The Benefits of Commitment to a Currency Peg: Lessons from the National Banking System

Scott L. Fulford* and Felipe Schwartzman†

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Abstract

In the late nineteenth century U.S., the elimination of uncertainty about the government's commitment to the parity between the Dollar and gold was closely associated with significant changes in bank balance sheets and in the real economy. In particular, the defeat of the anti-gold candidate in the 1896 presidential election provided a cleanly identified positive shock to that commitment, which was followed immediately by large increases in the leverage of National Banks. The increase was most pronounced among banks located in states where agents were more likely to have access to gold denominated assets. We use the cross-state impact of the election to identify the importance of fluctuations in commitment throughout the period in a structural factor analysis. When feeding the identified factor through a VAR, we find that, in the last decade of the nineteenth century, full commitment to the currency peg had the potential to reduce the volatility of real activity overall by a significant amount, as well as substantially mitigate the economic depression starting in 1893.

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*Boston College department of economics, scott.fulford@bc.edu (617 552 2425, 140 Commonwealth Ave, Chestnut Hill, MA 02467). We thank John Maney for research assistance and Boston College for research support. We also thank Bernardino Adão, Tiago Berriel, Huberto Ennis, Christian Mathes, Gary Richardson, Ricardo Reis, Pedro Silva, Mark Watson, Alan Taylor, and members of the audience at UCI, FRB-Richmond the 2015 EEA meetings, 4th LubraMacro and PUC-Rio for valuable comments and insights.

†Federal Reserve Bank of Richmond, Felipe.Schwartzman@rich.frb.org (804 697 8000, Post Office Box 27622, Richmond, VA 23261). The views expressed here are those of the authors and do not reflect those of the Federal Reserve Bank of Richmond or the Federal Reserve System.

1 Introduction

Can strengthening the credibility of a currency peg benefit an economy? This possibility underpins the view that fixed exchange rate regimes work best the stronger is the institutional commitment to them, and has been an important part of the rationale behind the creation and expansion of the European Monetary Union (Rehman, 1997, p. 263) [1] Threats to monetary unions and exchange rate pegs continue to be pressing issues. For example, in July 2012 as concerns over the debts of several European countries peaked, 73% of investors predicted at least one country would exit the euro within a year.[2] Interest rates for Greece, Spain, Italy, and Portugal spiked, and it took a speech by the president of the European Central Bank promising to "do whatever it takes" to calm fears[3] Similarly, following the election of the Syriza government in Greece in January 2015, Greek banks were forced to declare a "banking holiday" and shut down for several weeks in July 2015 as fears of a Greek exit from the euro peaked.

The importance of the threat of euro exit in these events is difficult to separate from the particular economic situations of Greece and other periphery nations. Because of these complications, as Eichengreen and Temin (2010) argue, it is useful to look at other periods of fixed exchange rates, in particular, the Gold Standard (Eichengreen, 1992). Our paper highlights an instance in which a country was able to increase its degree of economic stability by reinforcing its commitment to an exchange rate peg, corresponding to the U.S. in the end of the XIXth century. This provides a contrast to the inter-war period emphasized by the literature on the Gold Standard, which highlight the costs of excessive commitment to exchange rate pegs. The period is specially interesting since the presidential election of 1896, in which William Jennings Bryan famously declared that

[1] In particular, it often drives multiple equilibria model of currency crises: Market expectations that a currency will devalue can generate costs that lead policymakers to let the currency devalue.

[2] The survey was conducted by sentix and asked 811 institutional investors. See press release: `https://www.sentix.de/index.php/en/sentix-Euro-Break-up-Index-News/sentix-ebr-index-shows-quick-euro-end-for-greece.html`, accessed 22 May 2015.

[3] See, for example, Jeff Black and Jana Randow in Bloomberg, 26 July 2012 "Draghi Says ECB Will Do What's Needed to Preserve Euro Economy" `http://www.bloomberg.com/news/articles/2012-07-26/draghi-says-ecb-to-do-whatever-needed-as-yields-threaten-europe`, accessed 14 May 2015. The speech and OMT are widely credited with substantially reducing the risk of a breakup as spreads declined substantially (Martin and Philippon, 2014; Paul De Grauwe, 2013). By July 2013, the fraction of investors predicting an imminent breakup had fallen to 24%.

"mankin d shall not be crucified on a cross of gold" (Jones, 1964), offered a particularly clear resolution of uncertainty over the gold standard. The main contribution of this paper is to use the election as a lens through which to identify fluctuations in the commitment to the gold standard throughout the period, and investigate how those were associated with fluctuations in measures bank intermediation and in real activity.[4]

Two observations indicate that the resolution of uncertainty about the commitment of the United States government to the gold standard following the 1896 presidential election is informative about the interactions between commitment to the gold standard and the financial system. First, it was associated with a large and persistent increase in the capacity of the banking system for financial intermediation as measured by its leverage. Furthermore, the growth in bank leverage around the election was most pronounced in states where depositors were most likely to have easier access to alternative gold denominated assets. These findings are compatible with the interpretation that the Bryan loss reduced the chance of a devaluation, therefore increasing the relative return of dollar denominated assets such as bank deposits. [5]

The clean shock to credibility around the election allows us to construct an index of credibility of the gold standard. This follows the spirit of Romer and Romer (1989) in combining narrative evidence and formal time-series analysis, but with an application to identification of structural factors. In essence, the method consists of a structural factor analysis, where a structural factor corresponding to fluctuations in credibility of the gold standard is identified from the cross-state

[4]More generally the period is of particular interest because it includes systemic banking panics. This is relevant for the study of financial crises, which, given their relative rarity, can greatly benefit from historical research. Other examples of recent papers that analyze the experience of banking panics in the nineteenth century U.S. with a similar motivation are Schularick and Taylor (2012) and Bordo and Haubrich (2012).

[5]The findings are consistent with the emphasis of "third generation" models developed after the Asian crisis on the interaction between exchange rate fluctuations and the financial system. Models of currency attacks are typically categorized in three "generations" (see Jeanne (1999) for a discussion of this and other taxonomies. For canonical examples of first, second and third generation models see Flood and Garber (1983), Obstfeld (1996) and Aghion, Bacchetta, and Banerjee (2001), respectively). Our focus on the balance sheet of the banking sector ties our paper most closely to third generation models. In those models banks and/or firms have liabilities in foreign currency. In the event of a devaluation, their liabilities suddenly increase relative to their assets. Given the costs of being heavily leveraged, this then forces them to either reduce borrowing sharply or default altogether. If the monetary authority does not defend the currency, devaluations can become self-fulfilling as the inability to borrow abroad leads to a sudden stop in capital flows and an ensuing devaluation (Krugman (1999); Aghion, Bacchetta, and Banerjee (2001)). The proposed explanations range from bailout guarantees and other forms of government induced moral hazards (Burnside, Eichenbaum, and Rebelo, 2001) to particular forms of market incompleteness (Caballero and Krishnamurthy, 2001).

data around the 1896 election. Given that identification, we can then elicit the fluctuations in credibility of the currency peg throughout the period. We show that this procedure produces a valid identification of a structural factor of interest to the extent that the resolution of the uncertainty surrounding the peg between the dollar and gold was the dominant macroeconomic shock in the months around the 1896 election, and that the cross-state impact of the credibility shock is uncorrelated from the cross-state impact of other shocks. We also show how we can relax these assumptions by controlling for other periods, such as the 1907 panic, in which other macroeconomic events were dominant but fluctuations in credibility were not. We find that the salient characteristics of the structural factor estimated using this procedure is largely robust to the inclusion of such controls. Laying out this particular method for narrative identification of structural factors forms a separate contribution of the paper.

Given our estimated index, we find that, indeed, the credibility of the gold standard was much in doubt during the height of silver agitation, from the Sherman Silver Purchase Act of 1890 until the presidential election of 1896, with a large dip around the 1893 panic. The credibility of the gold standard was then greatly enhanced in the four years following the election, a period that coincided with large gold finds around the world; and that it remained high and steady after the formal adoption of the gold standard in 1900. The index exhibited no meaningful reduction around the 1907 panic, signaling the extent to which the Gold Standard was well established at that time.

Lastly, we investigate the impact of the lack of credibility in the exchange rate regime on the economic instability of the period, including the 1893 panic. To the extent that shifts in uncertainty about the gold standard shift preferences for holding gold relative to deposits, those would also influence the ability of banks to extend more loans, in turn reducing the cost of funds to firms and inviduals that wish to borrow to finance production, exhcange and consumption. In particular, a theoretical literature has associated contractions in bank leverage with output contractions (Gertler and Kiyotaki, 2010), and the fact that the contraction in employment accompanying the 1893 panic was one of the largest in United States history, the evidence of a nexus between fluctuations in the credibility of the exchange rate peg and the health of the banking system suggests large real costs

to the economy from exchange rate uncertainty. To evaluate that hypothesis more formally, we perform a structural VAR analysis of the interaction between the index and measures of economic activity. Using different indentification approaches, we find that under most scenarios exchange rate credibility would have been associated with an economically significant reduction in variation in business failures in the 1880's and 90's. Importantly, we find that exchange rate uncertainty appears to account for between 30% and 70% of the increase in business failures around the 1893 panic. On the other hand, exchange rate instability played no role after the formal adoption of the Gold Standard in 1900, even though it includes a significant episode of financial turbulence in the 1907 panic.

The National Banking Era is appealing as a laboratory to investigate the relationship between exchange rate credibility and the banking system because, unlike modern economies, there was at the time a large number of banks in the United States which could not branch. This provides us with a panel of states in a currency union all sharing similar regulatory environment with each state populated by a large number of independent financial institutions. Importantly, banks in all States were affected by the same fluctuations in the probability of a currency devaluation, allowing us to examine how the effects of possible devaluation differed with the access that individuals in different states had to gold denominated investment alternatives. Accordingly,the period has also received a great deal of study both for understanding the benefits and costs of imperfect currency pegs (Grilli, 1990; Calomiris, 1992; Hallwood, MacDonald, and Marsh, 2000) and the causes and consequences of banking panics (Noyes, 1909; Sprague, 1910; Wicker, 2000).

More broadly, our paper contributes to a large empirical literature quantifying the importance of currency mismatches in propagating movements in the exchange rate in modern economies (Calvo and Reinhart, 2002). While much of the theoretical literature and historical narratives emphasize currency mismatch among financial firms.[6] the high concentration of the financial sector has forced much of that literature to focus either on cross-country data (Calvo, Izquierdo, and Mejía, 2004,

[6]Diaz-Alejandro (1985) provides an early discussion of the role of currency mismatch at the bank level in the Chilean 1981 crisis, and more recently Choi and Cook (2004) introduce a model in which currency mismatch operates by constraining bank's lending ability.

2008), or on data from nonfinancial corporations (see Galindo, Panizza, and Schiantarelli (2003) for a review, and also Cowan et al. (2005), Pratap, Lobato, and Somuano (2003), and Gilchrist and Sim (2007)). In contrast, our study focuses exclusively on bank data, from within a single country.

The paper proceeds as follows: Section 2 motivates using the 1896 election as a Natural Experiment. Section 3 describes the bank balance sheet data used for the identification of the credibility index and its behavior around the 1896 election. Section 4 provides the conditions for the identification of the credibility index, describes how it correlates with other macroeconomic variables and provides estimates of the role of uncertainty about the currency peg in bringing about economic fluctuations in the period.

