Credit Rationing and Social Stability: Evidence from 1930s China

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Abstract

Can credit affect social stability? To answer this question, we turn to a natural experiment from 1930s China, where credit contracted as a consequence of the 1933 U.S. Silver Purchase program. Building on extensive archival information, we assemble a novel, hand-collected data set of loan contracts to individual firms as well as labor unrest episodes. We show that the Silver Purchase shock results in a severe credit contraction, and that firms borrowing from banks with a larger exposure to the shock experience increased labor unrest intensity. These findings support Milton Friedman's (1992) conjecture that the U.S. Silver Purchase program exacerbated social tensions in 1930s China, and contribute to our understanding of the (unintended) social consequences of credit provision.

Keywords: Silver Purchase program, bank liquidity, social unrest
JEL: E42, E51, G01, G21, N15, N25.

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I. Introduction

Can credit affect social stability? Versions of this question often feature in the academic debate in economics, political science, and history, as well as among the general public. Examples include whether tight money and credit led to the development of populist movements in 19th century United States (Friedman and Schwartz (1963), pp. 116-117); whether capital outflows and the ensuing banking crisis drove the Nazis to power in 1930s Germany (Feinstein et al. (1997), pp. 120-124); and more recently, whether the credit slowdown following the Eurozone crisis of 2010-11 fueled the emergence of populist movements in southern Europe.[1]

Despite its relevance, the literature does not yet provide a clear answer to this question. This is because a test of the relationship between credit and social stability poses three key empirical challenges. First, any inference is confounded by the presence of monetary authorities – e.g. a central bank whose policies may pursue, even indirectly, social objectives.[2] Second, causality can run both ways: social instability can worsen investment opportunities and economic conditions, reducing the demand for credit (Alesina and La Ferrara (2005)). Third, credit rationing has wide-ranging effects: it can trigger a general deterioration of the economy, leading in turn to social unrest (Funke et al. (2015)), so that it is difficult to identify the direct impact of credit.

Our study addresses these challenges. First, we consider a setting where the link between monetary policy and credit is much looser than today: 1930s China. The fledgling Republic of China lacked a central bank, and private ones issued money and loans. Second, we focus on natural experiment, triggered by the U.S. 1933 Silver Purchase program. Undertaken

[1] See, for instance, "Populism: What Happens Next?" Financial Times, 9 January 2015.
[2] For instance, the Federal Reserve is charged with conducting monetary policy "so as to promote effectively the goals of maximum employment" together with "stable prices, and moderate long-term interest rates". See the Federal Reserve Reform Act of 1977 and the Full Employment and Balanced Growth Act of 1978.

for purely U.S. domestic reasons, the Silver Purchase raised the price of silver worldwide and drained the Chinese silver stock. Since China was on a silver standard, its monetary base and its banks' credit capacity were tied to silver reserves – we use the Silver Purchase shock to identify changes in credit supply. Third, we provide micro-econometric evidence of the shock's effects, based on hand-collected archival information on credit and labor conditions in 1930s China. Our data reconstruct a Chinese "credit registry" for the period 1931-1935, and document firm- and plant-level labor unrest episodes in three major Chinese cities (Nanjing, Shanghai, and Tianjin). We exploit cross-sectional variation in the exposure of lenders and borrowers – banks and firms – to the Silver Purchase shock to identify the direct effect of credit rationing on social stability.

Our empirical strategy is articulated in two steps. First, we ask if silver outflows affect lending: banks with a larger exposure to the Silver Purchase shock (lower pre-1933 silver reserves) more likely curb credit after 1933. Second, we study whether labor unrest episodes at Chinese firms relate to their banks' silver reserves. If banks exposed to the Silver Purchase shock cut lending, firms borrowing from them face tighter financial constraints, which limit growth, increase workers' dissatisfaction as well as the likelihood of labor unrest. Our evidence supports these arguments.

While throughout the analysis we pay great attention to identification and what we can and cannot conclude in causal terms, our main results are immediately visible. Chinese credit contracts sharply over 1933-35: credit-to-GDP drops by about 15%, and credit-to-deposits by 10%.[3] As we show in Figure 1, this pattern is driven by banks with lower pre-1933 silver reserves (panel A). Firms borrowing from these banks, in turn, experience increased labor

[3] Cheng (2003, Appendix II), and Liu (1946, Table 1).

unrest intensity, such that by 1935 labor unrest episodes are more than twice as likely as at firms borrowing from banks with large pre-1933 reserves (panel B).

Our tests exploit the wealth of micro-level information in our data to interpret these facts in a causal sense. First, we show that banks with lower pre-1933 silver reserves reduce lending volumes after 1933. Because we are able to observe bank-firm lending relationships, we can absorb credit demand with borrowing-firm fixed effects (as in Khwaja and Mian (2008); Schnabl (2012)): the *same* firm, borrowing from multiple banks, experiences restricted lending from those banks that are more exposed to the Silver Purchase. Therefore, the shock's first-order effect appears to be credit rationing.

Second, we document that firms that are more exposed to the Silver Purchase shock experience a disproportionate increase in labor unrest after 1933. We gauge a firm's exposure by the pool of pre-1933 silver reserves of banks with branches near the firm's, or the firm's plants', location. Again, our data allow us to absorb much unobserved heterogeneity with fixed effects: plants of the *same* firm, with access to different reserves pools due to their location, experience changes in labor unrest intensity to different degrees. The number of labor unrest episodes experienced by firms and plants in the top decile of silver exposure is about 14% larger than in firms in the bottom decile. Similarly, labor unrest episodes in firms in the top decile of silver exposure are 28% longer than those happening in firms in the bottom decile. Limited access to credit resulting from the Silver Purchase, thus, has important social consequences, exacerbating labor relations.

Two additional tests rule out alternative interpretations of our findings. First, we compare industries relatively exposed to versus isolated from international trade, to assess the impact of a mechanical currency appreciation driven by the Silver Purchase. We find statistically indistinguishable effects across the two groups, suggesting that the exchange rate

channel is unlikely to drive our results. This test also alleviates concerns about a worldwide trend towards greater instability associated with the 1930s Great Depression: international trade exposure does not appear to mediate our effects.

Second, we address the potential endogenous selection of banks into high and low pre-1933 silver reserves groups. We exploit a unique feature of 1930s China's monetary system, the parallel circulation of a "traditional" currency backed by copper. Copper coins circulated locally and were typically used to clear small transactions, as a substitute to Chinese silver dollars, in regions with a relative abundance of copper. We use copper availability at local mines as an instrument for the demand for silver-backed currency, and thus pre-1933 reserves. Instrumental variables estimation confirms our results, indicating that they are not driven by selection.

In sum, our paper provides new evidence on the effects of economic, and in particular, credit shocks on social stability. In this way, it contributes to the literature on the economics of social and political order (Acemoglu and Robinson, (2000); Alesina et al. (2010); Alesina and Perotti (1996); Besley and Persson (2011); Brender and Drazen (2008); de Bromhead et al. (2009); Dube and Vargas (2013); Funke et al. (2015); Mian et al. (2014); Miguel et al. (2004); Ponticelli and Voth (2014); Voth (2011)) as well as the economic determinants of labor unrest (Kennan (1986); Card (1990); Naidu and Yuchtman (2015)). Many of these studies relate economic downturns to social outcomes looking at a cross-section of countries. Focusing on the Silver Purchase episode, and using micro data, allows us to identify a causal channel running from a negative economic shock – the 1930s Chinese credit crunch – to social outcomes. To the best of our knowledge, we are the first to show that a credit shock can generate social and labor unrest.

