britain after the Glorious Revolution, lacked stable political institutions with real veto power that could allow credit to expand. Peruvian politics continued to be plagued by autocrats, frequent changes in government, internal rebellions, and foreign wars. What the country needed was to find an alternative mechanism to raise the penalty that creditors could impose on it if it defaulted again. The penalty had to be sufficiently large, direct and imminent so as to persuade even short-sighted governments of the benefits of repayment. As I discuss in the subsequent sections, Peru was able to find such a mechanism by securitizing its guano deposits. This was possible because the special characteristics of the guano deposits and the collection of revenues from its export made it feasible to design a series of contracts that bondholders would trust.

6. Debt Settlement: The Carrot and the Stick

In January 1849 the Peruvian government reached a settlement with British bondholders. As described earlier, the principal of the old loans was converted into new bonds for a

[34] Platt, *Finance Trade and Politics,* pp. 34-53.

total of £1,759,100, 25% of the interest was written off, and the remainder of the accumulated interests for £1,854,700 pounds was floated as "passive" bonds, which would not begin to pay interest until April 1852. Both issues were secured by up to fifty percent of government revenue from the guano monopoly.

The 1849 settlement was a necessary pre-requisite for regaining access to international credit markets. At the time, British and Continental bondholders were able to exert pressure on delinquent debtors through a simple institutional device: the leading European stock exchanges would not list any new issue proposed by a defaulting state.[35] Peru issued new debt only in 1853, after four years of "good behavior." Peruvian guano exports had only begun to exceed 50,000 tons in 1847. Unless guano exports remained at high levels, Peru would have to cut spending or raise taxes in order to meet its obligations. No Peruvian government in the early republican period had demonstrated its ability to accomplish that.[36]

The ability of Peru to maintain high levels of export revenues depended on the extent of its guano deposits and whether or not it faced serious competition from abroad, as it did from Africa in the mid 1840s.[37] Surveys of the Chincha Islands were conducted in the 1850s, and the surveys included foreign observers. In 1851, for example, it was estimated that the guano deposits were of around 26 million tons, which would last –at current export rates- until the year 2112. In 1853 the deposits were estimated at a total of

[35] Borchard, *State Insolvency,* p.xxiv.
[36] The most recent attempt to resume payment on the foreign debt occurred in January 1842 when the Peruvian government approved a decree that promised half of guano proceeds to the British bondholders. The terms of the decree were never followed. Exigent circumstances existed – the Peruvian government fell and there were numerous changes of government in the next few years, and the guano revenues were nowhere near the level that initially had been forecasted. The 1842 decree can be found in Dancuart, *Anales,* vol. 3, chp. 2, p.155. See also the letter of G.R. Robinson, chair of the Committee of Spanish-American Bondholders, to *The Times*, dated February 26, 1847. *The Times*, 13 March, 1847.
[37] The guano deposits, found off the west coast of Africa, were depleted in the course of four years. It was much cheaper than Peruvian guano, and as a result captured a good size of the market in the mid 1840s.

around 12.5 million tons. A member of the British government wrote in 1854 that it would take about four decades to exhaust the deposits of the Chincha islands alone – which had the best quality deposits, and that considering the other deposits, guano was possibly inexhaustible. In 1859 an American trade journal suggested a figure of 27 million tons for the Chincha islands and others. The grimmest view calculated the Chincha deposits at about 6-8 million tons, which still implied a long life span for guano deposits.[38]

Insofar as outside competition, the most significant new discoveries, the Lobos Islands, were also claimed by Peru. No comparable guano deposits were found, nor were they likely to be. The exceedingly arid climate and the nutrient-rich Humboldt current made the Peruvian coast an ideal location where guano could accumulate. Many locations had one of those two key characteristics, but not the other.

Peru remained politically unstable, however, and the investment of guano revenues in an uncertain scheme to regain access to international capital at some future date does not seem to gibe for a government with a high discount rate. Notwithstanding, there are mitigating circumstances. First, Ramón Castilla, Peru's president at the time, had been in power for more than three years when the settlement was reached, making his government the longest in the republic's brief history. According to the portrait of Castilla advanced by one of Peru's most eminent historians, he cared more about the future financial condition of the state than previous rulers.[39] Perhaps he was sufficiently self-confident that he believed his government would last.

[38] See for example, *The Times,* 17 October 1853; Statement of E. Escobar de Bedoya, Attaché to the Legation of Peru in Paris, New York, *The Times*, 23 November 1853. Also see Dancuart, *Anales* vol. 5, p.18, and Mathew, *House of Gibbs,* p. 146.
[39] Basadre, *Historia de la República,* vol.3, pp.87-89.

Notwithstanding, Castilla was succeeded by Rufino Echenique in 1851. Three years later, however, he overthrew the latter and regained power. After fending off a series of revolts, he finally relinquished power again in 1862, only to attempt two other coups before his death. Given his personal history, it seems entirely possible that Castilla had a lower discount rate than other Peruvian rulers. A careful account of flows of guano revenues from 1849 to the end of his period in office shows that he received net flows (in the form of cash advances from the consignees) for as much as £344,400 pounds.[40] The government commitment with the bondholders on the other hand, for the same period, summed up to around £202,768 pounds.[41] That is, settlement did not pose a negative flow and no additional risk to losing power. The government continued to receive large positive balances.

What of the threat of sanctions? Is there any evidence that Castilla, or other decision-makers in his government, settled the foreign debt due to fears that the British government might intervene by either seizing guano cargos abroad, or affecting guano trade? Alternatively, did continued growth in exports to Britain depend on settlement with the bondholders? It was certainly the case that after the relatively high levels of exports in 1847 and 1848, the bondholders felt that Peru had the ability to pay, but not the will. The bondholders had been pressing the British government for assistance for years,

[40] From the December 1847 contract with Gibbs, £90,000 pounds. From the October 1849 contract, with the same house, £94,400 pounds. And from the May 1850 contract, again with Gibbs, £160,000 pounds. See the contracts in Dancuart, *Anales*, vol 4, chp. 5, with the exception of the 1850 one which was never published. See Mathew, *House of Gibbs,* for details on the 1850 contract, pp. 104-105.