2 The 1896 Election as a Natural Experiment

In this section we aim to establish that the 1896 election provided a clear and sharp break in the likelihood of dollar devaluation relative to gold, and therefore can be used as a natural experiment to understand the effect of exchange rate uncertainty on bank balance sheets. We start by providing the historical and institutional context so as to clarify what was at stake in the 1896 election. We then argue that people at the time had good reasons to believe that Bryan's platform would lead to a devaluation of the dollar relative to gold. Next, we provide evidence that the election results had a clear impact on the expectations about exchange rates at the time. Finally we argue that other macro-economic events between the the two dates around the election for which bank balance sheet information is available would be either relatively minor or directly related to the uncertainty about the exchange rate related to the election.

2.1 Historical and Institutional Context

The United States was technically on a bi-metallic standard until 1900. However, since the Coinage Act of 1873 – later dubbed the "Crime of 73" by silver proponents— had not made any provision for minting silver, de facto only gold was in widespread circulation (Friedman and Schwartz, 1963,

pp. 114-15). A new political movement, "free silver," emerged to try to bring silver back into circulation. Whether the federal government would buy silver and at what price were crucial questions that came up again and again.

Silver proponents were most successful with the Sherman Silver Purchase Act of 1890, which committed the Treasury to buying much more silver than it had before (Friedman and Schwartz, 1963, pp. 132-133). The resulting purchase of silver put a large strain on Treasury gold. In 1893 there was a widespread banking panic associated with capital flights away from the United States.[7] As the 1893 crisis deepened Treasury gold reserves were depleted, so that many took the suspension of gold payments became imminent (Noyes, 1909). The Sherman Silver Purchase Act was repealed in late 1893, and while this was not enough to bring about renewed business activity, it did enable the United States to secure temporary assistance from Europe.

The 1893 crisis did not resolve the question of silver money. The silver producers in the West were joined by a loose coalition of mainly agrarian interests from the Northwest and South in calling for silver. Moreover, the repeal of the Sherman Silver Purchase Act in response to the panic seemed just further evidence to the Populists of what they regarded as a betrayal of agrarian debtors to mortgage holders in the East (Friedman and Schwartz, 1963, p. 116). These factors all came together in the presidential election of 1896.

The selection of William Jennings Bryan as the Democratic and Populist party candidate for the presidential election of 1896 marked the height of the divisions over the silver issue. Bryan's famous "Cross of Gold" speech at the Democratic National Convention that earned him the nomination set the tone for an election with the gold standard at its heart.[8]

While Bryan would run again in 1900, after 1896 the support for silver was substantially weaker. Of considerable help in strengthening the credibility of the gold standard was the increase

[7] Friedman and Schwartz (1963, pp. 133) suggest that from 1890 to 1893 the purchase of silver by the Treasury was so large that it would have driven the United States off gold and Sprague (1910, p. 179) argues that the Silver Purchase Act was one of the reasons for the crisis in 1893 and its repeal was helpful in restoring confidence.

[8] The most famous line in the speech reads: "Having behind us the commercial interests and the laboring interests and all the toiling masses, we shall answer their demands for a gold standard by saying to them, you shall not press down upon the brow of labor this crown of thorns. You shall not crucify mankind upon a cross of gold" (Jones, 1964, pp. 228-229).

in the world supply of gold from discoveries in South Africa, Alaska, and Colorado. The greater supply of gold led to an increase in the monetary supply in the United States starting in 1897 and also substantially reduced the economic reasons for silver agitation (Friedman and Schwartz, 1963, p. 137). The relationship of the dollar to gold was not formally settled until the passage of the Gold Standard Act in March of 1900 set the United States officially on a pure gold standard. The subsequent re-election of McKinley that November by a wide margin was viewed as an endorsement of the gold standard (Hepburn, 1903, p. 405), although silver featured much less prominently than in the campaign of 1896.

2.2 Bimettalism in 1896 as de Facto Devaluation

While it is clear from his speech that Bryan stood firmly against the gold standard, he did not propose an outright abandonment of the parity between dollar and gold as part of his platform. Instead, he proposed the adoption of a bimetallic standard, in which the U.S. would guarantee parity between the dollar and simultaneously both gold and silver. Concretely, in his proposal the relative parities would be set so that an ounce of gold and an ounce of silver would trade at a rate of 16 to 1. This would represent a significant relative gain for silver when compared to the 30-32 to 1 rate prevalent at the time. In particular, Bryan was committed to buying substantial quantities of silver to raise the price, and called for the "free and unlimited coinage" of silver (Bryan, 1909, p. 274). The claim was that the government would by the "law of supply and demand" raise the price of silver bullion enough to fix the ratio between them since they are both in "limited" supply (p. 275).

Weber and Velde (2000) argue that a bimetallic system along the parameters defended by Bryan would be workable if adopted worldwide. However, Meissner (2015) casts doubt on whether the U.S. would be able to unilaterally adopt such a system. Meissner's view is in line with the experience from the Sherman Silver Purchase Act, when a commitment by the government to buy silver in fixed quantities led to the depletion of gold reserves ultimatly forcing the repeal of the act before it led to a devaluation of the dollar relative to gold. Furthermore, in the eyes of many

private agents at the time it seemed likely that any change in the currency standard would involve switching the payments of some government debts, including Treasury bonds, to silver and that this would make such assets less desireable. This view was most evident in April 1893 when the suggestion by Treasury Secretary Carlisle that, due to diminishing gold reserves, it might be necessary to redeem Treasury notes in silver rather than gold prompted an immediate sell-off in the stock market (Wicker, 2000, p. 58). The market settled somewhat only after President Cleveland issued an emergency statement that notes would be paid in gold. There were also widespread perception that the silver question could have had important real implications.

2.3 The Election as a Shock to Perceived Probability of Devaluation

The electoral loss of Bryan and the populists resulted in a marked shift in expectations about the commitment of the U.S. government to the Gold Standard. Who would win in 1896 was in doubt all the way to the end. The election was close, and a few hundred votes in close states might have swung the election the other way (Jones, 1964, p. 341). Moreover the lack of systematic polling would have left any contemporary observer uncertain about the results. The possibility of a Bryan win had bankers and financial interests very concerned and buying gold (Jones, 1964, pp. 339-40) and in the fall of 1896 a small banking panic ensued. Figure 2 illustrates that at least some at the time attributed substantial real economic costs to just the possibility of free silver.[9] Additionally, press coverage from the time provides further evidence that, for many contemporaries, it was clear that gold was the central question of the election and there was substantial uncertainty and worry over the outcome. In the days after the election, for example, *The New York Tribune* interviewed a number of business and political interests with a similar conclusion: "The one thing of prime importance that I see in this election is that it settles with definiteness and for good and all the

[9]The text reads: "FREE SILVER SCARE. Prevents SALE of New York City and Brooklyn City BONDS. 65 other MUNICIPALITIES had the same experience. BANKS and BUSINESS HOUSES CLOSING. RAILROADS and BUSINESS HOUSES CLOSING. RAILROADS have ABANDONED PROJECTED IMPROVEMENTS. FACTORIES and MANUFACTURERS all over the country CLOSE their DOORS. COKE OVENS, SILK MILLS, and ROLLING MILLS CLOSE DOWN. Thousands thrown out of employment. Workman–'If the cry of free silver will cause that, what would not free silver itself do?'

money question" according to Brayton Ives who had been a member of the electoral college in 1892.[10]The uncertainty about the election was expressed not only in interviews, but also in costly preparations against a Bryan win. For example, in New York, production orders were placed contingent on a McKinley win, sparking an apparent boom in business after the election. Also, just before the election there were also minor runs on the regional offices of the Treasury to obtain gold in exchange for greenbacks and treasury certificates.[11]Additionally, many individuals had been hoarding gold for weeks and after the election tried to sell it. For example, after the election results became clear, the cashier of New York Sub-Treasury said: "Yes, hoarders are trying to unload their gold on us. They want bills for what they were so anxious to posses before the elections. . . ."[12]These withdrawals from banks before the election were often made within a context in which there were clear costs. One Philadelphia bank reported that it received a substantial deposit of gold from a customer who had purchased the gold in the weeks before the election at a premium of between 0.25 and 1 percent.[13]

The loss of Bryan was met with clear relief by some. For example, "The universal feeling among the advocates of sound money that with the election of McKinley thorough confidence in the large business centers would at once be re-established and that factories long idle would be run on full time again . . . ."[14] After the election there was a clear sense of relief among financial interests across the country and reports that banks would start lending again. For example, in New York "The universal feeling among the advocates of sound money that with the election of

[10]"A Boom in Business: Contracts Conditional on McKinley's Election in Force: The Merchants of this City Unanimous in their Expression of Gratification at the Result—Many Orders for Goods places since Tuesday—Idle Factories to Start Up," *New York Tribune*, Nov. 5, 1896, p. 7; in ProQuest Historical Newspapers: New York Tribune (1841-1922).

[11]"Run on Chicago Sub-Treasury: Eighty-five Thousand Dollars in Gold Paid Out to Note-holders," *The Washington Post*, Nov. 3, 1896, p. 6. In ProQuest Historical Newspapers: The Washington Post (1877-1997). Also see: "Gold Withdrawn to Hoard: Chicago and St. Louis Sub-Treasuries Besieged with Applications," *The New York Times*, Nov. 3, 1896, p. 2. In ProQuest Historical Newspapers: The New York Times (1851-2010).

[12]"Gold Goes A-Begging: Yellow Metal Was a Drag on the Market," *The New York Times*, Nov. 5, 1896, p. 5. In ProQuest Historical Newspapers: The New York Times (1851-2010).

[13]"Gold Set Free in Philadelphia," *The New York Times*, Nov. 10, 1896, p. 13. In ProQuest Historical Newspapers: The New York Times (1851-2010). The relation to the election is clear: "Philadelphia, Nov. 9–Heavy deposits of gold have been made in this city the last few days .... Most of the gold recently deposited was withdrawn and hoarded to await the outcome of the election."

[14]"A Boom in Business" *New York Tribune*, Nov. 5, 1896, p. 7. In ProQuest Historical Newspapers: New York Tribune (1841-1922).

McKinley thorough confidence in the large business centers would at once be re-established and that factories long idle would be run on full time again . . . ."[15] A similar sentiment was apparent in both Chicago and San Francisco, where at least a part of the reason came because banks seemed increasingly willing to lend: "To-day banks are willing to lend, merchants are seeking to borrow, and customers are placing their orders where a week ago there was no lending nor borrowing and little buying."[16]

2.4 The election was the Major Macroconomic Event in the Relevant Time Window

The banking data that we use is available at five different call dates every year. For our purposes, it is important to establish that no other independent macroeconomic shocks were as important during the period from the last call date before the election (October 6) to the first call date after (December 17).

A first concern is whether results might be contaminated by financial disturbances occurring in October 1896. Compared to other disturbances in the period, the October 1896 one appears to have been relatively minor. Calomiris and Gorton (1991, p. 114) leave it as a question whether that disturbance actually a panic and Wicker (2000, p. xii) dismisses it, noting that it was not a

[15]"A Boom in Business" *New York Tribune*, Nov. 5, 1896, p. 7. In ProQuest Historical Newspapers: New York Tribune (1841-1922).