Second, our work offers a new account of the effects of the Silver Purchase on the Chinese economy. In their *Monetary History*, Friedman and Schwartz (1963, pp. 483-490) consider the Silver Purchase a milestone in Chinese economic history. In the words of Milton Friedman, "the US Silver Purchase program must be regarded as having contributed, if perhaps only modestly, to the success of the communist revolution in China" (Friedman (1992)). In contrast, Brandt and Sargent (1989) and Rawski (1993) argue that Chinese banks could replace their silver reserves with Republic of China treasury bonds, and thus maintain a steady credit supply. Our micro-level evidence suggests that this alternative reserve instrument did not prevent credit rationing. Furthermore, while we cannot document a direct link to the Communist takeover, we do show that the shock exacerbated labor relations.

Third, our work contributes to the literature on the real effects of bank liquidity shocks. This literature has focused on the identification of credit supply effects, via cross-sectional differences between large vs. small banks or liquid vs. illiquid balance sheets (Kashyap and Stein (2000)), or natural experiments (Khwaja and Mian (2008); Schnabl (2012)). Data limitations, however, typically restrict the ability to relate credit to real outcomes in natural experiments (Peek and Rosengren (1997, 2000); Chodorow-Reich (2014)). Our setting combines a plausibly exogenous shock to credit – the Silver Purchase program – with micro-level data on social stability. Furthermore, 1930s China presents many parallels with recent liquidity crises: in particular, a commitment to a fixed exchange rate, and financial outflows leading the country to deflation and economic downturn. Our results indicate that credit shocks can have far-reaching consequences, and affect social stability.

The remainder of the paper is organized as follows. Section II provides the historical background. Section III presents the data. Section IV presents our tests. Section V discusses the interpretation of our results. Section VI concludes.

II. Historical Background

A. Credit and silver in 1930s China

In the early 1930s, Chinese banks are divided into two categories, "modern" and "native". There are around 200 "modern" domestic banks in China, with over 1,300 branches (Liu (2007)). These banks can issue currency (e.g. to make loans), subject to a reserve requirement: the bank should hold silver reserves corresponding to at least 60% of the nominal amount of banknotes it issues (the remaining 40% consisting of government bonds). In order to extend a loan, thus, the bank can draw on its reserves in excess of the 60% threshold, or purchase silver on the market to back the issue amount exceeding its reserves. Reserve ratios range from 60% to 100% and are around 66% on average, so that different banks have a different exposure to the Silver Purchase shock (also see next section).

The four largest modern banks – Central Bank of China, Bank of China, Bank of Communications, and Farmers Bank of China – are known as "government" banks, have a closer relationship with political power, and perform duties such as placing treasury bonds on the market (Tamagna (1942, p. 121)). There is, however, no central bank in the modern sense of the term, entrusted to set interest rates or regulate the money supply.

The "native" banks are smaller and older, operate locally, and often lack limited liability (Tamagna (1942, p. 57-59)). They mainly place into circulation banknotes issued by the modern banks. In addition, they issue in their own name banknotes backed by copper, strictly for local circulation (Tamagna (1942, p. 68)). Although our data do not include native banks (we could not find records of their balance sheets and loans), we exploit their issuance of copper-based currency in a robustness check in Section V.

B. The Silver Purchase program

The Silver Purchase program is initiated in May 1933 with an amendment to the Farm Relief Bill, establishing that the U.S. government can monetize silver (in addition to gold) to back a money supply expansion. The Roosevelt administration orders U.S. mints to buy all newly produced U.S. silver at 64.64 cents per ounce, at a time when the market price is 44 cents (Friedman and Schwartz (1963, p. 483)).[4] The world price of silver nearly doubles in the space of two years, reaching about 70 cents per ounce in New York in 1935 (Figure 2.A).

The Roosevelt administration undertakes the Silver Purchase program to accommodate lobbying in the senate by the so-called "silver bloc." Between 1928 and 1932, the price of silver has dropped by 30%, and silver producers increasingly demand Federal intervention to reverse this trend. Out of 14 silver-bloc Senators, 12 are Democrats like Roosevelt, and strongly advocate policies to raise silver prices. Their interests are also backed by farmer states, which aim to increase inflation and, as a result, raise agricultural prices. In 1934, the Silver Purchase Act further empowers the Federal Government to purchase silver at home and abroad.

Rising silver prices have a visible impact on Chinese reserves, as large amounts are exported to take advantage of the high market price. The Chinese silver stock growth rate takes a sharp downward turn after 1933, reducing the stock by about 15% by 1935 (Figure 2.B). Unable to stem the outflow, the Chinese government finally abandons the silver standard in late 1935. An official announcement is made in November, declaring all silver to be government property. All silver exchange is forbidden, and paper banknotes are issued one-to-one against the silver Chinese dollars in circulation.[5]

[4] The London price of silver registers a similar rise as on the New York Market over this period (Rawski (1984)).
[5] Before 1935, the Chinese government imposes high export duties on silver, with the aim of curbing profits on silver exports. Official Chinese customs data show that the silver outflow is close to zero during 1935. However, smuggling makes this regulation ineffective: estimated silver smuggling amounts between 1934 and 1936 are roughly 250 million Chinese silver dollars. In 1935, towards the end of our sample period, the Chinese government becomes the controlling shareholder of two "modern" banks, the Bank of China and the Bank of Communication, in an attempt to boost the credit capacity of the two institutions (Cheng (2003, p. 99)).

C. Absence of confounding events in 1931-1935

In 1931-1935 China is relatively free from confounding events other than the Silver Purchase, and enjoys stable government and internal politics. Moreover, the only major external event, the 1931 Japanese invasion of Manchuria, unlikely has a tangible impact on credit provision in the main urban areas covered by our sample data (see next section).

In 1928 the Nationalist government led by Chiang Kai-shek reunifies the country after a decade of civil war, bringing along a period of relative peace that allows the economy, finance, and the banking sector to grow (Cheng (2003, pp. 67-70)). There are still skirmishes in rural areas with various guerrilla groups, but the Nationalists effectively control most of the country, especially the urban areas where economic activity concentrates. In particular, the data in our sample focus on cities under Nationalist control, free of guerrilla episodes in 1931-35.

By looking at the behavior of Treasury bond prices, Ho and Li (2013) determine that the only major political event in this period is the Japanese invasion of Manchuria, which begins on 18 September 1931. The invasion raises concerns about the solvency of the Chinese government, leading to a partial restructuring of treasuries in February 1932.

This event alone is unlikely to drive our results, for three reasons. First, it happens at the beginning of our sample period, and it does not appear to materially affect credit provision. In fact, the aggregate credit-to-GDP ratio slightly increases prior to 1933 (Cheng (2003) and Liu (1946)). Second, the restructuring involves a reduction of the coupon rate and an extension of maturities, while the principal is unchanged (Cheng (2003, p. 124)). Although treasuries can form up to 40% of bank reserves, their weight is based on their face value (see Appendix A). Thus, no adjustment is required to the outstanding amount of currency. Third, the time series of Chinese public debt yields does not exhibit a strong reaction to the event. In fact, the spread

relative to British Gilts *drops* towards the end of 1931 (Goetzmann, Ukhov, and Zhu (2007); Ho and Li (2013)).[6]

One last potential concern is that banks may cut loans collateralized with treasury bonds. Our data, however, reveal that less than 10% of outstanding loans have treasury bonds as collateral. We also find a very low correlation (–0.06) between banks' silver reserves and loan collateralization with treasuries.

III. Data

We build our analysis on three main sources: (1) Loan contracts; (2) Bank balance sheet data; and (3) Information on labor unrest episodes. All of our data refer to the years starting in 1931 and ending in November 1935, when China abandons the silver standard.