[41] It could be decomposed in the following way: 50% of guano revenues produced from January 1850 to April 1851. Sales in that period were of around 135,068 tons. Considering costs of around £6 pounds per ton, total net revenues would have amounted to around £405,204 pounds (price per ton was around £9), substracting consignees commissions, which were of around £71,666, we end up with a net total of £333,537 pounds. From the latter, 50% belonged to the bondholders £166,768 + £36,000 from interests in year 1849, totaling £202,768 pounds. The estimation of consignees' commissions is derived from Mathew, *House of Gibbs*, p.104.

and the increase in guano exports beginning in 1847 led them to renew their campaign. They passed a series of resolutions in July of that year, including a formal request to the British government for aid, and they resolved *"...that it appears abundantly evident to this meeting...that there exist within the territories of [Peru] ample resources in the article of guano alone to provide for the liquidation of its foreign debt; and that consequently the Government is bound by every principle of public faith and national honour to proceed to that stipulation without further delay."* [42]

Studies on this precise issue concluded that the Foreign Office communicated its displeasure to the Peruvian Government, but that no threats were issued.[43] In particular, a famous circular signed by Lord Palmerston in January 1848 stated that the British Government had absolutely no obligation to make delinquent sovereign debts a matter of even diplomatic negotiations, not to mention military intervention. Palmerston, however, left the door open to possible diplomatic action if the *"loss occasioned by the non-payment of interest...might become so great that it would be too high a price for the nation to pay."*[44]

But, what of Peruvian perceptions? The possibility of British intervention – even seizure of the islands – was openly discussed in Peru. Peruvian Finance Minister Del Río in his *Memoria* in 1847, expressed the government fears that *"...until the foreign debt is settled, the remission of guano abroad…could bring major complications that we must avoid"*.[45] One can not disentangle the precise motivation for such an announcement.

[42] *The Times*, 24 July 1847.
[43] For a comprehensive and exhaustive analysis of this point see Mathew, "First Anglo-Peruvian Debt." See also Platt, *Finance, Trade and Politics.* For an alternative (but not as well documented) view see *Levin, Export Economies,* and Palacios Moreyra, *Deuda anglo-peruana.*
[44] Parliamentary Papers, 1849 (1049), LVI, reprinted in Platt, Ibid., pp. 398-399.
[45] Del Ríos' *Memoria* is reproduced in Dancuart, *Anales*, vol. 4, p.107.

From a game-theoretic perspective, it is more important what the Peruvian decision-makers actually perceived than what the British intended. Moreover, to obtain credit, Peru might have wanted to convince potential foreign creditors that the Peruvian government feared intervention so that they would repay. Actual repayment would be consistent with that belief being held. Similarly, if bondholders believed that their government would enforce payment, they would loan freely. As stated above, however, the literature suggests that no serious threats either diplomatic or military were issued, making it unlikely that the threat of sanctions was a decisive factor in the settlement process.[46]

7. Establishing a Credible Commitment: The Guano Export Contracts

In 1852 the Peruvian Congress authorized its representative in London to negotiate the terms of a new debt issue. An agreement was reached in early 1853, and the prospectus for the debt issue was advertised February 26. The loan, as discussed earlier, would redeem the outstanding bonds from 1849 that were scheduled to take on an interest of six percent in April 1853, and still yield a net capital inflow of over 600,000 pounds sterling. The issue, priced at 85, came at a lower rate of interest (4.5%), and annual sinking fund payments of two percent were committed.[47]

Yet the 1853 bonds represented new debt. So why did bondholders believe Peru's promise to repay? In other words, how could they be sure that the guano proceeds would be used as stipulated in the terms of the bond contract? As discussed above, the literature

[46] See Platt, *Finance, Trade and Politics,* Mathew, "First Anglo-Peruvian Debt," and Tomz, "Finance and Trade."

[47] *The Times*, February 26, 1853. The interest rate charged Peru was the same as that on a smaller Brazilian issue in 1852, and less than the six percent three million pound Ottoman loan of 1854 – the first of a long series by that country. The Brazilian loan was priced at 95 and the Ottoman loan at 80. The figures are from Clarke, "Debts of Sovereign," pp. 314-315.

suggests that a higher penalty for default can generate increased access to credit. In our case, the penalty does not appear to have come from the threat of military or diplomatic sanctions. I argue that the increased penalty was the potential major loss in government income due to the disruption of the guano trade in case of government default.

It was not uncommon for governments to pledge government revenues – usually customs revenues – for the payment of interest and sinking fund obligations. The original Peruvian loans were "secured" by such a promise. In a number of Latin American cases, such pledges were ignored at the government's convenience.[48] Guano had the potential to be superior collateral because revenue from it was collected at the point of sale abroad. A bondholder quoted in the *Times* in April 1857 said exactly as much. *"The security of the guano is unquestionable, and from its local situation is beyond the reach of any Government in Peru to control...and it must be borne in mind that the proceeds are received in England and not in Peru."*[49] In assessing the history of Peru's credit, Fenn, the publisher of Britain's most important manual of stocks and bonds, observed that, *"Above all, in distinction from other securities hypothecated by foreign states, the transfer was so easy, the Peruvian revenue being, as it were, collected in Europe – that Peru grew in favour with European capitalists."*[50] Fenn's reference to the same argument advanced twenty years earlier suggests that this perspective was probably held by a large number of bondholders, and contributed greatly to confidence of lenders and investors alike.

[48] See Fenn for such repudiations in the case of Colombia, Ecuador, Mexico and Venezuela during the 1840s and 1850s.
[49] *The Times*, 23 April 1857.
[50] Fenn, *Compendium,* 1876, p. 387.

The practical linkage of the guano trade to the debt service was simple and effective. Recall that because Peru did not possess the expertise and connections for selling guano in European markets, they relied on consignees –Gibbs for Britain until 1862, and later Thomson, Bonar and Co.[51] In the consignee contract of 1849 Peru specified the consignee as the financial agent for the service of the debt. The terms of the debt settlement in 1849 were agreed upon the same day that the Gibbs contract was renegotiated.[52] According to the contract, Gibbs were responsible for withholding a large portion of guano income (originally 50% of proceeds from the British market at the time) for debt servicing. The export revenues were collected by Gibbs in Britain and distributed shortly after to the bondholders. The operation was clean and did not involve the meddling of the Peruvian government.

Still, the bondholders needed to have confidence in that the consignee-agent would not collude with Peru to defraud them. Thus, Peru needed to specify a firm that would lose a lot by taking such action. A firm with substantial reputational capital would be less likely to collude with a foreign government because it could cost them their network. Mathew, in his monumental work on Gibbs and the guano trade, stresses precisely this point: "*Gibbs' base was the London money market and therein they were attempting, with substantial long-run success, to build up a large acceptance business. Progress in this field had to do with the marketability of ones name and reputation.*"[53]

[51] After the expiration of the contract with Thomson, Bonar and Co, a new contract was signed with the House of Dreyfus. Dreyfus was appointed financial agent and received monopoly rights to sell guano in all of Europe and its colonies with the exception of Cuba and Puerto Rico.
[52] Both contracts were negotiated on 4 January 1849. The contracts can be found in Dancuart, *Anales*, vol.4, pp. 33-39.
[53] Mathew, *House of Gibbs,* p. 242.

Perhaps the best illustration of the significance of this arrangement is expressed in Castilla's confession to the British Charge d'Affaires in October 1849, that his main reason for persisting with Gibbs was his wish to establish Peru's credit on a firm basis. Mathew (1981) adds *"... the fact that the funds due to them came from a reputable London merchant house and not from exposed government coffers in Lima gave them great confidence in Peruvian paper."*[54] Further, because the consignee-agent was a legal entity in Britain, it could reasonably fear a lawsuit, as later occurred when Peru defaulted in 1875.[55] The costs of litigation and the risk of liability, even if a relatively low probability outcome, could ruin even a large merchant house because of the funds at stake.