[16]"Prosperity's Return to California," *The San Francisco Chronicle*, Nov. 10, 1896, p. 9; in ProQuest Historical Newspapers: San Francisco Chronicle (1865-1922). The Chronicle interviewed Henry Wadsworth, cashier of Wells, Fargo, & Co's Bank: "Banks can do something now. Of course every bank has tried to accommodate its regular customers right along, but has sought to make the amount of accommodation as small as possible and yet consistent with sound business requirements. Applications from other than regular customers, no matter what the security offered, had to be declined. Conditions are rapidly changing now. They are becoming normal. We can transact business on the sound judgement as to each transaction without being forced to measure everything solely by the general forecast of the future." In Chicago "Banks will be among the first of the business institutions to feel the effect of the sweeping victory for McKinley, sound money, and posterity. . . . There were numerous deposits of gold—a thing no bank had encountered in the last three months . . . . Another effect of the election was seen in the easing of interest rates." E.S. Lacy, who had been Comptroller of the Currency and was then President of the Bankers National Bank, held that "The triumph of the sound money party will restore confidence, re-establish credit, and release the large reserves held by the banks and the immense sums of gold hoarded, waiting the result of the election. An abundance of capital will now be forthcoming and all legitimate demands of business fully supplied at normal rates." In "Hoarded Gold Is Coming Out: First Deposits of the Yellow Metal for Months Made at the Banks," *Chicago Daily Tribune*, Nov. 5, 1896, p. 12; in ProQuest Historical Newspapers: Chicago Tribune (1849-1990).

banking panic and was entirely confined to Chicago and Minneapolis-St. Paul. Most importantly, narratives at the time point to the election as the main reason behind the increasing stringency for banks (Noyes 1909), so that it cannot be read as an independent macroeconomic shock.

A second concern is that the election occurred close to large increases in worldwide gold production. While increases in 1897 would in fact be substantial, and in large extent due to large gold finds in Klondike, there is no clear evidence that those would have been clearly anticipated in the last months of 1896. The first major gold shipments from the Klondike and surrounding areas arrived in July 16, 1897 and that is the generally accepted date when the world outside of Alaska learned of the rich deposits there (Wharton, 1979, p. 86). While the first public mention of a new find on the "Cloldyke" appeared in October 1896 in the *San Francisco Chronicle*, it was important only in retrospect. That announcement would hardly have stood out as particularly important at the time. It had been well known that there was gold in Alaska for a number of years, with the first rich strike in 1880 (Wharton, 1979, p. 3). In the summer of 1895 a number of reports of rich gold finds seem even more promising than the "Cloldyke" find.[17]

The small relative importance of whatever news about gold production seeped in during the last months of 1896 is apparent in the relative price of silver and gold (Figure 3). While the relative prices did increase between October and December 1896, this growth was well within the bounds of normal fluctuations, and are small relative to the increase observed over the course of 1897.

There are two additional shocks which are harder to rule out. One is a commodity price shock. As pointed out by Noyes (1909), news of crop failures in India arrived in October of 1896 led to an increase in the price of wheat per bushel in Chicago from 53 cents in August to 70 cents in September and just above 94 in election week. Noyes (1909) credits this agricultural shock with handing victory to McKinley. A second shock is to expected tariffs, since trade policy was an additional important factor distinguishing the two parties, even if it did not play a prominent role in the election campaign. In the construction of the credibility index in Section 4 we control for

[17]For example, "Alaska Gold Mines Pay: A Recent Strike of Marvelous Richness Made at Cook's Inlet," From the *San Francisco Chronicle* in *The New York Times*, Nov. 16, 1895, p. 7; in ProQuest Historical Newspapers, The New York Times (1891-2010). Prospectors were telling stories about finds in the Klondike in the fall of 1896 but "no one listened" (Wharton, 1979, p. 86).

these shocks by comparing the results to other periods in which similar shocks occurred but in which the credibility of the gold standard was not at stake.

3 Bank Balance Sheets Around the 1896 Election

In what follows we describe some key facts about the behavior of the balance sheets of National Banks around the 1896 election. We show that the election led to an increase in aggregate leverage of National Banks, with the increase most pronounced in states where, by some measures, we would expect there to be greater circulation of gold. These findings imply that the differential pattern of leverage growth across states is likely to be very informative about fluctuations in the credibility of the gold standard.

National Banks were created by the National Banking Act of 1863 as a means to attain uniform currency across the national territory. They differed from State Banks in that they received their charter from the Federal Government, and were subject to uniform regulatory constraints. [18]

Our main data consists of the balance sheets of National Banks between 1880 and 1910 as reported in five call dates distributed over the year, consolidated at the state level. The National Banking Act required National Banks to report several balance sheet items to the Office of the Comptroller of the Currency (O.C.C.) at five annual call dates, and the O.C.C. would in turn publish the data in annual reports to Congress. Weber (2000) provides these data in electronic form. We have independently checked the call reports during much of the period, and the Weber (2000) data matches the call reports. To our knowledge, our work is the first to explore both the cross-sectional and the time series dimensions of this data.

We construct our main variables of interest from the individual balance sheet items for individual states. We focus particularly on the behavior of leverage as measured either by the ratio of debt-to-equity or the ratio of debt-to-assets. Leverage provides a useful way of normalizing changes in bank activity across different states with very different sized banking sectors and/or

[18] See also Champ (2007b) for a discussion of aggregate bank balance sheet data constructed using the OCC aggregate balance sheets and Champ (2007a) for a detailed discussion of the legal and institutional background of the era.

which are growing at different secular trends. The present emphasis on leverage is in contrast to much of the previous work on the period, which has emphasized bank suspensions as an indicator of bank distress (Wicker, 2000; Carlson, 2005).[19]

Figure 1 shows that immediately following the 1896 election the overall leverage of national banks increased substantially, and continued to increase over the next three years. The overall change from about 2.5 before the election to 4 is a large increase in a period when banks held substantially more equity than banks today whose leverage often exceed 20. Figure 1 also shows the ratio of gold to assets held by banks. It is clear that the increased leverage after the election is not coming from banks passively letting their balance sheet increase as they absorb gold inflows from abroad.

Gold had different importance in the economies of different states, however, and this implied a differential impact of the election on their economies[20]The change in leverage around the election was particularly pronounced in states where gold was widely available. While we do not have any measure of direct holding of gold denominated assets by all individuals, we do have some measures of gold held by banks. The scatterplots in Figure 4 show changes in the bank deposits-to-assets ratio around the election in 1896. States whose banks held more specie as a share of assets before 1890 had substantially larger increases in deposits. We focus on the average holding of specie before 1890 to avoid direct endogeneity with the choices in 1896. Due to their special status as central reserve cities where other national banks kept their reserve, we also show New York City, Chicago, and St Louis separately.

This correlation between changes in leverage and gold is not a general trend that holds in

[19]The use of leverage data as is also in line with recent work by Gertler and Karadi (2011) and Gertler and Kiyotaki (2010) as well as with the model presented in Section **??** above. One further advantage of bank leverage as an indicator of bank distress is that good and bad news have symmetric effects. In contrast, suspensions are only observed in extreme negative states. Therefore, using leverage allows us to investigate the impact of positive as well as negative shocks to the credibility of the gold standard, including periods in which there were few if any bank suspensions in the data.

[20]The data does not discriminate between gold and other metals, combining all of them in a single "specie" category. However, gold coin and gold certificates (assets payable in gold on demand) accounted for the largest fraction in the value of specie held. For example, in 1891, out of $183 million held by banks in specie, $151 million or about five-sixths were held in gold or gold certificates issued either by the Treasury or by clearinghouses, and the remainder was held in silver coin and Treasury silver certificates.

general, but is particularly important around the election. Figure Bshows how the change in the debt-to-assets ration in each state between call dates is related to bank holdings of specie. The same relationship does not hold in general, nor is it an end of the year effect, as the other panels in figure B demonstrate.

Even when taken using lagged values, the specie-to-assets ratio suffers from an obvious endogeneity problem as a measure of the availability of gold in different states, since it stems at least in part from a choice made by banks. [21]As an alternative, we combine measures of gold production, gold imports, and customs duties. Each of these components represents a flow associated to an economic agent acquiring additional gold or making a payment in gold locally but it does not exhaust the uses for gold.[22] Customs are the least obvious component. They add to the circulation of gold in the state since the federal government required that they be paid in gold or gold certificates. Four states had no recorded production, customs, or imports. These states had lower specie holdings in general in 1890.[23] The second panel in figure 4 shows that the change in the debt-to-assets ratio around the the 1896 election is also positively associated with this measure of the local availability of gold.

The facts presented above show that the election had a distinctive impact on bank balance sheets, increasing bank leverage overall and most pronouncedly in states where gold was more widely available. Given that the election resolved an important source of uncertainty about the parity between the U.S. Dollar and gold, one one may wonder what kind of economic mechanism would lead such a reduction in uncertainty to generate the observed effects. In Appendix A we lay out in detail a stylized model economy in which there is such a causal link. The key assumption is

[21]In the case of the City of New York and other central reserve cities, regulations required banks to hold all of their reserves in either gold or silver coins or certificates, or legal-tender notes of the United States (Dunbar and Sprague, 1917, p. 235).

[22]We use the following sources: For gold imports in each state we use the average gold imports over 1886-90 for each city recorded in the Statistical Abstract of the United States 1895 pp. 72-82. We aggregate these together by state and New York City and use the five-year average since imports are quite volatile. For gold production we use the average production in 1889 and 1890 by state from the Statistical Abstract of the United States 1895, p. 39. For customs receipts we use the aggregate receipts from each custom district from the Annual Report of the Secretary of the Treasury in 1890 pp. 785-88.

[23]The four states are Arkansas, Kansas, West Virginia, and Wyoming. They have an average specie/assets ratio on the 17 May 1890 call date of 4.15%, well below the average of 4.87%.

that households face transaction costs for making bank deposits or acquiring alternative assets, and that those costs are heterogeneous across households with, in some states, households having easier access to gold denominated assets than in others. The heterogeneous transaction costs ensure that aggregate portfolios change smoothly with return differentials, even if households are risk neutral. If banks hold primarily government bonds, the interest that they pay on deposits is tied to the return on Treasury Bonds. IIt follows that banks attract more deposits as returns on treasuries increase relative to alternative gold denominated assets. The elasticity of deposits to changes in the return differential is higher in states where alternative gold denominated assets are more accessible.

The model also shows how changes in expected exchange rate are associated with changes in that return differential. If the dollar value of government debt is fixed, an increase in expected the expected value of the dollar relative to gold is equivalent to an increase in the real supply of government bonds. Given market segmentation, such an increase in the real supply of government bonds leads to an increase in the return of government bonds relative to gold denominated assets. Therefore, in equilibrium, return differentials become more favorable to banks as the probability of a devaluation decreases. Thus, the model can generate an increase in bank leverage in response to a reduction in the probability of devaluation, with that change increasing with the availability of alternative gold denominated assets

4 Commitment to the Gold Standard and Economic Fluctuations

The 1896 election was associated with a distinctive pattern of cross-state changes in bank leverage which is plausibly associated to a change in the probability of devaluation on bank balance-sheets. We now ask (i) whether the observation of a similar pattern in other time-periods would be similarly indicative of changes in devaluation probabilities and (ii) to the extent that this is true, what does it tell us about the role of fluctuations in the credibility of the gold standard on key measures of economic activity during that period.

In order to answer question (i), we use structural factor analysis to construct an index of commitment to the Gold Standard. We argue that the index provides a plausible measure of devaluation

probabilities for three reasons: First, its larger movements conform to the political narratives of the period. Second, the index correlates well with other variables which are plausibly connected to the probability of devaluation, such as the amount of gold held by the Treasury and interest rate spreads for the dollar versus the pound sterling. The co-movement with interest spreads is especially interesting, since it is strongly positive before 1900 but not afterward. Third, the index does not appear to react to other salient shocks that occurred in periods when the commitment to the Gold Standard was less in question, such as the 1907 panic, the 1905/06 agricultural boom or the 1888 election. In order to answer question (ii) we then introduce the commitment index in a structural VAR together with indices of economic activity. In particular, we inquire on the role of commitment to the Gold Standard in driving the 1893 depression, which was the primary macroeconomic event of the time.