A. Loan contracts

Individual loan information is collected from provincial and city archives in seven Chinese major provinces/cities: Beijing, Chongqing, Guangzhou, Nanjing, Shandong, Shanghai, and Tianjin. These areas are chosen because of their economic importance in inter-war China: Beijing was the imperial capital, with considerable industrial activities; Chongqing is one of the first trading harbors, and the most industrialized city in Southwest China; Guangzhou is also one of the oldest and largest trading harbors; Nanjing is the capital city; Shandong is a major industrial and farming province in North China with a large population; Shanghai and Tianjin are the main financial centers. Individual loan contracts report the issuing bank's name, the identity of the borrowing firm, the loan amount, issue date, and for a subset of contracts also additional terms such as interest rate, duration, collateral, or the purpose of the loan. The

[6] The only other two major events in the 1921-42 period identified by Ho and Li (2013) are the 1927 Northern Expedition and the 1937 Sino-Japanese war. Both take place well outside our sample period.

loan amount is the most widely populated data item, so we focus on it for the majority of our tests.[7]

In total, the sample covers 584 industrial loans, made by 34 banks to 154 individual plants belonging to 140 firms. The lenders in this set appear to be representative of the domestic banking sector in 1930s China, and comprise three "government" banks (Farmers' Bank of China was not only officially established until early 1933), 28 other modern banks, and three other financial institutions (Shanghai Trust Co., Ltd.; Central Trust of China; and Joint Savings Society of Yienyieh, Kincheng, Continental and China & South Sea Bank).

Based on the available information from the loan contracts, our sample borrowers are also representative of the 1930s Chinese economy. They span 17 different industries, out of a total of 27 industries based on the International Labor Organization 1923 classification in use in 1930s China.[8] The most important industries in our sample are transportation, services, and textiles (31%, 26%, and 14% of the aggregate loan amount, respectively), consistent with the massive railway construction underway during the period, as well as the historical role of textiles in Chinese industrial development.

B. Bank balance sheet data

Bank balance sheet data are retrieved from the Chinese Banker's Yearbook published by the Bank of China, and the Bankers' Weekly journal, a review published by the Shanghai Banking Association on a weekly basis from May 1917 through to March 1950. Each issue contains the annual reports of both national and regional banks, as well as eight leading trusts.[9]

[7] Khwaja and Mian (2008) and Schnabl (2012) also focus on this variable.
[8] We add a residual "Diversified" category for firms whose industry does not fit in any of the ILO categories.
[9] In the 1930s, trusts engage in various financial businesses, including collecting deposits, extending loans, selling insurance. There is no evidence showing that trusts materially differ from banks in terms of savings and lending practices, so we include them in our data (all the findings are robust to excluding them).

We complement these data with information from two additional sources: the Financial and Commercial Monthly Bulletin of the Bank of China (FCMB) issued by the economics research department of the Bank of China from 1934 to 1939, and Liu (2007). The FCMB is a widely adopted, reliable source providing data on the Chinese banking sector during the first half of the 20th century. It reports data on banks' banknote issuance and the related silver stock.[10] Liu (2007) reports complementary information on bank location and capital.

From these sources, we retrieve data on bank silver reserves, total cash, paid-in capital, total assets, deposits, equity, and total loans. The key variable of interest in our analysis is $Silver$, the stock of silver (log-)amount held by the bank to back up its banknote issuance. We also compute $Excess\ Silver$, defined as the difference between the bank's silver stock and the 60% silver reserve requirement. Our data contain complete balance sheets data for 115 institutions (101 banks and 14 other financial institutions).

We present descriptive statistics in Table 1. Prior to the implementation of the Silver Purchase program, there is significant cross-sectional dispersion in the level of silver reserves for our sample banks. The average bank has silver reserves of 3.5 million Chinese dollars. The minimum silver reserve we observe is exactly zero dollars, for the 64 banks in our sample that do not issue any banknotes, while the maximum value is about 129 million dollars. Around 51% of our sample banks that issue banknotes hold exactly the 60% minimum silver reserve; the remaining banks hold excess reserves, ranging between 60-100%, with an average level of 66% and a standard deviation of about 9% of the total currency issued.

[10] The FMCB also provides other useful data such as silver prices, silver shipping in China, and interest rates in various Chinese cities.

The average (median) loan in our sample amounts to 272,000 Chinese dollars (44,000 Chinese dollars).[11] Based on the subset of loans with more complete information that can be matched to our bank-level data, the average loan duration is 18 months, and the average monthly interest rate is about 0.93%, or 11% annualized. These numbers appear in line with contemporary accounts of the credit market in 1930s China (Tamagna (1942)).

C. Labor unrest

The final piece of data is information on labor unrest episodes in major Chinese cities around the Silver Purchase program. Unlike Friedman (1992), we do not attempt to prove a direct connection between the Silver Purchase program and the success of the Communist revolution. While one could take our test as a proxy for the extent of growing popular support for the Communist insurrection in the 1930s, focusing on labor unrest helps us to address the broader social consequences of the credit shock, beyond the scope of Friedman's argument.[12]

We retrieve these data from surveys on labor relations set up by the Republic of China's central government and local authorities. A first set of records provides information about labor unrest episodes that did not involve acts of violence, revolving around disagreements between employers and employees. We refer to these situations as "labor disputes." These data are available for Shanghai and Nanjing. Information about Shanghai is retrieved from the survey *Industrial Disputes in Shanghai since 1928*, conducted by the Bureau of Social Affairs of the city government of greater Shanghai between 1931 and 1932. For the years between 1933 and

[11] The average loan amount to average total bank assets ratio is 0.65% in our sample. In both Khwaja and Mian (2008) and Schnabl (2012), it is around 0.05%.

[12] As an alternative, one could look at Communist Party membership data in different locations throughout China over our sample period. At the time of writing (June 2016), we have not (yet) been able to obtain these data. That said, Party membership data suffer from two potential biases. First, membership data from contemporary 1930s sources will likely understate the real extent of Communist support, given that joining the party was a criminal offense at the time (Harrison (1972, pp. 91-96)). Second, membership data from later sources likely overstates Communist support, given the incentives, after the 1949 Communist takeover, to trace back one's party membership to the early days of the Revolution.

1935, we use an analogous survey published on the journal *International Labor Bulletin (Guo Ji Lao Gong Tong Xun; 1934-1941; No. 5 Issue 6, June, 1937)*, compiled by the Chinese Branch of the International Labor Organization. The Nanjing data come from the survey *Industrial Disputes in Nanjing,* which records cases that were reported and processed by the Bureau of Social Affairs in the city of Nanjing.[13]

A second set of surveys record labor unrest episodes that were accompanied by violence. We refer to these cases as "riots." These data are also available for two cities: Shanghai and Tianjin. The Shanghai data are retrieved from the survey *Strikes and lockouts in Shanghai since 1918* for the period 1931-1932, and *Strikes and lockouts in Shanghai in the Recent Four Years* for 1933-1935. Regarding Tianjin, we make use of the information available in the *International Labour Bulletin (1934-1941)*. These data are complemented with additional information retrieved from two newspapers, the *Yishi Bao* (a Tianjin daily) and the *Shen Bao* (a Shanghai newspaper covering stories from other parts of China).

We identify in total 804 labor disputes and 405 riots between 1931 and 1935 (Table 2, panel A). Throughout most the analysis, we merge disputes and riots together.[14] The Shanghai data report information on the underlying reason for disputes and riots. There are multiple causes for both labor disputes and riots during our sample period, but as illustrated in Table 2, panel B, the majority can be related to worsening economic conditions: the top causes are employee dismissal (56%), and salary disagreements (21%).

IV. Empirical Analysis and Results

[13] This source only covers labor unrest episodes in Nanjing subsequent to 1931.
[14] Results are similar when we consider them separately.

We use our data to test the impact of the credit shock on social stability. Our empirical strategy is articulated into two parts. First, we test if the U.S. Silver Purchase program led to a contraction of lending in China. Second, we test if there were social stability consequences to the credit shock.