But, what would have been the consequences if Peru reneged on its consignee contract because Gibbs refused to collude in defrauding the bondholders?[56] Such an action would have implied a sudden interruption in the flow of guano income, which in the context of political instability could topple the government because of Peru's enormous dependence on guano and its complete inability to save.[57]

At the onset of the guano boom in the early 1850s, Presidents Echenique and Castilla radically reformed the tax system. Some of the key changes included massive

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[54] Idem. p. 233.

[55] For a brief introduction to the legal battles between bondholders and guano consignees see Wynne, *State Insolvency,* vol.2, pp. 127-136.

[56] The latter would have entailed finding another consignee willing to enter into business with Peru, and that possessed the capacity for raising the capital for transportation and storage, as well as the skills in marketing the guano. By their experience, Gibbs had developed a considerable advantage in these departments and finding an equally adept export consignee willing to risk their reputation would be difficult. On these points, see Mathew, *House of Gibbs*, p. 243.

[57] The issue is further complicated by the consignee's practice of advancing future guano revenues to the state. These short-term loans were quite substantial and the main source of regular government income at the time. For much of the period regular stipends in the form of cash advances were of around £300,000 pounds per year – a sizable sum in relation to annual debt service on the bonds. In the event that Peru reneged on Gibbs, Gibbs might have seek a legal remedy to cover its advances if not against the Peruvian government itself, against any future consignees. Gootenberg *Between Silver and Guano*, p. 130.

reduction in tariffs, commercial treaties with foreign countries, and the abolition of the *tribute* (Indian head tax). The reduction of tariffs and abolition of the head tax comprised close to 70 percent of government income in the pre-guano era. Re-imposition of the head tax or raising tariffs would entail political negotiations that could be time-consuming and perhaps have unintended political consequences. There is well documented evidence of major resistance to any tax reforms (re-imposition of these measures) in the period.[58] Furthermore, a fall in guano exports would cut into imports, so that even with an increase in tariff rates, positive effects on revenue would be uncertain.

This meant that, at least in the short term, there was no alternative to guano –see Table 1 for a description of the relative importance of different sources of revenue throughout the period. This raises the penalty from default because the opportunity cost is very large. Historians have typically interpreted Peru's tax reforms of the 1850s as motivated by domestic political considerations, but the problem of credible commitments offers another possible explanation. By increasing dependence on guano, Peru made its commitment to the bondholders more credible because it could not risk interrupting the guano trade. Any Peruvian government could not take the risk. Thus, Peru's notorious political instability was not an impediment to the credible commitment to repay loans. Because of the nature of the guano security, the identity of the government was of secondary concern.

8. Evidence from Financial Markets

Peru's commitment to repay had to meet some threshold of credibility simply to be able to resume borrowing. But how credible was Peru relative to other debtors? And were

[58] For a succinct overview of the political economy of tax reforms see Pike, *Modern History*.

investors rattled by Peruvian internal political events? There are two types of evidence that I examine to answer these questions. First, I compare Peru's access to foreign credit with that of different Latin American countries at the time by displaying some statistics on debt to export and debt to population ratios. Second, I examine the performance of bond prices and yields, and their sensitivity to events that transmitted information about the adequacy of guano revenues for debt service -the size of the guano deposits, the government's control over the guano islands, changes in the amount of debt outstanding, and sinking fund payments- and those that do not transmit information about the adequacy of the guano deposits –internal rebellions and wars that did not involve the security of the guano islands. Through this analysis I wish to gain insight as to whether or not investors were concerned about Peruvian politics or if, as I argue in preceding sections, they perceived that the nature of their contractual relationship with the Peruvian government did not depend on the structure or stability of Peruvian political institutions.

Table 5 provides a basis for comparing the relative debt burdens of Latin American countries in the early 1850s. Note that only Peru, Brazil and Chile were solvent at the time, and of those three countries Peru's debt to export and debt to population ratio were substantially higher. This suggests that Peru might have been closer to its credit limit. If Peru were closer to its credit limit than the other two countries, then the yield on its bonds would likely reflect a higher default risk premium.

In Figure 2 I show the price of the major Peruvian bond of the moment and that of the British consol, as a low-risk comparison, for the years 1830 to 1875. Figure 3 compares the Peruvian yield spread versus the consol to the yield spreads of Brazilian and Chilean bonds for 1830 to 1875.[59] The first two decades of the series in Figure 3 are not true yield spreads, because Peru was in default and there were no interest payments (Chile was also in default until 1842). The salient feature in the figures is the dramatic increase in the price of Peruvian bonds and decrease in the spread coinciding with the resumption of debt service under the guano-debt contracts of 1849. The price of Peruvian bonds rose by more than 33 percent between December 1848 and January 1849, and the sharp rise continued over the next several months. The Peruvian-British consol yield spread decreased to 2%, which was lower than those of Brazil and Chile -the most stable countries in the region.[60] This result is remarkable considering that Brazil was the only country in Latin America that maintained an impeccable record of interest and sinking fund payments since the early loans of the 1820s.[61]

The next major movement in the graphs occurred in 1853-54. The prices of Peruvian bonds fell and the yield spread increased. This corresponds to significant uncertainty about the adequacy of the guano revenues to cover a sudden increase in the debt burden. As discussed earlier, in February 1853 Peru floated new debt. This loan, a 4.5% per cent issue for £2,600,000 was created for the conversion and/or redemption of various liabilities that were carrying higher interest charges. The latter included the active bonds of 1849, which at this point yielded a 6% interest rate. As shown in Figure 2, there was a precipitous decline in Peruvian bond prices in that year. Also, in Figure 3 we observe an increase in the spread from 2% in May of 1853 to a spread as large as 5.1% by April 1854. Interpretation of 1853-54 is complicated by the fact that the consol

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[59] The data presented on Peruvian and Latin American bonds have been taken from *The Economist* and the *Course of the Exchange*. Monthly prices of British consols, a low-risk security used for comparison, were taken from the *Course of the Exchange.*

[60] Brazil was a monarchy and Chile was close to a functioning democracy.

[61] For a discussion see Summerhill, *The Inglorious Revolution.*

also suffered a marked decline. Notwithstanding, the exceedingly strong fall in Peruvian notes coincides with the controversy over the consolidation of the internal debt and its unexpected conversion to external debt through the Uribarren and Montané loans of mid 1853. Bondholders complained that the issues were diluting the value of their investments, even if guano was available in sufficient quantities to secure the loan.[62] The conversion of the domestic debt was highly controversial not only in London but also in Lima, where it was seen by many as a massive scheme to defraud the nation by recognizing some highly questionable debt claims of those politically connected with the Echenique government. Dissatisfaction with this operation was a major impetus for Castilla to wage a war against Echenique, driving him from power in January 1855.