4.1 Narrative Identification of Factors in a Data-Rich Environment

Previous work, notably Romer and Romer (1989) and Romer and Romer (2004), has relied on historical narratives to identify macroeconomic shocks and then econometrically trace out the impact of those shocks in macroeconomic time-series. From an econometric standpoint, the success of this approach relies on using historical narratives to identify exogenous shocks at different points in time in sufficiently large number to allow for inference. Here, we show how, under certain assumptions, one can instead combine knowledge of a single shock which is well identified by the historical narrative with rich cross-sectional data, to identify a factor corresponding to that shock over the time-series. In econometric terms, the method consists of using the historical narrative to identify a time-varying structural factor.

Let X_t be a $1 \times N$ vector of "informational" variables, i.e., variables who we believe are likely to contain meaningful information about the factor we are interested in identifying. For any given entry in this vector $x_{i,t}$, we assume that

$$x_{i,t} = \sum_{r=1}^{R} \lambda_{i,r} F_{r,t} + \varepsilon_{i,t},\ i \in \{1, .., N\}, t \in \{1, ..., T\}$$

where $R < N$, $F_{r,t}$ are time-varying factors and $\lambda_{i,r}$ are factor-loadings that vary across variables but are fixed in time. Under mild conditions on the structure of the error term $\varepsilon_{i,t}$ (see, for example, Stock and Watson (2003)), one can show that for large N and T one can consistently estimate the space spanned by factors 1 through R using principal component analysis. However, without further assumptions it is impossible to uniquely estimate the values of individual factors and factor loadings.[24] Without loss of generality, let $F_{1,t}$ denote the structural factor of interest. The following two assumptions allow for identification:

Assumption 1. There is some t^* for which $F_{1,t^*} \neq 0$ and $F_{r,t^*} = 0$ for $r \neq 1$.

Assumption 2. $cov\left(\lambda_{i,1}, \lambda_{r,1}\right) = 0$ for $r \neq 1$.

Assumption 1 states that the structural factor is the only aggregate source of variation in the period identified by the narrative, and Assumption 2 states that the cross-sectional impact of other factors is orthogonal to that of the identified factor. Given Assumptions 1 and 2, the following proposition holds:

Proposition 1. *Suppose Assumptions 1 and 2 hold and that the sample estimates correspond to population values. Let* $\bar{x}_{i,t} \equiv \sum_{r=1}^{R} \lambda_{i,r} F_{r,t}$ *be the part of variable* $x_{i,t}$ *explained by the common factors and let* $\bar{x}_t$ *be the* $N \times 1$ *vector stacking all values of* $\bar{x}_{i,t}$ *for a given time* t*. Then* $F_{1,t} = \frac{cov\left(\bar{x}_{i,t}, \bar{x}_{i,t^*}\right)}{var\left(x_{i,t^*}\right)} F_{1,t^*}$.

Since a principal components analysis of the covariance matrix for $x_{i,t}$ provides us with a consistent estimate of the space spanned by the factors, it follows that $\bar{x}_{i,t}$ can be consistently estimated and, given Assumptions 1 and 2, so can $F_{1,t}$. The procedure consists at each time t of regressing $\bar{x}_{i,t}$ on $\bar{x}_{i,t^*}$.

We can relax the assumptions needed for identification of $F_{1,t}$ if there are dates for which we know that other shocks played an important role but $F_{1,t}$ was unlikely to be important. For example,

[24] In matrix form, the model can be written as $X_t = \Lambda F_t + \varepsilon_t$, with $F_t = \{F_{1,t}, F_{2,t}, ..., F_{R,t}\}$ and Λ a $N \times R$ matrix with entries $\lambda_{i,r}$. It follows that for any invertible $R \times R$ matrix H the model can be alternatively rewritten as $X_t = \tilde{\Lambda}\tilde{F}_t$ with $\tilde{\Lambda} \equiv \Lambda H$ and $\tilde{F}_t \equiv H^{-1} F_t$.

the 1907 panic was most likely not associated with a large perceived change in the commitment of the U.S. government to the Gold Standard. Formally, suppose the following assumptions hold:

Assumption 1')$F_{r,t_k} = 0$ for $r > K$

Assumption 2') $cov\left(\lambda_{i,r}, \lambda_{i,r'}\right) = 0$ if $r \leq K$ and $r' > K$

Assumption 3) $F_{1,t_1} > 0$ and $F_{1,t_k} = 0$ for $k > 1$

Assumption 4) The $K \times K$ matrix with element F_{r,t_k} in row r, column k is invertible.

Assumptions 1' and 2' are generalizations of assumptions 1 and 2. They state that we can find a set of K dates in which only the first K structural factors matter, and that the other factors don't correlate with the ones in those dats. Assumption 3 states that F_{1,t_1}, our factor of interest, is only relevant in one of the K dates (denoted t_1 without loss of generality). This assumption will hold, for example, if all the dates other than the 1896 election are ones where the Gold Standard was clearly not in question. Assumption 4 is a technical assumption requiring that the dates selected as control include independent information about the reaction of the factors to shocks.

Given those assumptions, the following proposition holds:

Proposition 2. *Suppose Assumptions 1', 2', 3 and 4 hold and that the sample estimates correspond to population values. Let $\bar{x}_{i,t} \equiv \sum_{r=1}^{R} \lambda_{i,r} F_{r,t}$ be the part of variable $x_{i,t}$ explained by the common factors and let $\bar{x}_t$ be the $N \times 1$ vector stacking all values of $\bar{x}_{i,t}$ for a given time t and $\bar{X}^* = \left[\bar{x}_{t_1}, ..., \bar{x}_{t_k}\right]$. Let $\{\alpha_{1,t}, \alpha_{2,t}, ..., \alpha_{K,t}\}$ denote the OLS regression coefficients of $\bar{x}_{t_1}$ on $\bar{X}^*$. Then $\alpha_{1,t} = \frac{F_{1,t}}{F_{1,t_1}}$.*

In what follows, we will construct a credibility index based on a single date t^*, thus relying Assumptions 1 and 2. We will then use Proposition 2 to evaluate whether results change in an important way if we control for other shocks that we can identify from the historical narrative.

4.2 The Credibility Index: Historical Behavior and Interpretation

We construct the credibility index by identifying a structural factor using the procedure delineated in Proposition 1, which holds under assumptions **1** and **2**. We take 1896/12 as the reference date

t^* which amounts to assuming that the only nation-wide shock of importance around the election was a change in commitment to Gold.

To construct the index, we estimate a factor model using log changes in bank debt/assets ratio in 48 states for which continuous time-series are available as our informational variables. Since we extract information from changes in balance sheets, we take the factor to correspond to changes in credibility. The credibility index is therefore the cumulative sum of the estimated structural factor over time. To choose the number of principal components in the estimate, we calculate the ICP_1 and ICP_2 indices from Bai and Ng (2002). The number of factors that minimize the two indices are, respectively, 11 and 4. We thus take a conservative stance and calculate the index based on 11 factors for our baseline calculations.[25]

Figure 6 depicts the time path of our baseline credibility index together with a 90% confidence interval constructed through bootstrapping. Each panel of figure 6 compares the index to a different measure from the period. The first note-worthy feature of the time-series for the credibility index shown in Figure 6 is that it is relatively volatile up to around 1900, after which the credibility index becomes much more stable. The standard deviation of changes in the index are only 28% as large after February 1900 than before. Given the passage of the Gold Standard Act of 1900, approved in March of that year, this large reduction in volatility provides a strong indication that changes in expected devaluations played a key role in driving the index before 1900. Furthermore, before 1900, the index exhibits strong movements around two episodes that the historical narrative identifies as critical for the credibility of the Gold Standard. The first is the passage of the Sherman Silver-Purchase act in 1890, which was widely regarded as damaging to the credibility of the standard and which is associated with a strong reduction in the index. The second is the time period following the election in December 1896. While the change in the index was positive by construction right around the election, it is noteworthy remained on a strongly increasing path. This continuing increase is associated with other important events at the time that consolidated

[25]The number of factors implied by the Bai and Ng criterion is sensitive to whether or not we normalize the individual time-series by their variance, as is common practice in principal component analysis. We decided against normalization since all the time-series refer to the behavior of the same variable in different geographic locations, and are in a common unit.

the adherence of the U.S. to the gold standard, notably the verification that there were large gold reserves to be exploited in Alaska. Finally, the credibility index dips around the 1884 and 1893 banking panics suggesting that those panics were associated with a strong decrease in the credibility of the Gold Standard. There is no comparatively large dip around the 1907 panic, by which time the commitment of the U.S. to the Gold Standard was not in question.

The adherence of the broad movements of the series to the historical narrative of the time provides some assurance that it captures an important dimension of the variations in the commitment to the gold standard around the period. As a further measure to inquire the importance of exchange rate fluctuations in driving the index, we compare its behavior with "gold premium" over the next 60 days as calculated by Calomiris (1992) which we extend using the original source (National Monetary Commission, 1910).[26] The gold premium is the forgone interest from holding dollar denominated commercial paper over the next 60 days in New York compared to a pound-sterling denominated bond, and so, assuming uncovered interest parity holds between those two markets, gives the expected appreciation within 60 days. Figure 6 compares the negative of the gold premium with our credibility index. Like our credibility index, it drops abruptly around the 1893 panic and right before the 1896 election, after which it switches to a higher and more stable path. The correlation between the two series is 48 percent.[27]

The middle panel of Figure 6 shows a comparison of the index with the amount of gold held by the Treasury. One might expect the amount of gold held by the Treasury might be correlated with

[26]The National Monetary Commission (1910) reports the prices of 60-day and sight bills of exchange bought in New York and presentable in London. Calomiris (1992) suggests that it would take about 10 days to travel from New York to London, and so the "sight" rate is really a 10 day rate. The difference between the two rates gives an interest rate for funds in a gold pegged currency (assuming there were no reasons to believe that Britain would abandon exchangeability) over a 50 days starting in 10 days. This rate is then converted to a 60 day rate by multiplying by 6/5. The gold premium is the difference between this "gold" rate and the rate for 60 day top rated commercial paper in New York. Under the assumption that participants in the two markets can move funds freely between them, uncovered interest parity holds and the gold premium measures the expected devaluation of the dollar within 60 days. The gold premium is not itself a clean measure of expected devaluation, however, as transaction costs preventing arbitrage between gold and dollars were substantial, so that gold premia would not necessarily vary smoothly with changes in devaluation expectations (see Coleman (2012) for recent a detailed discussion of the failures of uncovered interest parity at the time).

[27]In the model described in the end of Section 3, markets are segmented, so that uncovered interest parity need not hold. In Appendix A we discuss in detail how the relationship between our estimated credibility index and the interest rate differential can be understood in light of the model.

commitment to the gold standard for two reasons. First, as emphasized by Grilli (1990), higher gold reserves give the Treasury more "fire power" to defend the gold standard in the event of a speculative attack. Second, an increase in the probability of an exit from the gold standard would be an incentive for agents to redeem gold from the Treasury in exchange for dollars, depleting gold reserves. As Figure 6 shows, the correlation between the two measures is very high, with both series peaking together in the beginning of 1889, bottoming around the 1893 panic, and rising again after the 1896 election. The correlation between the two series is 66 percent. Furthermore, the correlation is not restricted to low-frequency fluctuations. If converted to year-on-year changes the correlation is a smaller but still high 56 percent.