A. Impact of the Silver Purchase program on lending

We start by documenting the impact of the Silver Purchase program on lending. In order to make a loan, a bank needs to draw on its silver reserves in excess of the 60% requirement, or acquire additional silver on the market. A higher market price of silver, thus, increases the cost of lending for the bank, particularly for banks with ex ante lower silver reserves. As a result, banks that are more exposed to the Silver Purchase shock, i.e. with lower pre-1933 silver reserves, will drive the post-1933 credit contraction.

We measure silver reserves in two ways: the bank's 1931 (log-)silver holdings ($Silver$), and the difference between the bank's silver holdings and 60% of their outstanding banknotes ($Excess\ Silver$), computed with data available between 1931 and 1933, the years preceding the Silver Purchase Program.[15]

We first relate these variables to the (log-)loan volume reported on bank balance sheets. The estimates, reported in Table 3, are consistent with the notion that the Silver Purchase Program leads to a credit crunch: banks with lower reserves reduce their lending volumes after 1933. The economic impact is also economically important: moving from the top to the bottom decile in terms of 1931 silver holdings is associated with a 25% larger drop in total loan volume after 1933. The impact of the shock is pervasive, and affects the entire cross-section of modern Chinese banks. In particular, we do not detect an economically meaningful difference in the

[15] Whenever the 1931 silver reserves value is not available, we use in its stead the 1932 value.

impact on small and large banks (below and above the median, specifications (5) and (6)), although the effect of the silver shock is statistically significant only for large banks.

These results suggest an economically large impact of the shock on credit provision. The estimates, however, could be confounded by credit demand effects associated with individual firms. For instance, banks with larger silver reserves might tend to lend to more efficient firms, or less risky firms with a lower exposure to the international economic crisis of the 1930s. This would also predict higher lending growth for banks with larger silver reserves – but due to credit demand, not supply.

To address this potential concern, we turn to our data on individual matched bank-firm loan contracts. Following the literature on bank liquidity shocks (e.g. Khwaja and Mian (2008) and Schnabl (2012)), we absorb the impact of credit demand by controlling for firm fixed effects, interacted with time, in the following specification:

$$L_{fbt} = \alpha_{f0} + \alpha_f \times Post_t + \alpha_t + \beta_0 Silve_{\ b,1931} + \beta Post_t \times Silver_{b,1931} + \gamma' x_{fbt} + \varepsilon_{fbt} \quad (1)$$

The dependent variable is the natural logarithm of the dollar amount lent to firm f by bank b in year t. We regress this variable on an indicator $Post$, equal to 1 in the years subsequent to the U.S. Silver Purchase program (1933 onwards), the banks' 1931 silver reserves $Silver$ (or $Excess\ silver$), and an interaction term, as well as a vector x of control variables, including firm × time fixed effects, i.e. allowing for a different firm-specific intercept before and after the 1933 shock. A positive β coefficient in equation (1) indicates that banks with larger silver reserves before the shock extend larger loans after 1933. We estimate (1) by collapsing the data

down to firm-bank pair averages before and after 1933, to be immune to the Bertrand et al. (2004) critique.[16] That is to say, we estimate:

$$\Delta L_{fb} = \alpha_f + \beta Silver_{b,1931} + \gamma' \Delta x_{fb} + \varepsilon_{fb} \quad (1')$$

Identification in equation (1) (or (1')) mostly originates from the cross-sectional differences of banks' silver reserves. Banks with a larger amount of pre-shock silver reserves are better able to absorb the liquidity shock, and are thus less likely to ration credit after 1933. As Khwaja and Mian (2008) and Schnabl (2012), we restrict the sample to the set of firms that borrow from at least two banks, allowing us to control for firm fixed effects.

We report the estimates of (1') in Table 4. They are consistent with our earlier results: banks with a larger exposure to the Silver Purchase program (lower pre-1933 silver reserves) are quicker to cut down lending. The point estimates are remarkably stable across specifications with and without firms fixed effects. They imply that banks in the bottom decile of 1931 silver holdings experienced a reduction of about 27% of their loan growth between 1931 and 1935 compared with banks in the top decile. Moreover, our empirical strategy alleviates the potential confounding effect of loan demand by individual firms. The presence of borrowing firm fixed effects in the regression equation implies that the *same* firm, borrowing from two different banks, will experience a larger drop in lending from the bank with lower silver reserves, i.e. greater exposure to the shock.

Taken together, these findings provide the first block of evidence for our analysis. The scarcity of silver in China, driven by the U.S. Silver Purchase program, leads to a reduction in credit, the more severe the lower pre-1933 silver reserves. The credit contraction cannot be explained by demand conditions, supporting a causal interpretation for our evidence.

[16] Equivalently, one could cluster the standard errors around firms, banks, or firm-bank pairs. We obtain similar results with these alternative approaches, omitted for brevity (but available upon request).

B. Social consequences

Next, we look at the consequences of the Silver Purchase program shock on social stability, focusing on labor unrest episodes. In our test, we conjecture that industrial plants in 1930s China borrow primarily from banks headquartered near them, or with branches in their proximity. This assumption is motivated by the literature on relationship lending (e.g. Petersen and Rajan (2004); Degryse and Ongena (2005)), which finds that geographical distance is an important determinant of credit provision. Given that this applies to modern banking, a fortiori it should be a valid assumption also for 1930s China, where transportation and information costs were likely more important than now.

We build an index of local silver reserves availability around each firm (or plant, denoted by f) in our sample as an inverse distance-weighted average of bank silver reserves:

$$Available\ silver_f = \sum_b \frac{Silver_b/d(f,b)}{\sum_b 1/d(f,b)} \quad (2)$$

where $Silve_b$ denotes the log-1931 silver reserves of bank b, and $d(f,b)$ is the distance between firm f and bank b's each branches, measured in km. $Available\ silver$ is larger if banks in the vicinity of firm f have larger silver reserves; it thus captures the ability of the potential lenders of firm f to absorb the Silver Purchase shock. Similarly, we define $Available\ excess\ silver$, as a weighted average $Excess\ silver$.

We then relate the index to measures of labor unrest intensity, namely the (log-)number of dispute or riot occurrences and the (log-)duration in days of dispute or riot experienced by a firm in a given year. We estimate:

$$Unrest_{ft} = \alpha + \beta_0 Av.silve_{f,1931} + \beta Post_t \times Av.silver_{f,1931} + \gamma' x_{ft} + \varepsilon_{ft} \quad (3)$$

As before, we collapse the sample to plant averages before and after 1933 as in Bertrand et al. (2004) and estimate:

$$\Delta Unrest_f = \alpha + \beta Available\ sil_{f,1931} + \gamma' x_f + \varepsilon_f \quad (3')$$

The control variables x alternatively include city district, industry, and firm nationality fixed effects or city district and firm fixed effects.

Table 5 presents the estimates. In a first set of tests in Panel A, we focus on the (log-) number of labor unrest episodes in a given year. Across all specifications, we find that both $Available\ silver$ and $Excess\ silver$ are negatively associated with the number of labor unrest episodes. This is consistent with the notion that firms that have access to a smaller pool of silver reserves through their potential bankers are more exposed to the shock, and experience intensified labor unrest. The effect is also important in economic terms: moving from the top to the bottom decile in terms of $Available\ silver$ ($Excess\ silver$) is associated with a 14% (18%) increase of labor unrest intensity.

Panel B presents results where the dependent variable is labor unrest duration, the (log-) duration (in days) of labor unrest episodes experienced by a firm in a given year. In this case, we also find a negative association between $Available\ silver$ ($Excess\ silver$) and labor unrest duration. Firms in the bottom $Available\ silver$ ($Excess\ silver$) decile experience labor unrest episodes that are 28% (69%) longer than firms in the top decile. The fact that we base our analysis on manufacturing plants, and include city district fixed effects and alternatively firm fixed effects, attenuates the possibility that we capture a "bad neighborhood" effect, as we focus on the place where people worked, rather than where they lived.