The next large price movements occurred in 1855 and in 1858, which correspond with increases in sinking fund payments. The sinking fund on the February 1853 loan increased from 2% to 5% by the end of 1854, and from 5% to 8% in 1858. Increasing the sinking fund effectively shortened the term of the loan, reducing the risk that guano supplies would run out or that some other unforeseen event would cause a default. After the first increase Peru's yield spread approached that of Chile's. After the second the yield spread on Peruvian bonds was comparable to Brazil's.

Figures 2 and 3 also illustrate an important decline in Peruvian bond prices and increase in the yield spread during the Spanish-Peruvian conflict (1864-1866). There are strong reasons to believe that the war was responsible for the unusually poor performance of Peruvian bonds during this period. The conflict originated in 1864 when the Spanish ordered a naval expedition to seize the guano-rich Chincha Islands.[63] The islands were

[62] *The Times*, 6 August 1855.
[63] See Pike, *Modern History*, p.115, for a brief description of the events that provoked the Spanish invasion.

seized between April 1864 and January 1865. In January 1865 Peru and Spain signed the Vivanco-Pareja treaty. Under the terms of the treaty Spain withdrew from the islands in exchange for an indemnification. Many considered the treaty as an affront to national honor and shortly after, in January 1866, President Prado declared war on Spain.[64] Importantly, throughout these years the perception in Britain was that the Chincha islands were under serious threat.[65] After Peruvian victory was secured, by mid 1866, bond prices began to recover and the yield spread initiated a downward trend.

The final feature is the movement toward default in the 1870s, as the crushing railway debt Peru took on in 1870 and 1872 required too great a burden for guano revenues to meet. The yields on these new bonds were considerably higher than previous ones. The sudden jumps in the yield in 1870 and 1872 observable in Figure 3 occur when those bonds are issued.

Not only was the debt burden immense, but, as mentioned earlier, a sudden decline in the guano market coincided with the increase in debt. Ironically, a contributing factor was increased competition from nitrate of soda as a fertilizer, which was also found in great quantities on Peruvian territory. The Government took measures to establish a monopoly that would protect its guano revenues and supplement them, but the cost of expropriation proved immense and it was only carried out by virtually stripping the local banks of liquidity. Suspension of convertibility followed closely thereafter, and the state's finances collapsed. This is well put in President Pardo's message to Congress in 1874, "*My predecessor, Balta, formed the idea to convert our guano into railways. In two years he contracted for nine railways to cost 125 million dollars – say 24 million*

[64] Building on such discontent, Castilla and Prado led an insurrection that placed the latter in power in November of 1865.

[65] See for example, *The Times*, 4 March 1865.

pounds sterling, which money being raised by foreign loans, the Dreyfus guano contract for 8 ½ million dollars per year would pay the interest. Such enormous loans soon crippled us, as the railways were unproductive. At the same time the sudden influx of twenty millions sterling in two years upset our equilibrium. Everything ran up to fabulous prices...then came failures and suspensions and all the troubles that have reduced Peru to her present wretched condition."[66]

What is most remarkable about the data is the relative unimportance of internal politics. Of all of the major price movements in Peruvian securities from 1849-1875, none can be associated with Peruvian political instability. In Table 6 we see the correlation between major rebellions and wars and the Peruvian yield spread. The data show that the only two conflicts that are associated with any increase in the spread are precisely the ones that involved the occupation of the guano islands: the rebellion against the Vivanco-Pareja treaty and Vivanco's rebellion of 1856, which affected the shipment of guano. In Vivanco's 1856 rebellion, the rise in the spread was still of a small enough magnitude as to make the Peruvian bond look like that of Chile. Except for these two episodes other conflicts were either insignificant or associated with a reduction in the spread of the two bonds. Perhaps the best way to illustrate the irrelevance of political instability is to cite a letter from a British bondholder to *The Times: "With respect to the [disturbed] internal state of Peru…It is not of the slightest importance to the English bondholders. Did their security rest upon no other foundation than the internal resources of Peru and the honesty of her government I do not believe there is a single holder of the stock who would value it at 10 per cent (...) but the security of the guano is*

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[66] *The Economist,* 24 April 1875, pp. 483-484.

unquestionable, and from its local situation is beyond the reach of any Government in Peru to control.''[67]

Cumulative Abnormal Returns

Although a preliminary evaluation of the evolution of bond prices and yields strongly suggests that the factors associated with the adequacy of guano revenues drove much of the evolution in bond prices (as opposed to those factors that did not transmit information about the adequacy of the guano deposits like internal rebellions and wars), I further examine the data through an econometric analysis. The objective of this section is to establish with greater precision whether political and economic events coincide with anomalous returns on Peruvian bonds. Following the work of Mitchener and Weidenmier, I develop a market model in which the return on Peruvian bonds is regressed against the returns of an indicator of the sovereign debt market.[68] The model can be stated as follows:

$$\mathrm{R}_t = a_o + \beta X_t + \varepsilon_t \quad (1)$$

where R_t is the return on Peruvian bonds, a_o is a constant, β is the beta coefficient, X_t is the market return at time period t, and ε_t is an error term. The beta coefficient measures the correlation of the returns on Peruvian bonds with an index of the market return.

I estimate two versions of the equation, one employing the return on the British consol as the market indicator and another with the average return on Brazilian and Chilean debt.[69] The errors resulting from these estimations are interpreted as the

[67] *The Times*, 23 April 1857.
[68] Mitchener and Weidenmier, "Empire," pp. 671-672.
[69] Note that the equation I estimate is not technically a market model, in which the return on Peruvian bonds is compared to the return on a market portfolio. Instead, the model is a single-factor model in which either the return on the British consol or on the Chilean/Brazilian bonds is used to provide a base for comparison with the return on Peruvian debt. Returns in period t are computed by taking the natural logarithm of the bond price at time t divided by the bond price at time $t-1$. The data employed are monthly.

abnormal returns on Peruvian bonds. Examining the path of cumulative abnormal returns (CARs) permits one to identify periods of time during which Peruvian bonds consistently over-performed or under-performed relative to the market indicator.[70] Figure 4 shows the CARs for Peruvian bonds from 1830 to 1875. The figure confirms the basic patterns observable in the graphs of bond prices and yields. First, the onset of the guano-debt contracts coincides with a period of large positive abnormal returns for Peruvian bonds with respect to both the British consol and the Latin index. Second, there are substantial negative abnormal returns both during the financial scandals of 1853-54 and during the conflict with Spain in 1864-66. Finally, the last years before default are ones in which Peruvian securities under-performed relative to the consol and the Chilean and Brazilian bonds. Besides those episodes, the most striking feature of the graph is the remarkable stability of returns over much of the guano period.