Assumptions **1** and **2** only hold if changes in the credibility of the gold standard are the only Lastly, we relax Assumptions **1** and **2** by recalculating the index using the procedure laid out in Proposition 2, taking the cross-sectional pattern of behavior of changes in banking leverage in periods when other shocks were likely to have been particularly important as controls. In particular, Assumption **1** assumes that the change in perceived commitment of the U.S. government to the Gold Standard was the only important aggregate shock in December 1896. One could worry about two additional possibilities: The first is that other, relatively less prominent policies that depended on the election outcome, such as tariffs, might have affected bank balance sheets. To control for that possibility, we re-estimate the credibility index taking the 1888 and 1900 elections as controls. These elections took place in periods in which the commitment to the gold standard was relatively less at stake. The 1900 election was a rematch of the 1896 election, with now incumbent president McKinley running against William J. Bryan. The 1888 election provides an interesting point of comparison because, like the 1896 election, it was fairly close. A second possibility that would invalidate the method is that the behavior of the informational variables are simply depicting a typical rebound from a banking panic, since October 1896 was marked by a spike in bank failures. To control for that possibility, we add a control for the December 1907, capturing the period in which the 1907 panic was at its worst. Third, we also experiment with controls for agricultural shocks by taking changes around the fall call-date for 1905, a year in which the price of wheat

reached a peakas a control. As a robustness check, we also control for a five call-date window around the 1907 panic and the 1905 agricultural shock, to take account of the fact that those events unfolded over the course of several months.

Table 1 depicts the results of the robustness exercise. The first three rows show, respectively, statistics referring to the baseline index, and for indices calculated using 5 and 20 factors instead of 11. The six subsequent rows correspond to results obtained using different sets of control. The first column shows the correlation between the credibility index calculated under different assumptions and our baseline (90% confidence intervals based on a bootstrap are presented below each statistic, in parenthesis). The correlation is uniformly high, above 95% in most cases, and reaching its lowest value at 88% when we control for a five call-dates window around the 1905 commodity shock. The second column shows the ratio between the volatility of changes in the credibility index after and before 1900. In all cases, the ratio is close to 25%, implying that the credibility index varied four times as much before the formal adoption of the Gold Standard than before. Columns 3 through 5 show the change in the index following the three main historical events that we highlighted above: the year after the passing of the Sherman Silver Purchase Act in 1890, the year after the 1896 election and the trough of the 1893 crisis. The ability of the index to capture these key episodes is robust to changing the number of factors or to the addition controls. Together, these robustness exercises lend some credence that Assumptions **1** and **2** provide a close enough basis for the construction of a meaningful index of credibility of the government's commitment to the Gold Standard.

4.3 The Economic Impact of Imperfect Commitment

The last panel of figure 6 shows the time series for the credibility index, overlaid with the time series for log leverage of national banks, aggregated across all states. The two are highly correlated. There is no noticeable reduction in leverage following the Sherman Silver Purchase Act, but otherwise the two series share similar peaks and troughs. This correlation suggests that even if changes in commitment to gold did not explain all fluctuations in leverage over the period, they

played a key role in the increase in bank leverage after 1896 and the reduction in volatility after 1900.[28]

How important was the lack of commitment to the gold standard for real economic activity? The close relationship with leverage suggests a potentially large effect and as figure 2 illustrates, some contemporary observers did as well. To assess the impact of fluctuations in commitment on economic activity we estimate the effect of changing commitment on four measures of real activity, for which high-frequency (monthly or quarterly) data is available: (i) the number of business failures tabulated by Dun and Bradstreet's, (ii) pig iron production as tabulated by Macaulay (1938) from weekly capacity of furnaces in blast, (iii) industrial production as calculated by Miron and Romer (1990) and (iv) Factory Employment as calculated by Jerome (1926). All of these time-series are available in the NBER Macro History Database. Of these, the number of business failures is only one which is a direct depiction of a single uninterrupted data-series stemming directly from a primary source. For that reason, we take that as our baseline.

For each measure, we first estimate a two variable vector autoregression (VAR) including log-changes in the measures of economic activity and changes in the relative return index. We include five lags covering one year of data. To identify the effects of shocks to credibility we take two extreme identification approaches. In one case, we assume that exogenous shocks to the commitment to the gold standard have no immediate impact on the measures of economic activity but that the converse is true. This is a plausible assumption if we take the relevant economic variables to be relatively slow moving, and we take it as our baseline. In the other case, we assume that shocks to the different measures of economic activity do not have any immediate impact on credibility. This assumption amounts to viewing fluctuations in the government's commitment to the gold standard as largely exogenous to economic events over the short run.

Given the identification of shocks, we then construct counter-factual time-series for the measure of economic activity under perfect commitment to the gold standard. We obtain the counter-factual by calculating an alternative sequence of structural shocks to the credibility index that

[28]Importantly, this close relationship is not just by construction. Rather, the credibility index is identified by how the cross-section across states varies around the election of 1896, not by the aggregate time series.

ensure that it remains constant throughout the period, while keeping other structural shocks at their historic path. This counter-factual exercise is vulnerable to the Lucas critique, since greater commitment to the gold standard could change the propagation of shocks. Thus, as an additional measure of robustness we also calculate the counter-factual using VAR coefficients estimated using the post 1900 sub-sample.

Table 2 shows summary statistics for the results. For each measure of economic activity, we present results with the two alternative identification schemes. We label "fast" the identification scheme in which the credibility index reacts immediately to shocks affecting economic activity and "slow" where it does not. The first two columns show the volatility of changes in the counter-factual measure of economic activity relative to the actual historical experience before and after the formal adoption of the Gold Standard in 1900. Before 1900 the volatility of changes in business failures would be 19% lower for the "fast" identification scheme (10% in the "slow" one. Numbers for the volatility of change in pig-iron production, factory employment and industrial production are progressively smaller, at 14% (9%), 17% (13%), and 3% (3%), respectively. In all cases but that of industrial production, the results imply that full commitment to the gold standard would yield a statistically significant reduction in the volatility of economic activity. The post 1900 period acts as a placebo test since there was, by all accounts, full commitment to the gold standard after 1900 and eliminating shocks to credibility should not have any effect during this period. Accordingly in all cases the effect of eliminating shocks to credibility after 1900 is not statistically significant.

The last two columns of Table 2 present the implication of the counter-factual calculations for the 1893 depression, which was the prominent macroeconomic event of the period. In the "fast" identification scheme, the point estimates imply that fluctuations in the commitment to the gold standard account for close to 70% of the rise in business failures between March and October 1893, 43% of the reduction in pig iron, 60% of the change in employment, and 70% of the change in industrial production. Under the slow identification scheme, the lack of commitment to the gold standard accounts for smaller, but still substantial, fractions of the drop in economic activity in that period, ranging from 23% of the change in pig iron production to 50% of the change in business

failures.

Table 3 inquires whether the results are robust to the Lucas Critique by calculating the counterfactual using parameters estimated using post 1900 data only. The trade-off as compared to the baseline estimates is that those calculations rely on a much smaller sample, and are therefore less precise. The point estimates change relatively little, confirming the results in Table 2. Given the less precise estimates for the VAR parameters, the confidence intervals broaden, so that now the ratio of variances pre 1900 is significantly different from 1 for not only some of the variables and identifications.

5 Conclusion

The modern view of exchange rate pegs is that they work best the more credible they are. When analyzing the costs of abandoning a peg, the negative impact of a devaluation on the balance sheets of financial institutions appears to be a a major source of problems. We find evidence that, in the gold standard era, the prospect of a devaluation was costly, and that the cost was exactly on the balance sheet of banks whose depositors had the greatest access to other currencies. Concern over devaluation had large impacts on volatility during the period and on the 1893 depression. The more general lesson from our findings is that, whether or not a currency peg is good policy, uncertainty and imperfect commitment to that policy can be costly, particularly for the financial sector.

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A The Banking Model

This section develops the conclusions of the model described in Section formally 3. There are two periods, $\{1, 2\}$, and two assets, gold and dollar denominated bonds $\{G, D\}$. Gold assets pay an exogenous rate of return R^G. Dollar assets are issued by the government in period 1 and exchanged for goods against a promise for repayment in period 2. We assume that the government issues an exogenously fixed dollar face value D of this asset. This reflects the slow moving nature of the stock of nominal government debt, since in the context of the time, most nominal bond issues required authorization of congress.

The prospect of abandonment of the gold standard changes the real face value of government debt. In the status quo in which the U.S. remains in the gold standard, the real face value of debt is also equal to D. In the event of an exit from the gold standard, a dollar will afford fewer goods, so that the real face value of debt is equal to qD, with $q < 1$. In period 1, the government sells its debt for $\frac{D}{R^B}$ units of gold. Thus, R^D is the dollar return on dollar assets, and the expected real return is equal to $E[q] R^D$.

In each state (indexed s) there is a representative bank that behaves competitively. The bank in state s is endowed with equity E_s and takes deposits D_s from individuals, offering them a dollar deposit rate R^B. We assume that banks can only purchase dollar assets. This is an extreme assumption that simplifies the exposition. We can relax it so long as (i) at the margin, return on bank assets vary with the return on dollar bonds, and (ii) so long as this dependence is relatively stable across states. Hence, for example, an extension of the model where banks face decreasing returns in the issuance of loans or the purchase of foreign assets but not in the purchase of domestic assets would imply identical results. Competitive behavior by banks implies that interest rates on deposits are identical to the returns on dollar assets: $R^B = R^D$.

In the model, each state is populated by a measure 1 of prospective depositors indexed $i_s \in [0, 1]$, each endowed with x_s units of a consumption good in $t = 1$, and with an investment opportunity. Individuals can invest in either dollar denominated bonds, with nominal rate of return R^D dollars for each dollar invested, or in gold denominated bonds, with real rate of return R^G

units of gold for each dollar invested. Each individual faces a transaction cost of $1-\tau^B(i_s)$ per unit invested in dollar denominated assets and $1-\tau^G(i_s)$ in gold assets. Individuals also have the option to deposit their goods with the bank, at a cost $1-\tau^D(i_s)$ per unit deposited. The transaction cost implies that, after paying the cost, a fraction $\tau^G(i_s)$ of the asset is left. Depositors only consume in period 2 so they invest their endowments fully and have risk neutral utility functions and so maximize returns.[29] For analytical convenience, we assume that in each given state s a fraction ξ_s of individuals (indexed $i_s \in [1, \xi_s)$) can only invest in gold denominated assets (so that $\tau^B(i_n) = 0$ for $i_s \in [0, \xi_s)$) and the remaining can only invest in dollar denominated assets (so that $\tau^G(i_n) = 0$ for $i_n \in [\xi_n, 1]$). We also assume that individual values for $\frac{\tau^B(i)}{\tau^D(i)}$ for agents with dollar denominated investment opportunities and $\frac{\tau^G(i)}{\tau^D(i)}$ for agents with gold denominated opportunities are independent and identically distributed draws from the continuous and differentiable cumulative distribution function $H(\cdot)$.