V. Alternative Explanations and Discussion

In this section, we discuss two set of tests to rule out alternative interpretations of our findings. First, we compare industries exposed to and isolated from world markets, as a check for mechanical exchange rate effects and the impact of the worldwide Great Depression. Second,

we use instrumental variables estimation to rule out effects due to self-selection of banks into high- and low-silver reserves groups. Finally, we discuss the external validity of our results.

A. Exchange rates and the Great Depression

The Silver Purchase program is announced in the midst of the Great Depression. The decline in world demand, thus, could affect Chinese firms. Moreover, because of the silver standard, the rise in silver prices leads to an appreciation of the Chinese dollar, hurting the competitiveness of Chinese exporters. Both effects predict a generalized contraction of Chinese credit demand.

But neither mechanism can, in fact, account for our findings. First, it is not clear why their effects should be more pronounced on banks with lower silver reserves, or the firms that borrow from them. Second, the loan-level estimates control for firms fixed effects, which capture firms' credit demand. Third, we present further evidence by comparing firms with different exposure to international trade, splitting industries between Traded and Non-Traded sectors. Both mechanisms outlined above predict stronger effects in the Traded sector.

Table 6 presents the loan regressions. We find similar results as in the overall sample, across Traded and Non-Traded sectors: Banks with lower pre-1933 silver reserves reduce lending. The coefficients estimates on Traded sectors are larger than those for Non-Traded sectors, however they are not statistically different from each other. The lack of a difference between loans (firms) in Traded and Non-Traded sectors suggests that the exchange rate and Great Depression channels do not drive our results.

B. Selection into high- and low-reserves groups and instrumental variables estimation

An alternative concern might be that silver reserves are not randomly assigned to banks. In fact, they may be correlated with unobserved factors, related e.g. to the banks' clientele and/or business model, affecting lending policies and the probability of labor unrest. Our results so

far considerably raise the bar for a "selection" explanation of this sort. Since we observe *changes* in credit and labor unrest intensity after 1933, whatever unobserved sorting variable may drive our results must change precisely around the start of the Silver Purchase program.

To further alleviate concerns about selection, we resort to instrumental variables estimation. We exploit a unique feature of 1930s China's monetary system, the "parallel" circulation of a traditional currency, issued by the "native" banks, and backed by copper instead of silver. The use of copper as a monetary base dates back to about 1100BC (Kann, (1927, pp. 403-404)). Copper-backed money circulates only locally, and is mainly used to clear small transactions (Tamagna (1942, p. 68)). It is, however, not a trivial quantity: Rawski's (1984) estimates indicate that during the 1930s copper-backed money corresponds to about 20% of the silver-backed monetary base.

We conjecture that the relative abundance of copper at mines near the headquarters of a given *modern* bank determines the availability of copper-backed currency. Further, if people use the copper-backed currency as a substitute for Chinese silver dollars, greater availability of copper should associate with lower silver reserves, as the modern bank may face a lower demand for silver-backed currency for transaction purposes.

We build an index of locally $Available\ copper$ as the natural logarithm of the inverse distance-weighted-average copper capacity in the nearest three copper mines to a bank. To the extent that the availability of copper mines near modern bank headquarters is exogenous to credit provision and labor unrest episodes *in Nanjing, Shanghai, and Tianjin*, our instrument meets the exclusion restriction.

The first-stage regressions reported in Table 7.B validate our conjecture, and the relevance of the instrument: where copper abounds, banks hold smaller silver reserves. The relationship between $Available\ copper$ and silver reserves is economically meaningful:

moving from the bottom to the top $Available\ copper$ decile is associated with a 56% drop in silver reserves. The first-stage F test statistic is also very large, suggesting that our instrument is not weak.

Table 7.A presents the second-stage estimates. They confirm our earlier findings: banks with lower pre-1933 silver reserves reduce credit provision after 1933. The magnitude of the coefficient estimates is in fact very close to the OLS estimates of Table 4, suggesting that any selection bias in those estimates is at best small.

In Tables 8 and 9, we present the results for labor unrest, defining an index of the available copper pool around a given firm in a way analogous to the previous index. The second stage regressions are presented in Table 8.A for labor unrest intensity (log-number of labor unrest episodes) and Table 9.A for log-duration. A larger pool of available silver reserves at the firm's lenders is, again, negatively associated with the probability of riots and labor disputes, and the economic effects implied by these estimates are similar to the ones reported in Section IV, suggesting, again, that our baseline results are not biased.

C. External validity

Because our results are based on data from 1930s China, it is important to determine the extent of their external validity. That depends on two questions: (i) Can modern credit shocks be similar in magnitude to the Chinese one of 1933-35?, and (ii) Will a modern society respond similarly to a shock of similar size?

The answer to the first question is an unambiguous yes. Chinese credit-to-GDP drops by about 15% over 1933-35 (Cheng (2003, Appendix II), and Liu (1946, Table 1)). This value

is very close to the corresponding drops for Finland in 1991 (13%), Turkey in 2000 (18%), Spain in 2010 (10%), all identified by Laeven and Valencia (2012) as recent banking crises.[17]

As for the second question, one key ingredient to the answer is labor mobility. If workers are able to move and seek employment at firms that do not face tight credit, a shock such as the Silver Purchase program should generate less social tensions in a modern economy. Labor mobility in 1930s China, however, is not especially limited compared to modern China. Regulatory restrictions on internal migration, in fact, are less stringent in 1931-35 than today.[18]

Moreover, internal migration is not uncommon in 1930s China. In 1935, immigration inflow (outflow) as a fraction of total population is 16% (13%), quite comparable with the 1995-2000 average of 13% (10%). [19]

Of course, this conclusion must be moderated by a number of other factors beyond the scope of our analysis, such as the government's willingness and ability intervene to attenuate the negative effects of economic shocks.

VI. Conclusions

Using a novel, hand-collected dataset on credit and social unrest in 1930s China, we provide micro-econometric evidence on the impact of credit rationing on social stability. We exploit a natural experiment provided by the 1933 U.S. Silver Purchase program, which, acting as a

[17] Data on credit-to-GDP for these episodes is retrieved from the World Bank's website.

[18] According to the Household Registration Law (*Hu Ji Fa*), passed in 1931, individuals can register at a new location after living there for 6 years, and there is no further discrimination between temporary and permanent residents. In contrast, formally registering as a Shanghai resident in the 2010s requires at least 7 years of residence, minimum professional qualifications and social security contributions; temporary residents, moreover, face severe welfare discrimination (Li and Ren (2011)).

[19] Total Shanghai population for 1935 is retrieved from *Statistics Monthly. No 32. (统计月报，32号),* compiled by Statistics Bureau of the Guangxi (广西省政府统计局). Immigration inflow and outflow are obtained from *Police Monthly* No. 3, Roll 3 (警察月刊，第三期第三卷), compiled by the Shanghai Police Bureau (上海市公安局第一科). Data for modern Shanghai are obtained from Fan (2005), and from the 5th National Population Census of the People's Republic of China.

drain on silver world-wide, generates a monetary and credit contraction in the Republic of China, which is on the silver standard in the 1930s. We find that (i) banks more exposed to the shock (with lower pre-1933 silver reserves) are quicker to cut lending after 1933, and (ii) labor unrest episodes at firms borrowing from exposed banks increase in intensity after 1933, relative to other firms. The level of detail of our micro-data suggests a causal interpretation of our findings. Our evidence is consistent with credit rationing having a material impact on social stability.