The evidence from financial markets strongly supports the hypothesis that Peru's contractual commitment to repay debt from guano revenues was credible. The analysis of market reactions to major political and financial events suggests that through much of the guano period, investors cared much about Peru's ability to pay – control of guano deposits and debt burdens were important. But they were indifferent to much of the internal instability that historians argue held back Peru's broader development.

Conclusions

Peru's 19th century guano boom signified the country's emergence from the bankrupt and relatively stagnant state of affairs that had existed in the twenty years following

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For a discussion of the market model see Sharpe, Alexander and Bailey, "Investments," pp. 258-260. I apply the Newey-West methodology to correct for autocorrelation.

[70] CARs are calculated by taking the partial sum of the residuals in equation 1.

independence. The country possessed a natural resource that had the potential to revolutionize Peruvian government finances. But arranging for the export of the commodity and the return to international capital markets was not a foregone conclusion. Both were accomplished through the linkage of guano export consignee contracts to the financial agency role of debt service. These measures were effective in convincing investors that Peru was creditworthy because they understood Peru's extreme dependence on the guano trade made them highly unlikely to risk losing it. The Peruvian government's experience with guano-based borrowing provides support for the view that even in the context of highly unstable polities a sufficiently large penalty for default can support an equilibrium with positive lending.

The guano windfall ushered in an era of relative prosperity for many in Peru, particularly those among the elite. It also created a flow of capital that facilitated the creation of Peru's first banks, and of investment in cotton, nitrates and sugar. The guano boom did not markedly improve Peru's political institutions, however. There continued to be a struggle between liberals and conservatives that more often than not took place outside the realm of the law, which explains the largely unproductive use of the guano resources. Much of the guano income that entered the state's coffers (approximately 90 million pounds by Hunt's calculations) was directed to military and bureaucratic expenses.

The guano boom finally came to an end in the early 1870s. The dramatic decrease in guano income due to the exhaustion of the best guano deposits and the competition of new fertilizers, led Peru into a period of abysmal public finance and default, and the weakened state fell easy prey to Chilean territorial ambitions in the disastrous War of the Pacific.

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Table 1: Peruvian Government Revenues and Expenditures
Thousands of Pounds Sterling

	1831	1847	1852	1857	1862	1866	1872	1877
Total Revenue	662	1,001	1,739	3,731	3,990	4,026	4,491	3,064
Guano	0	0	659	3,059	2,797	2,713	2,121	1,291
Customs	280	401	622	417	651	781	1,483	1,377
Indian Head Tax	164	265	267	-	-	-	-	-
Total Expenditure	995	1,192	1,676	3,272	3,941	3,912	11,884	4,176

Sources and notes: 1831: Tantalean, *Política económico-financiera,* appendix Tables 4 and 5. 1847, 1852, 1862, 1866, 1872, 1877: Hunt, "Growth and Guano," pp. 299-300. Hunt's figures have been adjusted by subtracting revenue from loans and advances. Repayments of advances to consignees and Dreyfus in 1872 have been subtracted from expenditures. These adjustments account for differences with his figures for 1862, 1872 and 1877. 1857: Fenn's Compendium, 1863, pp. 295-296. Figures were converted to pounds sterling at the rate of 5:1.

Table 2: Peru's Public Debt
Millions of Pounds Sterling

Year	Domestic Debt	Foreign Debt	Total Debt
1825	-	1.82	-
1850	1.58	4.16	5.74
1853	4.84	5.12	9.96
1858	3.08	5.77	8.85
1865	2.78	10.00	12.78
1875	2.34	35.05	37.39

Source: Fenn's *Compendium* (1837, 1855, 1863, 1867), Investor's Monthly Manual (January 30, 1875), Quiroz, *Domestic and Foreign Finance,* p. 36.

Table 3: Loans to Peruvian Government (1822-1872)

Date of Issue	Agent7	Loan	Amount	Issue Price	Coupon Rate	Amortization	Increase in Total Debt
1822	Fry and Chapman	War Finance	£1,200,000	88, 82	6 %	1.16%	£1,200,000
1825	Fry and Chapman	Idem	£616,000	78	6%	1%	£616,000
1849	Casa Murrieta	Debt Settlement	£3,613,800: A: £1,759,100 B: £1,854,700	n.a.	A: 4%- 6% 1849-53 B: 1%- 3% 1852-56	A: 1% from 1856 B: 0.5% from 1856; was raised to 3% in 1855	None
Feb. 1853	Murrieta and Hambro & Sons	Renegotiation 1849 issue A	£2,600,000	85	4.5%	2% ; increased to 5% in 1854; to 8% in 1858	£620,447
May 1853	Montané (Paris)	Conversion of domestic debt into foreign debt	20,000,000 ff (£800,000)	n.a.	4.5%	8% in 1862	£800,000
May 1853	Uribarren	Conversion of domestic debt into foreign debt	£1,800,000	n.a.	4.5	1%	£1,800,000
1853	Hegan	Railroad Tacna-Arica	£403,100	n.a.	4.5	1%	£403,100
1862	Heywood, Kennard & Co.	Renegotiation and paying off old debts	£5,500,000	93	4.5%	8%	£2,308,374
1865	Thomson, Bonar & Co.	Conversion, War Finance	£10,000,000	83.5	5%	5%	£3,000,000
1866	U.S. interests	Jointly with Chile. War with Spain	$2,000,000	n.a.	7%	n.a.	$2,000,000
1869	Thomson, Bonar and Co.	Railway construction	£290,000	71	5%	2%	£290,000
1870	J.H. Schroder	Railway construction	£11,920,000	82.5	6%	2%	£11,920,000
1872	J.H. Schroder and Stern Brothers	Railroads, conversion	£22,130,000	60 to 75	5%	2%	£13,700,000

Multiple sources: Most importantly Dancuart, *Anales,* various volumes. See also Fenn, *Compendium,* various years*, The Times*, various years, Mathew, "The First Anglo-Peruvian Debt," Palacios Moreyra, *La deuda,* Tantaleán, *Política económico-financiera,* and Wynne, *State Insolvency*, vol. 2, pp. 109-195.

Table 4. Peruvian Presidents and Manner Selected during the Guano Age

Date Assumed Power	Chief Executive	Manner Selected
April 1845	Mar. Castilla	Civil War, Congressional Election
April1851	Gen. Echenique	Congressional Election
January 1855	Mar. Castilla	Civil War, Congressional Election
April 1857	*Consejo de Ministros*	Civil War
October 1858	Mar. Castilla	Civil War, Congressional Election
October 1862	Gen. San Román	Indirect Election
April1863	Gen. Diez Canseco	Interim
August 1863	Gen. Pezet	Constitutional Succession
November 1865	Gen. Diez Canseco	Civil War
November 1865	Col. Prado	Military Proclamation
January 1868	Gen. Diez Canseco	Civil War Interim President
August 1868	Col. Balta	Civil War Indirect Election
July 1872	Col. Gutiérrez	Coup
July 1872	Col. Zevallos	Constitutional Succession
August 1872	Don Manuel Pardo	Popular Uprising Indirect Election
August 1876	Gen. Prado	Direct Election

Source: Palmer, *Peru*, pp. 37-40, and Basadre, *Historia de la República,* various volumes.