Agent i_s invests in dollar denominated bonds if:

$$\tau^B(i)\, E[q]\, R^B \geq \max\left\{\tau^D(i)\, E[q]\, R^D, \tau^G(i)\, R^G\right\}.$$

Analogously, she invests in gold denominated bonds if:

$$\tau^G(i)\, R^G \geq \max\left\{\tau^D(i)\, E[q]\, R^D, \tau^B(i)\, E[q]\, R^B\right\}.$$

Finally, she acquires deposits with the bank if:

$$\tau^D(i)\, E[q]\, R^D \geq \max\left\{\tau^G(i)\, R^G, \tau^B(i)\, E[q]\, R^B\right\}.$$

For given interest rates R^G, R^D and R^B the demand for deposits with banks is:

$$D_s = \xi_s H\left(\frac{E[q]\, R^D}{R^G}\right) x_s + (1-\xi_s)\, H\left(\frac{R^D}{R^B}\right) x_s,$$

[29] In reality a large fraction of government bonds were held by banks who then used them to back the issuance of bank notes. So we can alternatively intepret household holdings of government bonds as holdings of bank notes.

which, given that in any equilibrium in which deposits are large enough that banks will wish to hold some bonds $R^D = R^B$, we have that:

$$D_s = \xi_s H\left(\frac{E\left[q\right]R^B}{R^G}\right)x_s + \left(1-\xi_s\right)H\left(1\right)x_s. \tag{1}$$

To close the model, we need to pin down the interest rate differential $\frac{E[q]R^B}{R^G}$. For that purpose, we assume that R^G is pinned exogenously in the international money market. At the same time, in the first period the government issues an amount of the dollar denominated debt B whose face value is pre-determined. It exchanges for the goods held by households, which it then consumes The government pays the debt through lump-sum taxation of households in the final period. The equilibrium condition in the debt market is:

$$\frac{B}{R^B} = \sum_{s=1}^{S} B_s^I + \sum_{s=1}^{S} B_s^B,$$

where B_n^I is dollar denominated debt held directly by individuals in state n, which is equal to $\left(1-\xi_s\right)\left(1-H\left(1\right)\right)x_s$, and B_s^B is the amount held by banks in that state, given by:

$$B_s^B = E_s + D_s$$

It follows that:

$$\frac{B}{R^B} = \sum_{s=1}^{S}\left[E_s + \left(1-\xi_s\right)x_s + \xi_s H\left(\frac{E\left[q\right]R^B}{R^G}\right)x_s\right].$$

Applying the implicit function theorem, we can check that $F = \frac{E[q]R^B}{R^G}$ increases as $E\left[q\right]$ increases. As the probability of devaluation declines (which is equivalent to an increase in $E\left[q\right]$), the rate of return on dollar denominated bonds has to fall in order for the gold rate of return to remain constant. However, a fall in the rate of return on dollars implies an increase in the price of dollar denominated debt. It follows that the return differential $F = \frac{E[q]R^B}{R^G}$ has to increase in order to attract a larger number buyers.

Finally, differentiating equation 1 it follows that

$$\frac{\partial D_s}{\partial E\left[q\right]} = \xi_s H'\left(F\right) x_s \frac{\partial F}{\partial E\left[q\right]} > 0,$$

and

$$\frac{\partial D_s}{\partial E\left[q\right] \partial \xi_s} = H'\left(F\right) x_s \frac{\partial F}{\partial E\left[q\right]} > 0$$

Thus deposits held by banks increase with the expected face value of dollar denominated assets, and is more sensitive the higher the share of individuals with alternative investments denominated in gold in the state, ξ_s. Defining the debt-to-assets ratio $L_s = \frac{D_s}{D_s + E_s}$, the same comparative statics hold normalizing by bank size: $\frac{\partial Ls}{\partial E[q]} > 0$ and $\frac{\partial Ls}{\partial E[q] \partial \xi_s}$.

Note that we can alternatively write the domestic bond market equilibrium as:

$$\frac{E\left[q\right] B}{R^G} = \frac{E\left[q\right] R^B}{R^G} \sum_{s=1}^{S} \left[E_s + \left(1 - \xi_s + \xi_s H\left(F\right)\right) x_s\right],$$

so that, given endowments $\{x_s, E_s\}_{s=1}^S$ and the parameters $\{\xi_s\}_{s=1}^S$, the real supply of dollar assets in the economy $\frac{E[q]B}{R^G}$ is a sufficient statistic for the determination of relative real returns $\frac{E[q]R^B}{R^G}$. Thus, changes in R^G and B have similar impact on bank deposits as changes in $E\left[q\right]$.

Note that, given the model, the change in the probability of exchange rate devaluation affected leverage by changing the relative on bank deposits as compared to alternative assets denominated in gold. Under this intepretation, Assumptions 1 and 2 cannot be valid if other macroeconomic shocks have a sizeable impact in relative returns of bank and gold denominated assets. We can investigate this possibility further with the data on interest rate differential between dollar and gold denominated assets used in Section 4 above.

In the model, uncovered interest parity need not hold. Since fluctuations in exchange rate devaluation expectations only affect bank leverage through their impact on the relative return of gold versus dollar denominated assets, the factor identified in Section 4 captures the impact of fluctuations in that relative return. Using a logarithmic approximation:

$$\alpha F_t = -(r_{G,t} - r_{D,t}) + E_t[\Delta q]$$

where F_t is the the value of our index at any given time t, $E_t[\Delta q]$ is the expected exchange rate devaluation, $r_{G,t} - r_{D,t}$ is the difference between local-currency interest rates on gold and dollar denominated assets. The parameter α captures the fact that the indicator has arbitrary scale as well as the possibility that participants in the markets for commercial paper and London exchange are relatively better equipped to arbitrage interest rate differentials. As one can immediately see from the equation any other factor that leads to an increase in $r_{G,t} - r_{D,t}$ without affecting $E_t[\Delta q]$ would lead to a negative co-movement with F_t, so that any positive co-movement between $r_{G,t} - r_{D,t}$ and F_t has to be associated to fluctuations in $E_t[\Delta q]$. Accordingly, we find that before formal commitment to gold in 1900, changes in the index are dominated by changes in expectations of devaluation and the correlation between the two series is 56%. Conversely, after 1900, the two series are slightly negatively correlated (-1%) and the clear spike in the gold premium around the crisis of 1907 at the same time as the index becomes more negative suggests that it is no longer primarily capturing fluctuations in exchange rate devaluation expectations.

B Narrative Factor Identification: Proofs

The proofs take as given that the sample moments are consistent estimators of the population moments, and that the data is large enough that they have converged.

Proof of Proposition 1

The proof follows from direct calculation. In particular, note that given $\bar{x}_t = \sum_{r=1}^{R} \lambda_{i,r} F_{r,t}$, it folows that

$$cov\left(\bar{x}_{t^*}, \bar{x}_t\right) = \sum_{r=1}^{R} \sum_{r'=1}^{R} cov\left(\lambda_{i,r}, \lambda_{i,r'}\right) F_{r',t^*} F_{r,t}$$

Given Assumption 1, all the terms with $r' \neq 1$ drop out, so that

$$cov\left(\bar{x}_{t^*}, \bar{x}_t\right) = \sum_{r=1}^{R} cov\left(\lambda_{i,r}, \lambda_{i,r'}\right) F_{1,t^*} F_{r,t}$$

Given Assumption 2, all the terms with $r \neq 1$ also drop out, so that

$$cov\left(\bar{x}_{t^*}, \bar{x}_t\right) = var\left(\lambda_{i,1}\right) F_{1,t^*} F_{1,t}$$

Finally, note that, from the particular case with $t = t^*$ we get $var\left(\bar{x}_{t^*}\right)$,

$$var\left(\bar{x}_{t^*}\right) = cov\left(\bar{x}_{t^*}, \bar{x}_t\right) = var\left(\lambda_{i,1}\right) F_{1,t^*}^2$$

It follows that

$$\frac{cov\left(\bar{x}_{t^*}, \bar{x}_t\right)}{var\left(\bar{x}_{t^*}\right)} = \frac{F_{1,t}}{F_{1,t^*}}$$

Proof of Proposition 2

Given $\bar{x}_t = \sum_{r=1}^{R} \lambda_{i,r} F_{r,t}$ the OLS regression coefficients $\alpha_{k,t}$ satisfy for each t,

$$\min_{\{\alpha_{k,t}\}_{k=1}^{K}} \sum_{i=1}^{I} \left(\bar{x}_{i,t} - \sum_{k=1}^{K} \alpha_{k,t} \bar{x}_{i,t_k} \right)^2$$

The F.O.C. are:

$$\sum_{i=1}^{I} \left(\bar{x}_{i,t} - \sum_{k=1}^{K} \alpha_{k,t} \bar{x}_{i,t_k} \right) \bar{x}_{i,t_k} = 0$$

Let $\hat{x}_{i,t} \equiv \sum_{r=1}^{K} \lambda_{i,r} F_{r,t}$ and $\tilde{x}_{i,t} = \sum_{r=K+1}^{R} \lambda_{i,r} F_{r,t}$. Then we can rewrite the F.O.C. as

$$\sum_{i=1}^{I} \begin{bmatrix} \left(\hat{x}_{i,t} - \sum_{k=1}^{K} \alpha_{k,t} \hat{x}_{i,t_k} \right) \hat{x}_{i,t_k} + \left(\tilde{x}_{i,t} - \sum_{k=1}^{K} \alpha_{k,t} \tilde{x}_{i,t_k} \right) \hat{x}_{i,t_k} \\ + \left(\hat{x}_{i,t} - \sum_{k=1}^{K} \alpha_{k,t} \hat{x}_{i,t_k} \right) \tilde{x}_{i,t_k} + \left(\tilde{x}_{i,t} - \sum_{k=1}^{K} \alpha_{k,t} \tilde{x}_{i,t_k} \right) \tilde{x}_{i,t_k} \end{bmatrix} = 0$$

Assumption 2' states that if $r \leq K$ and $r' > K$, then $\sum_i \lambda_{ir} \lambda_{ir'} = 0$ (this is equal to the covariance, given that factor loadings average to zero). It follows that for any t, t', $\sum_{i=1}^{I} \bar{x}_{i,t} \tilde{x}_{i,t'} =$

0, since

$$\begin{aligned}\sum_{i=1}^{I} \bar{x}_{i,t}\tilde{x}_{i,t'} &= \sum_{i=1}^{I}\sum_{r=1}^{K}\sum_{r'=K+1}^{R} \lambda_r^i \lambda_{r'}^i F_{r,t}F_{r',t'} \\ &= \sum_{r=1}^{K}\sum_{r'=K+1}^{R}\left(\sum_{i=1}^{I}\lambda_r^i\lambda_{r'}^i\right)F_{r,t}F_{r',t'} \\ &= 0\end{aligned}$$

Thus, the F.O.C. reduces further to

$$\sum_{i=1}^{I}\left[\left(\hat{x}_{i,t} - \sum_{k=1}^{K}\alpha_{k,t}\hat{x}_{i,t_k}\right)\hat{x}_{i,t_k} + \left(\tilde{x}_{i,t} - \sum_{k=1}^{K}\alpha_{k,t}\tilde{x}_{i,t_k}\right)\tilde{x}_{i,t_k}\right] = 0 \;\forall k \geq 2$$

Assumption 1' states that for all k, $F_{r,t_k} = 0$ for $r > K$, so that $\tilde{x}_{i,t_k} = 0$. Thus, we can write the F.O.C. as:

$$\sum_{i=1}^{I}\left[\left(\hat{x}_{i,t} - \sum_{k=1}^{K}\alpha_{k,t}\hat{x}_{i,t_k}\right)\hat{x}_{i,t_k}\right] = 0 \;\forall k \geq 2$$

Rewrite this as

$$\sum_{i=1}^{I}\left[\left(\sum_{r=1}^{K}\lambda_{i,r}F_{r,t} - \sum_{k=1}^{K}\alpha_{k,t}\sum_{r=1}^{K}\lambda_{i,r}F_{r,t_k}\right)\hat{x}_{i,t_k}\right] = 0 \;\forall k \geq 2$$

isolate the $\lambda_{i,r}$, so that

$$\sum_{i=1}^{I}\sum_{r=1}^{K}\lambda_{i,r}\left[\left(F_{r,t} - \sum_{k=1}^{K}\alpha_{k,t}F_{r,t_k}\right)\right]\hat{x}_{i,t_k} = 0 \;\forall k \geq 2$$