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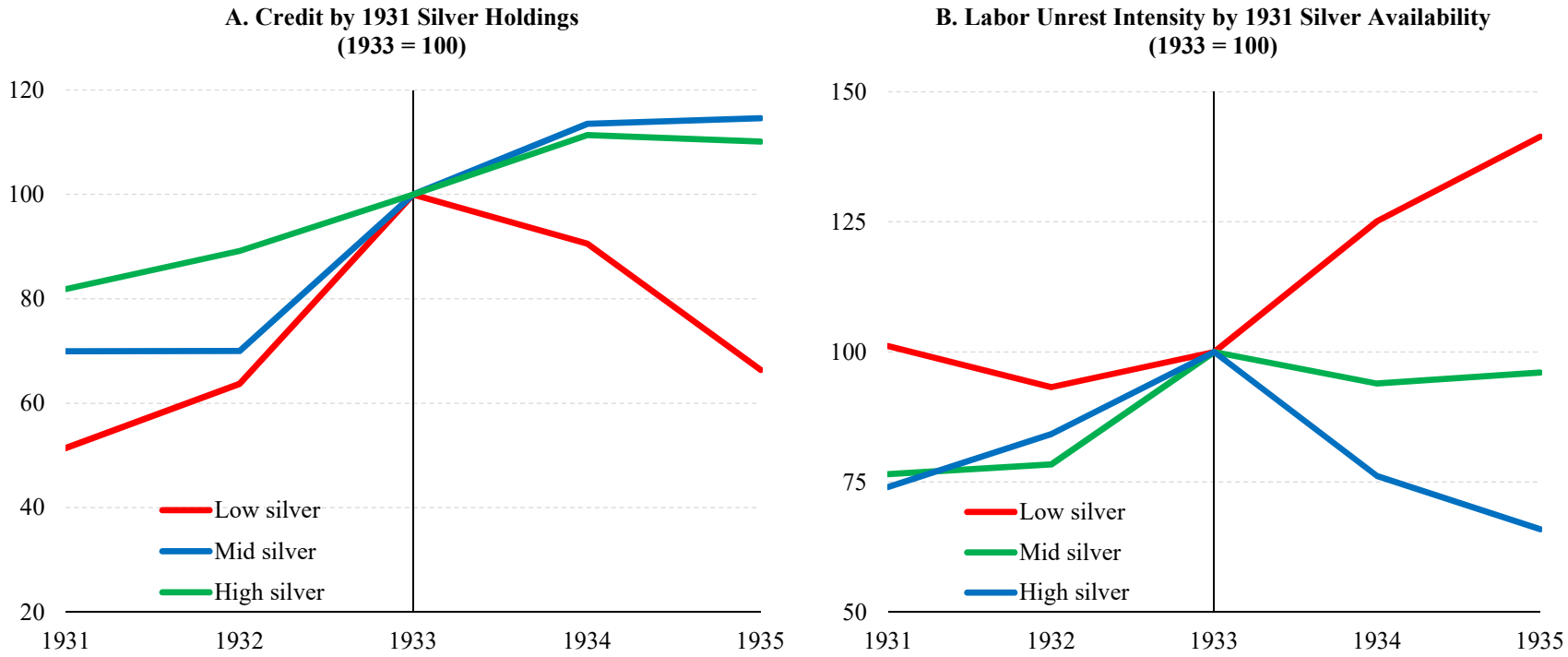

Figure 1 Chinese Credit and Labor Unrest Intensity, 1931-1935
Panel A reports the Chinese banks' aggregate dollar lending over the 1931-1935 period, broken down into components due to banks with low (below 25th percentile), high (above 75th percentile), and medium 1931 silver reserve holdings. All series are normalized such that the 1933 value equals 100. The credit data are based on the bank balance sheet data discussed in Section IV.A. Panel B plots the average number of labor unrest episodes per plant, by the level of silver holdings available at banks in its vicinity, $Available\ silver$, as described in Section IV.B, again normalized such that the 1933 value equals 100. The figures show that, after the Silver Purchase program is initiated, banks with lower pre-shock silver holdings reduce lending relative to banks with larger pre-shock holdings. Furthermore, firms and plants with a greater exposure to the Silver Purchase shock – in the vicinity of banks with lower silver reserves – experience intensified labor unrest episodes after 1933.

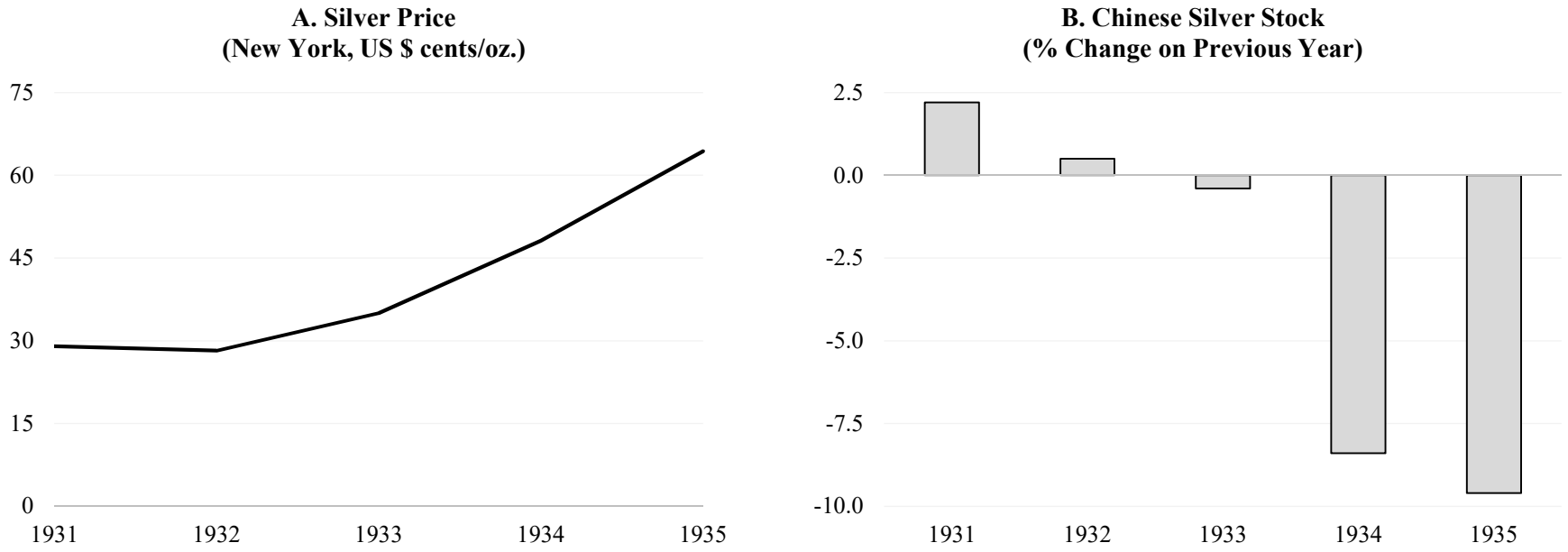

Figure 2 Silver Prices and Changes in Chinese Silver Stock, 1931-1935
Panel A reports the silver price quotes in New York over the period 1931-35 (source: *Financial and Commercial Bulletin of the Bank of China*, 1931-1935). Panel B reports yearly changes in the Chinese stock of silver reserves (source: Rawski (1984)).

Table 1 Bank Balance Sheets and Loans – Summary Statistics
Panel A reports summary statistics on balance sheet data for the Chinese banks in our sample. All figures are expressed in thousands of Chinese dollars. Panel B provides summary statistics for the loan contracts in our sample. Loan amounts are expressed in thousands of Chinese dollars. Loan duration is expressed in months. The monthly interest rate is expressed in percentage points. Number of loans granted to each industry is counted based on observations with identifiable industry information, according to the classification of the International Labor Organization (1923). The data are hand-collected, and retrieved from a number of archival sources described in greater detail in the text.