Table 5: Some Latin American Debtors circa 1853

Country	Population (millions)	Exports (millions of pounds sterling)	Government Revenue (millions of pounds sterling)	Foreign Debt (millions of pounds sterling)	Total Debt (millions of pounds sterling)	Debt per person	Debt / Export
Brazil	7.230	7.170	3.970	5.900	12.392	1.71	1.73
Buenos Aires	1.100	2.262		0.977	6.000	5.45	2.65
Chile	1.443	2.262	1.100	1.385	1.785	1.23	0.79
Colombia	2.200	0.827	0.396		7.500	3.41	9.07
Ecuador	0.816	0.319					
Guatemala	0.847	0.281		0.428	0.595		2.12
Mexico	7.662	4.863		10.855		1.42	2.23
Peru	2.001	2.916	2.963	5.118*	9.954	4.97	3.41
Venezuela	1.490	0.973	0.727		1.577	1.06	1.62

Notes: Countries in italics were in good standing in financial markets. All others were in default. Peru's exports are from Fenn's *Compendium,* 1853; others are from Bulmer-Thomas, *Economic History*. Mexico's total debt is unknown; debt per person and debt to export ratio reflects foreign debt alone. Government revenue and debts are from Fenn's, Ibid., 1855. Population is from Bulmer-Thomas, Ibid. p. 38. Peru's foreign debt figure does not include the domestic debt converted in 1853.

Table 6. Major Rebellions and Wars and Bond Yields, 1845-1879

Years	Conflict	Yield Spread Peruvian/British Consols*
1844-45	Castilla's rebellion	-
May 1854- Jan. 55	Castilla's rebellion	4.0 / May 54 3.1 / Jan 55 Max. 4.0 Min 3.0
Oct. 1856- Mar. 58 Dec. 1856 – May 57	Vivanco's rebellion **Occupation of Chincha Islands**	2.4 / Oct. 56 2.4 / Mar 58 2.5 / Jan. 57 2.7 / Jun. 57 Max. 2.7 Min 2.3
Oct. 1859	War with Ecuador	1.7 / Oct. 59 1.8 / Dec. 59
April 1864- Jan. 65 Jan. 65	Conflict with Spain **Occupation of Chincha Islands** Vivanco-Pareja Treaty	1.9 / Jun 64 2.5 / Oct. 64 2.0 / Feb. 65 Max. 2.5 Min 1.9
Feb. 1865- Nov. 1865 Jan. – May 1866	Prado's (and Castilla's) rebellion vs. Vivanco-Pareja Treaty) War with Spain	2.0 / Feb. 65 3.3 / Dec. 65 Max. 3.3 Min. 2.0 3.7 / Jan. 66 4.5 / Jun. 66 Max. 4.6 Min 3.3
Mar. 1867 – Aug. 1868	Castilla's (and followers) rebellion	4.1 / Ap. 67 3.3/ Mar. 68 3.3/ Oct. 68 Max. 4.5 Min 2.9
1872	The Gutierrez brothers rebellion	4.5 / Jul 72 4.6 / Aug. 72 4.7 / Nov. 72
Aug.- Sept. 1874	Vivanco's rebellion	6.1 / July 74 5.8 / Aug. 74 5.3 / Oct. 74 Max. 6.1 / Min. 5.3

Sources: Pike, *Modern History,* and Basadre, *Historia de la República*, various volumes; Figure 3.