The equation will be true exactly if $F_{r,t} = \sum_{k=1}^{K}\alpha_{k,t}F_{r,t_k}$ for all r. Let $\hat{F}_{\{k\}}$ be a matrix with entry F_{r,t_k} in row r, column k, $\hat{F}_t$ be the vector with entry $F_{r,t}$ in row r, and $\alpha_t = \{\alpha_{1,t}, \alpha_{2,t}, ..., \alpha_{K,t}\}$. Then, we can express the system of equations as $\hat{F}_{\{k\}}\alpha_t = \hat{F}_t$ and so long as $\hat{F}_{\{k\}}$ is invertible (Assumption 4), the equation will be exactly true if

$$\alpha = \hat{F}_{\{k\}}^{-1}\hat{F}_t$$

Now, following Assumption 3, suppose that $F_{1,t_1} > 0$ but $F_{1,t_k} = 0$ for $t_k \neq t_1$. Then the first line of the system of equations reduces to

$$\alpha_{1,t} = \frac{F_{1,t}}{F_{1,t_1}}$$

Table 1: The Credibility Index - Robustness

Factor Version	Correlation with baseline	std(> 1900)/std(< 1900)	Change 1890/5 - 1891/7	Change 1896/10 - 1896/12	Change 1893/5 - 1893/7
	(1,1)	(0.242,0.281)	(-1.9,-1.37)	(2.73,3.29)	(-2.21,-1.68)
5 factors	0.971	0.28	-2.16	3.46	-2.54
	(0.904,0.993)	(0.268,0.374)	(-2.49,-1.72)	(2.72,3.96)	(-2.95,-2.01)
20 factors	0.994	0.242	-1.73	2.88	-1.84
	(0.988,0.996)	(0.232,0.263)	(-1.83,-1.57)	(2.71,2.97)	(-1.92,-1.7)
Dec-07	0.987	0.286	-1.39	2.79	-1.77
	(0.942,0.999)	(0.254,0.35)	(-1.79,-1.14)	(2.54,3.03)	(-1.96,-1.58)
Dec-88	0.988	0.231	-1.77	3.39	-2.11
	(0.975,0.995)	(0.226,0.267)	(-1.99,-1.35)	(2.91,3.56)	(-2.27,-1.78)
Dec-00	0.994	0.225	-1.87	3.32	-2.1
	(0.981,1)	(0.218,0.273)	(-2.13,-1.54)	(2.88,3.5)	(-2.28,-1.79)
Aug-05	0.912	0.255	-2.01	3.33	-1.86
	(0.861,0.957)	(0.239,0.314)	(-2.47,-1.51)	(2.95,3.66)	(-2.22,-1.66)
	0.984	0.256	-1.5	3.1	-1.86
	(0.946,0.991)	(0.236,0.308)	(-1.91,-1.21)	(2.84,3.38)	(-2.15,-1.6)
Dec-1907 (window)	0.973	0.273	-1.51	2.94	-1.83
	(0.807,0.98)	(0.257,0.378)	(-2.19,-1.1)	(2.28,3.2)	(-2.2,-1.54)
Aug-05 (window)	0.882	0.259	-2.09	3.22	-1.91
	(0.795,0.945)	(0.224,0.353)	(-3.2,-1.67)	(2.72,3.65)	(-2.4,-1.64)

Notes: 90% confidence intervals in parentheses calculated using bootstrapping.

Table 2: Macroeconomic implications of lack of commitment to peg

Real Activity Measure	Speed of response of economic var.	Rel. vol. (<1900)	Rel. vol. (>1900)	Total change Mar - Oct 1893	Change full commitment
business failures	fast	0.807 (0.791,0.863)	1.01 (0.959,1.11)	1.01	0.307 (0.21,0.406)
	slow	0.903 (0.878,0.992)	1.02 (0.978,1.13)	1.01	0.5 (0.308,0.693)
pig iron	fast	0.856 (0.834,0.92)	0.966 (0.948,1.03)	-0.578	-0.329 (-0.366,-0.286)
	slow	0.907 (0.881,0.981)	0.967 (0.95,1.03)	-0.578	-0.445 (-0.479,-0.406)
factory employment	fast	0.833 (0.812,0.9)	0.98 (0.961,1.06)	-0.155	-0.0616 (-0.0746,-0.0482)
	slow	0.86 (0.849,0.921)	0.994 (0.978,1.08)	-0.155	-0.0938 (-0.108,-0.0767)
industrial production	fast	0.971 (0.912,1.09)	0.976 (0.959,1.05)	-0.196	-0.0581 (-0.0851,-0.0336)
	slow	0.969 (0.911,1.09)	0.988 (0.969,1.07)	-0.196	-0.0893 (-0.118,-0.0631)

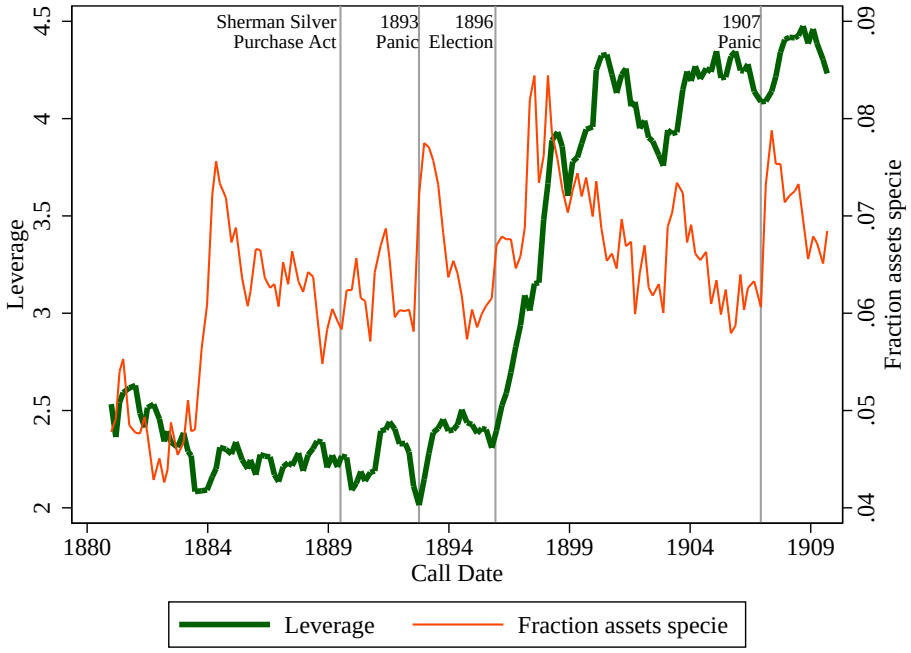
Notes: 90% Confidence intervals calculated using bootstrapping.

Table 3: Macroeconomic implications of lack of commitment to peg based on post 1900 VAR

Real Activity Measure	Speed of response of economic var.	Rel. vol. (<1900)	Rel. vol. (>1900)	Total change Mar - Oct 1893	Change full commitment
business failures	fast	0.84 (0.806,0.998)	1.24 (1.07,1.51)	1.01	0.27 (0.115,0.44)
	slow	0.94 (0.898,1.14)	1.32 (1.12,1.65)	1.01	0.36 (0.115,0.654)
pig iron	fast	0.84 (0.827,0.977)	0.96 (0.944,1.1)	-0.58	-0.31 (-0.38,-0.211)
	slow	0.89 (0.87,1.05)	0.96 (0.947,1.1)	-0.58	-0.42 (-0.491,-0.339)
factory employment	fast	0.82 (0.795,0.971)	1.06 (1.01,1.3)	-0.16	-0.05 (-0.0663,-0.0349)
	slow	0.86 (0.848,1.02)	1.06 (1.02,1.33)	-0.16	-0.08 (-0.0997,-0.0575)
industrial production	fast	0.87 (0.861,1.07)	1.03 (0.985,1.35)	-0.20	-0.04 (-0.101,0.0109)
	slow	0.88 (0.867,1.07)	1.04 (0.991,1.38)	-0.20	-0.08 (-0.137,-0.029)

Notes: 90% Confidence intervals calculated using bootstrapping.

Figure 1: National Bank Leverage



Source: Weber (2000) from the Annual Reports of the Comptroller of the Currency and author calculations. Leverage is (liabilities-equity)/equity=debt/equity.

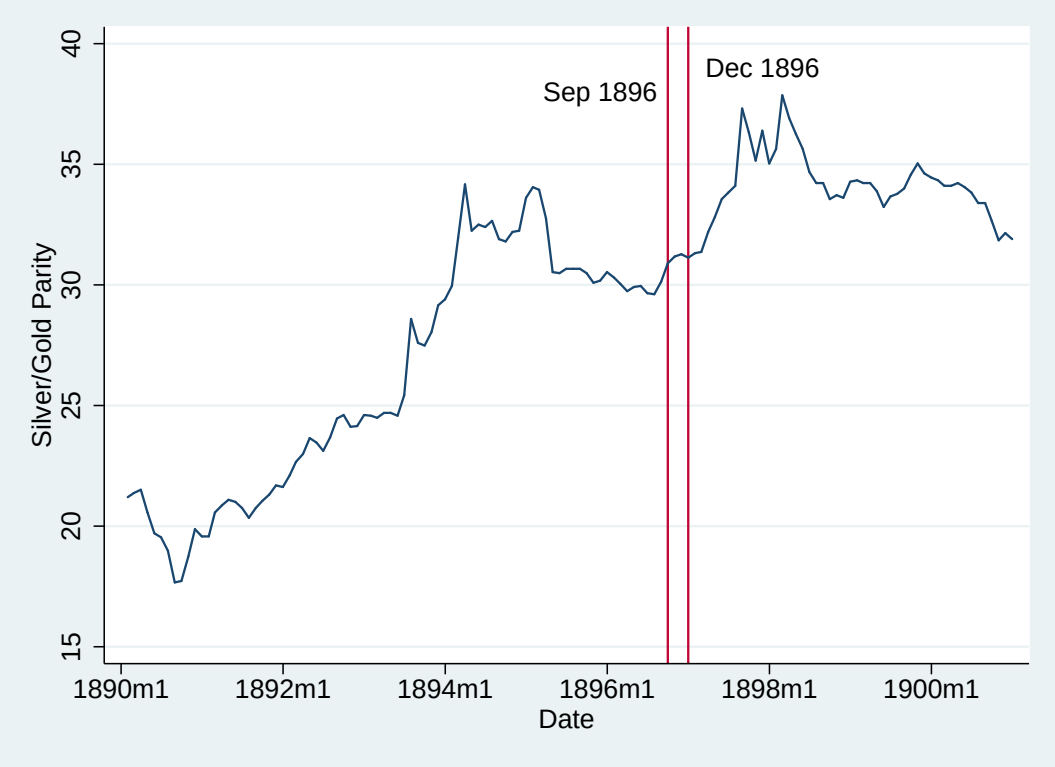
Figure 2: The costs of "free silver"



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Federal Reserve Bank of St. Louis