A. Bank level variables (Chinese $000)					
	N	**Mean**	**St. dev.**	**Min**	**Max**
Bank assets	412	41,897	132,136	67	1,342,242
Equity	421	3,369	8,808	23	103,845
Cash	410	3,304	9,404	0	87,409
Loan	402	25,732	83,867	34	962,871
Notes issuance	412	5,000	18,196	0	179,924
Silver reserves	402	3,515	12,613	0	129,026
Deposits	385	30,681	98,190	8	992,941
Net income	405	348	1,229	-220	14,822

B. Loan contract characteristics					
	N	**Mean**	**St. dev.**	**Min**	**Max**
Loan Amount (Chinese $000)	584	272	756	0.40	9,000
Loan Duration (months)	443	18	20	1	96
Monthly rate (%)	416	0.93	0.34	0.13	4.50

Loan contracts by industry					
Transportation	147	Chemistry	13	Construction	1
Services	125	Retail	9	Wood products	1
Textiles	69	Agriculture	8	Diversified	1
Power & utilities	28	Finance	6		
Specials (hospital, school, etc.)	23	Glass products	4		
Mining	21	Machinery	3		
Food	20	Paper products	2		

Table 2 Labor Disputes – Summary Statistics

The table reports summary statistics on riots from Shanghai and Tianjin and labor disputes from Shanghai and Nanjing in our sample. Panel A summarizes the intensity in terms of number of employees involved and duration. Panel B reports a breakdown of the causes of cases. The riots data in Shanghai are retrieved from surveys "Strikes and lockouts in Shanghai since 1918" (1931-32) and "Strikes and lockouts in Shanghai in recent four years" (1933-35) conducted by the Bureau of social affairs of the city government of greater Shanghai. Riots data in Tianjin are hand collected from several newspapers described in the text. The labor disputes data in Shanghai are retrieved from the survey "Industry Disputes in Shanghai since 1928" conducted by the Bureau of social affairs of the city government of greater Shanghai (1931-32), and analogous surveys published by the journal "International Labor Bulletin" (1933-35). Labor disputes data in Nanjing are retrieved from surveys "Industry Disputes in Nanjing 1932-1934" and "Industry Disputes in Nanjing 1935", published by the "Labor Monthly" journal (Lao Gong Yue Kan).

A. Intensity

	Riots					**Labor Disputes**				
	N	**Mean**	**St. dev.**	**Min**	**Max**	**N**	**Mean**	**St. dev.**	**Min**	**Max**
Employees	318	681	2,556	4	40,000	803	147	554	1	7,673
Duration	315	8	12	0.05	64	792	28	29	2	319
Riot nr.	405					804				

B. Causes (for Shanghai)

Causes	**Riots**	**Labor Disputes**
Employer dismisses workers	85	481
Salary disagreement	108	109
Working conditions	36	74
Union activity	23	16
Other	35	49

Table 3 Silver Reserves and Credit Around 1933 – Bank-Level
The table reports the estimates of:

$$\Delta L_b = \alpha_b + \beta Silver\ reserves_b + \gamma' \Delta x_b + \varepsilon_b$$

The dependent variable is the change in the natural logarithm of the overall loans ($Total\ loans$) extended by bank b around 1933 (average after 1933 minus average prior to 1933). The variable $Silver\ reserves_b$ is the natural logarithm of bank's silver reserves in 1931 (or the value in 1932 if not available, columns (1) to (3)). We alternatively define it as the silver amount in excess to compulsory reserves prior to 1933 in column (4). Columns (5) and (6) apply the same specification as column (3) for small and large banks, respectively (log of total equity below/above the sample median). x is a vector of control variables, including bank size, equity ratio, cash to bank assets ratio, return on assets, and an indicator for no retained earnings. Following Bertrand et al. (2004), the equation is estimated on changes around 1933, after collapsing and time-averaging the data before and after 1933. Specifications (3) to (6) also include banks that do not issue notes throughout the sample period (and add an indicator for no notes issuance). All variables are defined in detail in the appendix. The t-statistics, reported in parentheses, are based on standard errors clustered around banks. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

					Small Banks	**Large Banks**
	(1)	(2)	(3)	(4)	(5)	(6)
Silver	0.252***	0.183***	0.181***		0.147	0.183***
	(4.15)	(3.50)	(3.64)		(0.26)	(3.20)
Excess silver				0.443*		
				(1.88)		
Δ Bank size		0.415***	0.362***	0.316**	0.885*	0.406***
		(5.63)	(5.44)	(1.97)	(1.83)	(3.33)
Δ Equity ratio		-0.017***	-0.009***	-0.005***	-0.002**	-0.019***
		(-4.57)	(-4.22)	(-2.78)	(-2.19)	(-5.51)
Δ Cash ratio		-0.003	-0.003*	-0.001	0.001	-0.001
		(-1.52)	(-1.82)	(-0.71)	(0.31)	(-0.37)
Δ ROA		0.015	0.011*	0.010	0.000	0.004
		(1.05)	(1.88)	(1.58)	(-0.06)	(0.23)
Δ No ret. earnings		-0.003	-0.007	0.053*	-0.053*	-0.034
		(-0.04)	(-0.17)	(1.60)	(-1.87)	(-0.47)
No notes			-0.017	-0.058**	-0.015	0.008
			(-0.61)	(-2.27)	(-0.72)	(0.18)
Intercept	0.071***	0.039	0.053**	0.094***	0.003	0.040
	(3.00)	(1.64)	(2.61)	(4.53)	(0.13)	(1.24)
N	43	42	77	88	35	42
R^2	0.35	0.68	0.60	0.49	0.45	0.68

Table 4 Silver Reserves and Credit around 1933 – Loan-Level
The table reports the estimates of:

$$\Delta L_{bf} = \alpha_f + \beta Silver\ reserves_b + \gamma' \Delta x_{bf} + \varepsilon_{bf}$$

The dependent variable is the change in natural logarithm of loans extended by bank b to firm f (average after 1933 minus average prior to 1933). The variable $Silver\ reserves_b$ is the natural logarithm of bank's silver reserves in 1931 (or the value in 1932 if not available, columns (1) to (3)). We alternatively define it as the silver amount in excess to compulsory reserves prior to 1933 in column (4). x is the vector of control variables used in Table 3. In addition, the regression includes a full set of borrowing firm fixed effects. Following Bertrand et al. (2004), the equation is estimated on changes around 1933, after collapsing and time-averaging the data before and after 1933. Columns (3) and (4) include banks that do not issue bank notes throughout the sample period (and add an indicator for no notes issuance). All variables are defined in detail in the appendix. The t-statistics, reported in parentheses, are based on standard errors clustered around banks. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

	OLS	FE		
	(1)	(2)	(3)	(4)
Silver	0.277***	0.238***	0.234***	
	(3.52)	(2.93)	(3.28)	
Excess silver				0.113**
				(2.11)
Δ Bank size	0.152	0.443	0.426	0.761**
	(0.20)	(1.07)	(1.35)	(2.21)
Δ Equity ratio	-0.180**	-0.017	-0.011	0.035
	(-2.47)	(-0.28)	(-0.42)	(0.95)
Δ Cash ratio	-0.065***	-0.029**	-0.028**	-0.024**
	(-4.95)	(-2.34)	(-2.40)	(-2.19)
Δ ROA	-0.431	-0.190	-0.211	0.040
	(-1.11)	(-0.88)	(-1.21)	(0.25)
Δ No ret. earnings	-0.460	-0.261	-0.244	0.062
	(-0.74)	(-0.38)	(-0.44)	(0.11)
No notes			1.286**	-0.143
			(2.07)	(-0.38)
Intercept	2.004**	-1.255	-1.165*	0.268
	(-2.53)	(-1.57)	(-1.79)	(0.81)
Firm f.e.	N	Y	Y	Y
N	309	233	246	246
R^2	0.03	0.86	0.86	0.86

Table 5 Impact of the Liquidity Shock on Social Unrest
The table reports the estimates of:

$$\Delta Unrest_f = \alpha + \beta Available\ silver_f + \gamma' x_f + \varepsilon_f$$