Figure 1

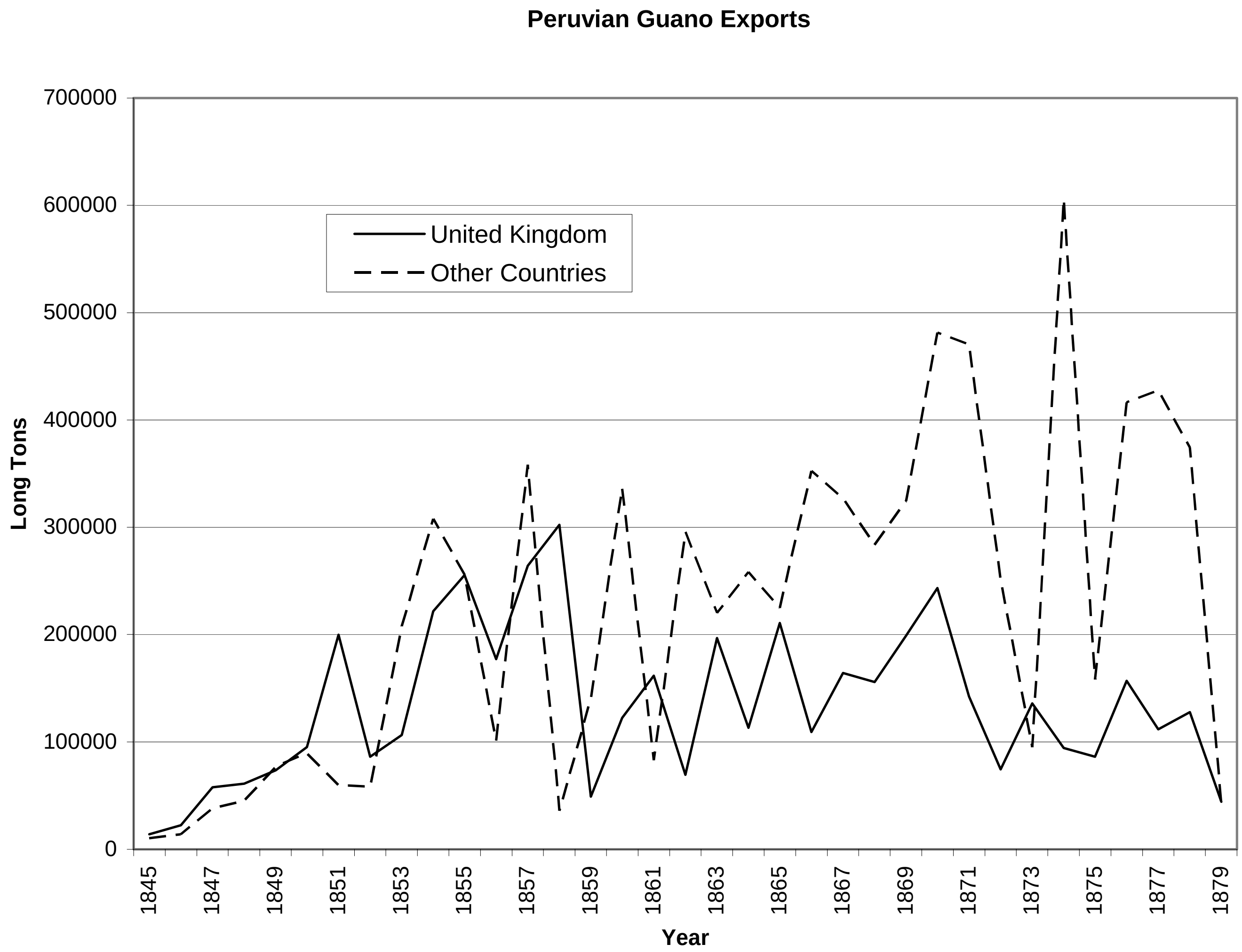
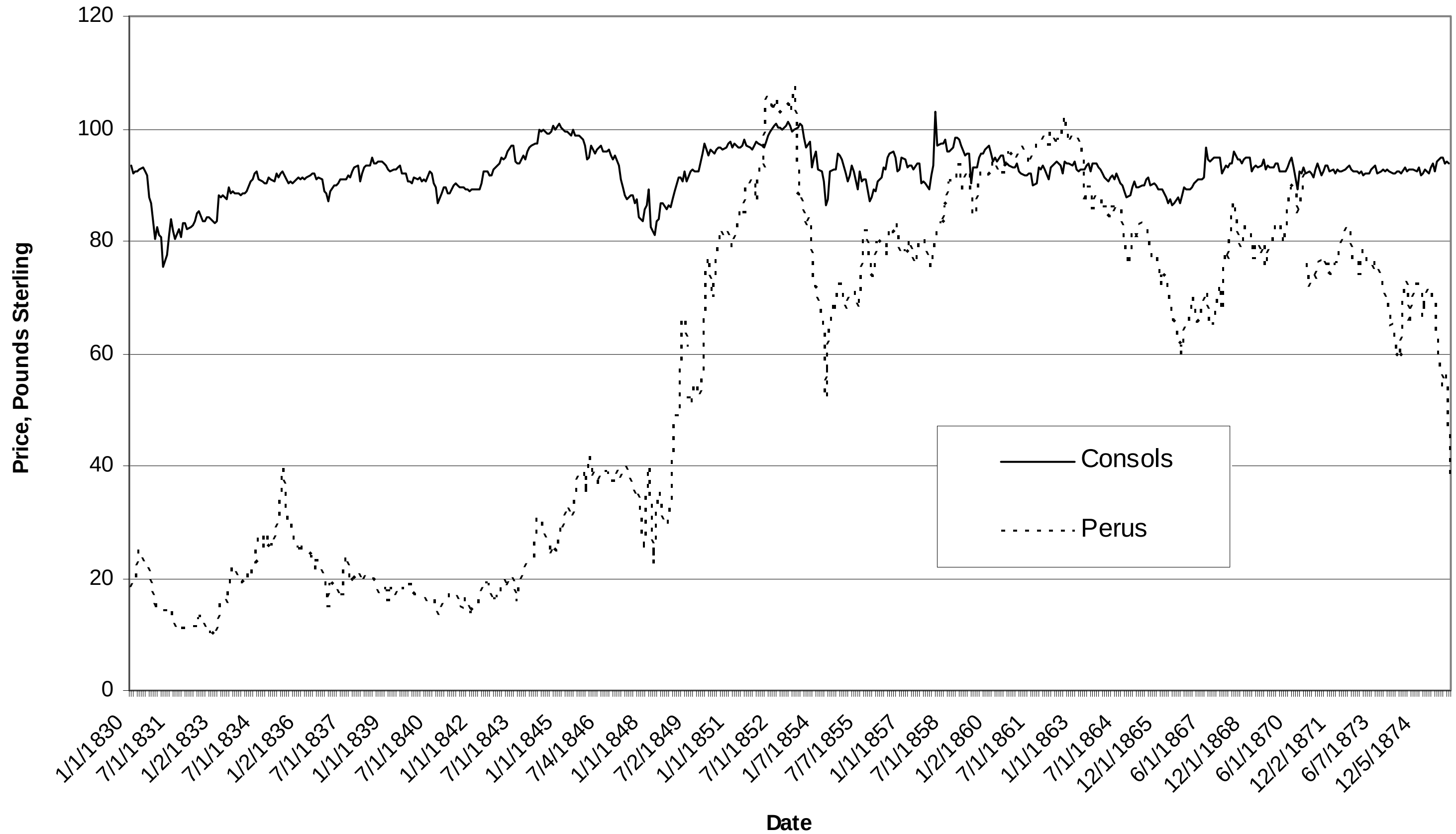

Peruvian Guano Exports
700000
600000
500000
400000
300000
200000
100000
0
Long Tons
United Kingdom
Other Countries
1845
1847
1849
1851
1853
1855
1857
1859
1861
1863
1865
1867
1869
1871
1873
1875
1877
1879
Year