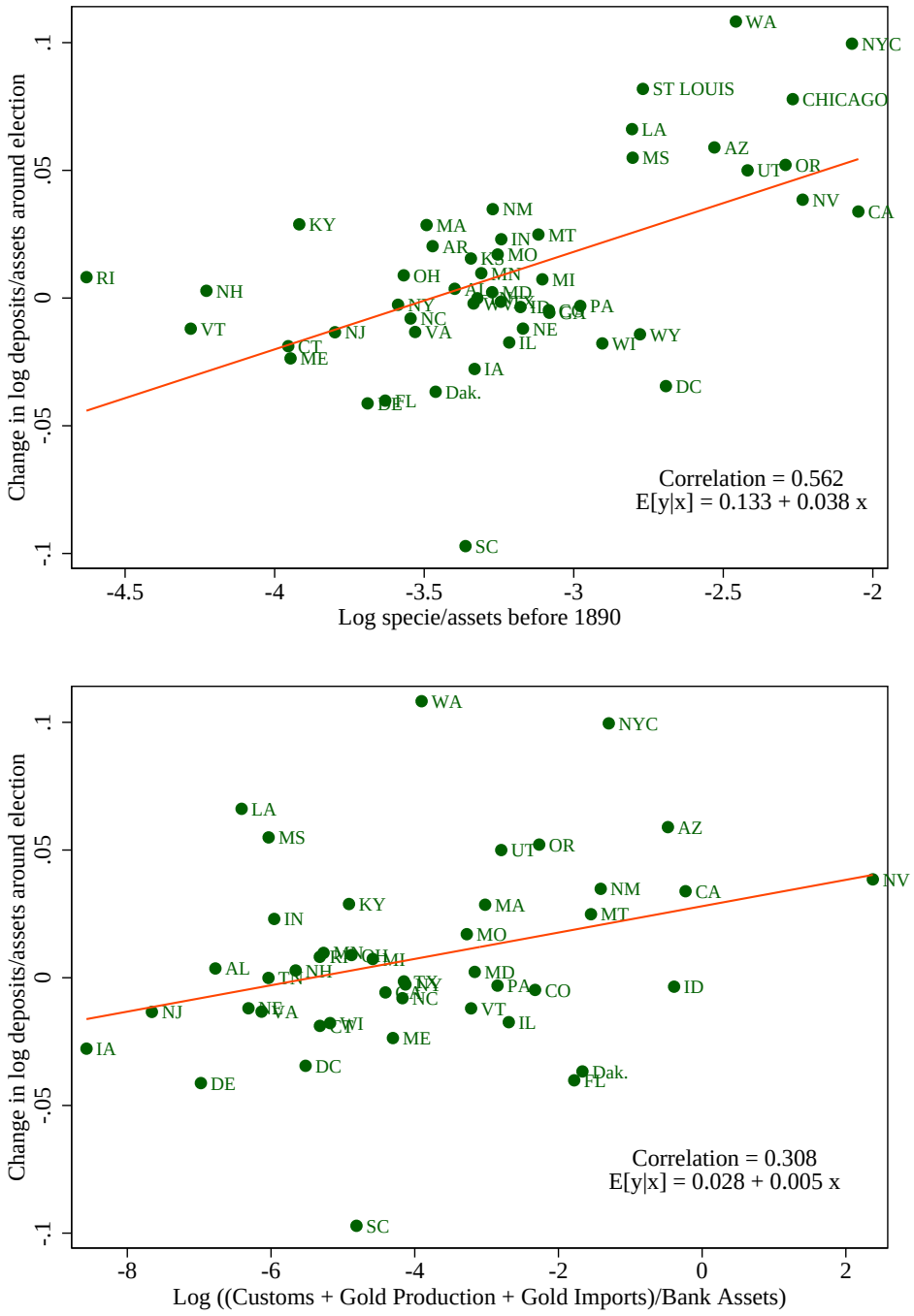
Source: Judge. New York: Judge Publishing Company, 1895; Digitized by FRASER, Federal Reserve Bank of St. Louis: `http://fraser.stlouisfed.org/docs/historical/brookings/16818_06_0001.pdf`.

Figure 3: The Silver / Gold Parity in International Commodity Markets



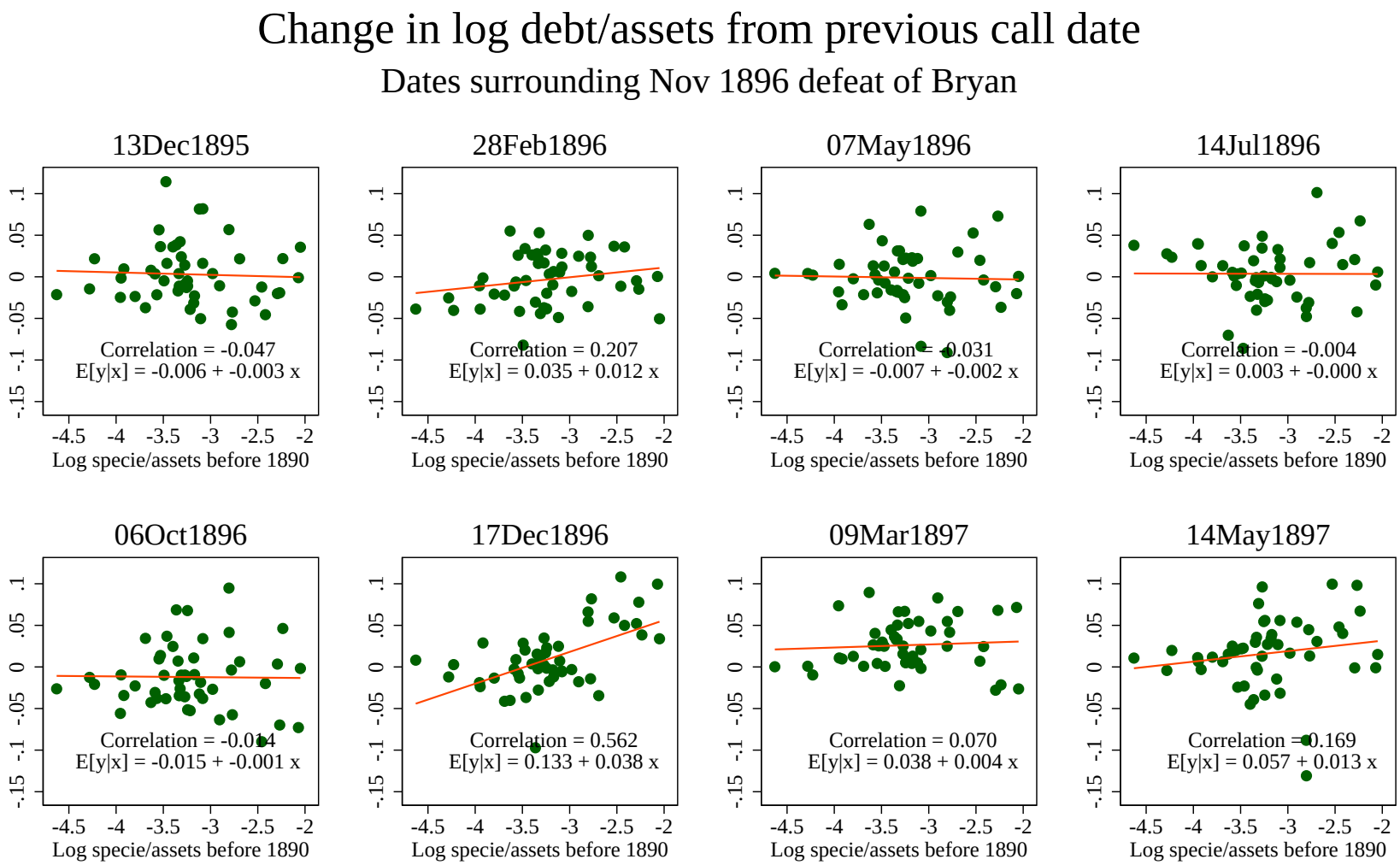
Source: Ratio of gold and silver spot prices in US$ per ounce, based upon prices in London; Digitized by Global Financial Data .

Figure 4: Changes in bank deposits in gold states around the 1896 election



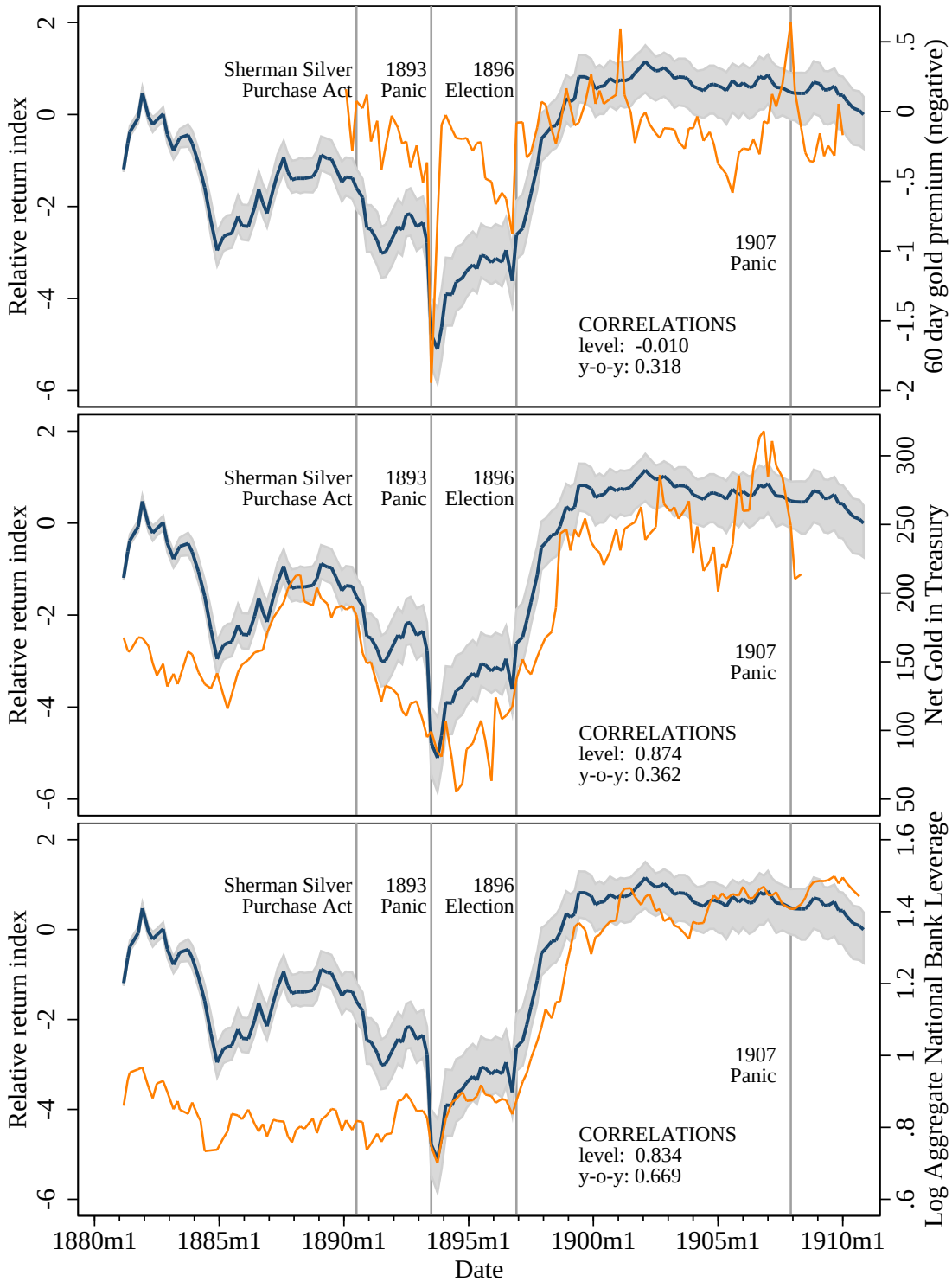
Source: National bank assets are from Weber (2000) and the Annual Reports of the Comptroller of the Currency. Gold imports and production from the Statistical Abstract of the United States 1895. Customs receipts from the Annual Report of the Secretary of the Treasury 1890. See text for full details

Figure 5: Leverage and specie holding around 1896



Source: National bank assets are based on Weber (2000) and author calculations.

Figure 6: The Relative return index, the gold premium, and gold in Treasury



Source: y-o-y refers to the correlation between year-on-year changes. The gold premium axis is flipped and is calculated from National Monetary Commission (1910, pp. 188-208) following Calomiris (1992). It is the difference between the exchange in New York for Sterling immediately and in 60 days. Gold in Treasury is from the Annual Report of the Secretary of the Treasury in 1900 and 1908. Shaded area shows two standard deviations of the changes in the relative return index.