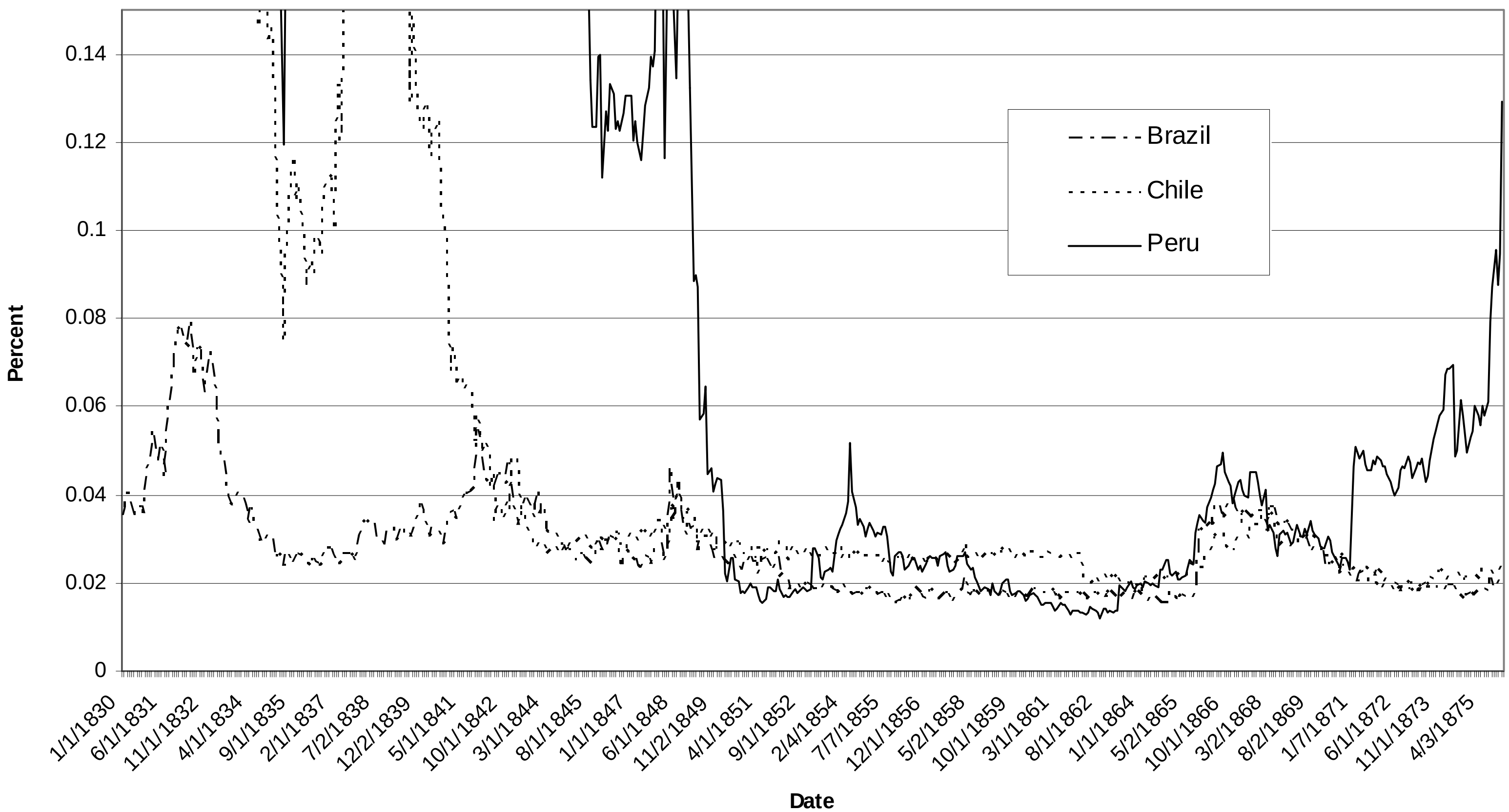
Figure 2
Bond Prices, 1830-1875



Source: Consols: Course of the Exchange. Perus: Course of the Exchange (1830-1844), Economist (1845-1875).

Note: The particular Peruvian securities used in the Peruvian series are the major issue traded in London at any given point in time.

Figure 3
Yield Spreads versus Consol, 1830-1875



Source: Consols: Course of the Exchange. Peru, Brazil and Chile: Course of the Exchange (1830-1844), Economist (1845-1875).

Note: The particular Latin American securities used are the major issue of each country traded in London at any given point in time.

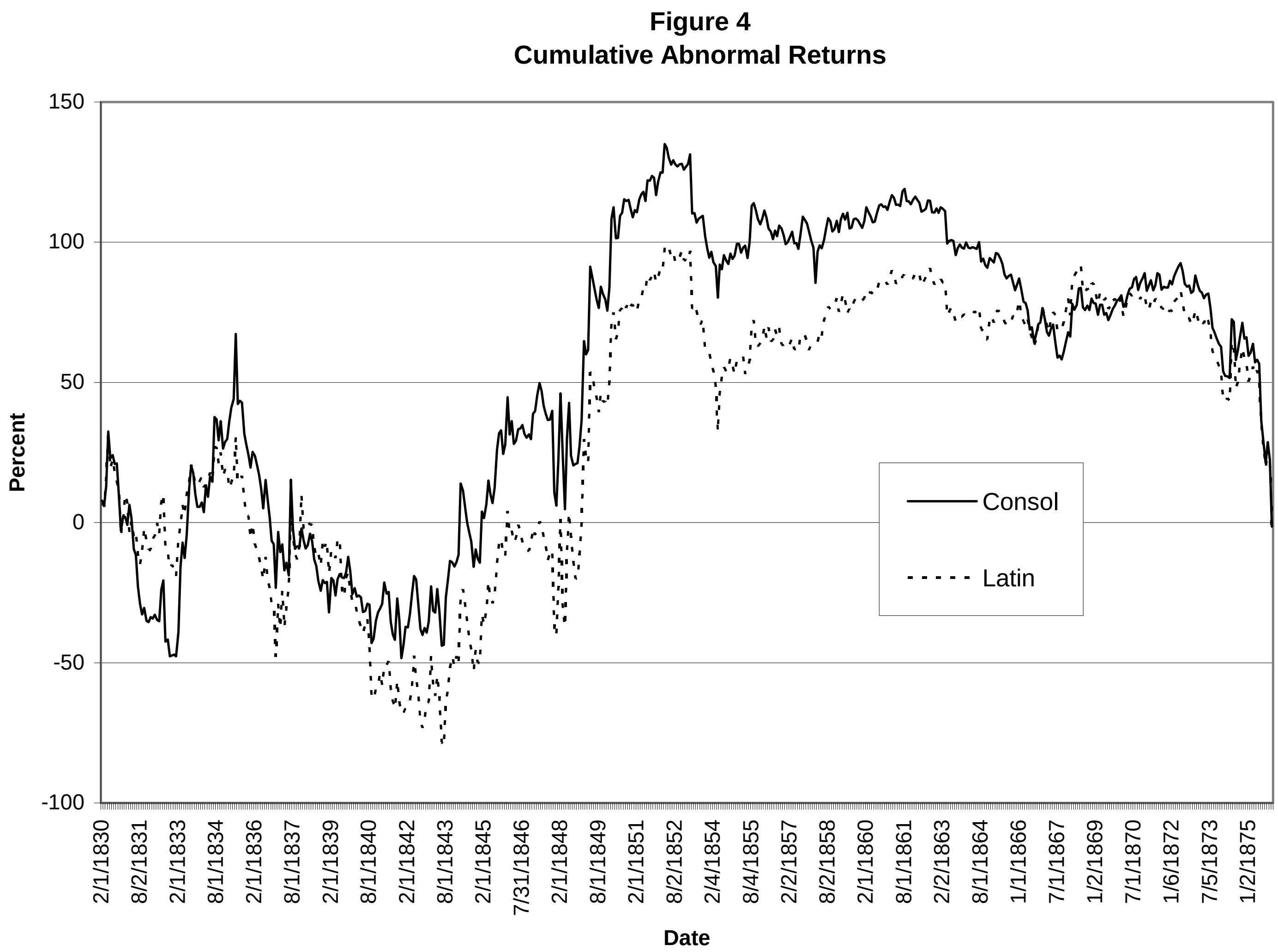


Figure 4
Cumulative Abnormal Returns
150
100
50
0
-50
-100
Percent
2/1/1830
8/2/1831
2/1/1833
8/1/1834
2/1/1836
8/1/1837
2/1/1839
8/1/1840
2/1/1842
8/1/1843
2/1/1845
7/31/1846
2/1/1848
8/1/1849
2/1/1851
8/2/1852
2/4/1854
8/4/1855
2/2/1857
8/2/1858
2/1/1860
8/1/1861
2/2/1863
8/1/1864
1/1/1866
7/1/1867
1/2/1869
7/1/1870
1/6/1872
7/5/1873
1/2/1875
Date
Consol
Latin