The dependent variable in panel A is the change in the natural logarithm of the number of labor unrests at firm f (average after 1933 minus average prior to 1933) and in panel B it is the change in the natural logarithm of the number of days in unrest at firm f. We restrict estimation in panel B to Shanghai firms only. The variable $Available\ sil_f$, in columns (1) and (2) is the natural logarithm of bank's silver reserves in 1931 (or the value in 1932 if not available), weighted by the inversed distance between the firm and each bank branches. We alternatively define it as the inverse distance-weighted average of the silver amount in excess to compulsory reserves prior to 1933, in columns (3) and (4). Specifications (1) and (3) include city district, industry and firm nationality fixed effects. Specifications (2) and (4) include city district and firm fixed effects. Following Bertrand et al. (2004), the equation is estimated on changes around 1933, after collapsing and time-averaging the data before and after 1933. All variables are defined in detail in the appendix. The t-statistics, reported in parentheses, are based on standard errors clustered around firms. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

	Panel A: Δ log(1 + Number of Unrest Episodes)			
	(1)	(2)	(3)	(4)
Available silver	-0.251***	-0.325*		
	(-3.73)	(-1.76)		
Excess silver			-0.307***	-0.257
			(-3.98)	(-1.02)
District f.e.	Y	Y	Y	Y
Industry f.e.	Y	N	Y	N
Nationality f.e.	Y	N	Y	N
Firm f.e.	N	Y	N	Y
N	1,743	1,743	1,743	1,743
R^2	0.12	0.99	0.12	0.99

	Panel B: Δ log(1 + Duration)			
	(1)	(2)	(3)	(4)
Available silver	-0.616***	-1.253*		
	(-2.45)	(-1.70)		
Excess silver			-0.673**	-0.819
			(-2.34)	(-1.03)
District f.e.	Y	Y	Y	Y
Industry f.e.	Y	N	Y	N
Nationality f.e.	Y	N	Y	N
Firm f.e.	N	Y	N	Y
N	1,500	1,500	1,500	1,500
R^2	0.08	0.99	0.08	0.99

Table 6 Silver Reserves and Credit around 1933 – Loan-Level – Traded vs. Non-traded Sectors
The table reports the estimates of:

$$\Delta L_{bf} = \alpha_f + \beta Silver\ reserves_b + \gamma' \Delta x_{bf} + \varepsilon_{bf}$$

following the specification as column (2) Table 4 for loans granted to traded and non-traded sectors, respectively. The regression includes a full set of borrowing firm fixed effects. Following Bertrand et al. (2004), the equation is estimated on changes around 1933, after collapsing and time-averaging the data before and after 1933. All variables are defined in detail in the appendix. The t-statistics, reported in parentheses, are based on standard errors clustered around banks. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

	Non-traded	**Traded**	**Non-traded**	**Traded**
	(1)	(2)	(3)	(4)
Silver	0.231**	0.357***		
	(2.66)	(3.34)		
Excess silver			0.118**	0.234***
			(2.33)	(3.07)
Δ Bank size	1.009	-1.397	1.056*	-2.338**
	(1.67)	(-1.61)	(1.88)	(-2.66)
Δ Equity ratio	-0.029	-0.092	0.055	0.105
	(-0.41)	(-1.04)	(0.81)	(1.01)
Δ Cash ratio	-0.027*	-0.050**	-0.026*	-0.057***
	(-2.05)	(-2.49)	(-1.91)	(-3.03)
Δ ROA	-0.192	-0.802	0.157	0.384
	(-0.82)	(-1.41)	(0.81)	(0.63)
Δ No ret. earnings	0.179	-2.498**	0.423	-2.247*
	(0.23)	(-2.28)	(0.54)	(-2.07)
Intercept	-1.137	-2.519**	0.341	-0.296
	(-1.27)	(-2.36)	(0.81)	(-0.67)
Firm f.e.	Y	Y	Y	Y
N	180	53	180	53
R^2	0.88	0.84	0.87	0.84

Table 7 Silver Reserves and Credit around 1933 – Loan-Level – IV Estimation
The table reports the estimates of:

$$\Delta L_{bf} = \alpha_f + \beta Silver\ reserves_b + \gamma' \Delta x_{bf} + \varepsilon_{bf}$$

The variable $Silver\ reserves_b$ is the natural logarithm of bank's silver reserves in 1931 (or the value in 1932 if not available), columns (1) to (2)). We alternatively define it as the silver amount in excess to compulsory reserves prior to 1933 in columns (3) to (4). It is instrumented by copper availability $Available\ Coppe_b$, defined as the natural logarithm of distance-weighted-average copper capacity in the closest 3 copper mines around $bank_b$. The first stage estimation is specified as:

$$Silver\ reserves_b = \alpha Available\ coppe_b + \gamma' \Delta x_{bf} + \varepsilon_{bf}$$

Panel A reports the second stage results and panel B reports the first stage results. x is the vector of control variables used in column (2) Table 4. The regression in columns (2) and (4) include a full set of borrowing firm fixed effects and all variables are time-averaged before and after 1933. All variables are defined in detail in the appendix. The t-statistics, reported in parentheses, are based on standard errors clustered around banks. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Panel A – Loan 2nd stage				
	(1)	(2)	(3)	(4)
Silver	0.314*	0.409*		
	(1.65)	(1.89)		
Excess silver			0.093	0.206**
			(1.61)	(2.06)
Δ Bank size	0.135	0.365	0.202	0.256
	(0.17)	(0.87)	(0.30)	(0.63)
Δ Equity ratio	-0.200*	-0.102	-0.072	0.058
	(-1.82)	(-0.92)	(-1.03)	(0.95)
Δ Cash ratio	-0.067***	-0.039***	-0.059***	-0.038***
	(-4.05)	(-3.27)	(-4.31)	(-3.45)
Δ ROA	-0.493	-0.468*	0.018	0.201
	(-0.99)	(-1.73)	(0.04)	(1.09)
Δ No ret. earnings	-0.491	-0.446	-0.122	-0.061
	(-0.83)	(-0.70)	(-0.19)	(-0.10)
Intercept	-2.369	-1.042	0.113	1.719***
	(-1.32)	(-0.50)	(0.34)	(2.82)
Firm f.e.	N	Y	N	Y
N	309	233	309	233
First-stage F-stat	26.42	9.80	13.62	5.71

Panel B – Loan 1st stage				
	1st stage - Silver		1st stage – Excess silver	
	(1)	(2)	(3)	(4)
Available copper	-4.527***	-3.846***	-15.228***	-7.635**
	(-5.14)	(-3.13)	(-3.69)	(-2.39)
Δ Bank size	1.686	1.563	4.952**	3.636*
	(1.32)	(1.19)	(2.31)	(2.00)
Δ Equity ratio	0.461***	0.471***	0.182	0.160
	(2.92)	(3.01)	(0.66)	(0.67)
Δ Cash ratio	0.076**	0.071***	0.171***	0.137***
	(2.74)	(2.96)	(2.90)	(3.01)
Δ ROA	2.443***	2.392***	2.748*	1.498
	(3.61)	(3.16)	(1.92)	(1.27)
Δ No ret. earnings	0.480	0.383	-2.334	-1.105
	(0.56)	(0.42)	(-1.09)	(-0.53)
Intercept	33.177***	28.797***	84.967***	44.664**
	(7.28)	(4.66)	(3.99)	(2.69)
Firm f.e.	N	Y	N	Y
N	309	233	309	233
R^2	0.59	0.61	0.55	0.45

Table 8 Impact of the Liquidity Shock on Social Unrest – IV Estimation
The table reports the estimates of:

$$\Delta Unrest_f = \alpha + \beta Available\ silver_f + \gamma' x_f + \varepsilon_f$$

following the same specifications as in Table 5. $Available\ silver_f$ is instrumented by copper availability $Available\ copper_b$, defined as the natural logarithm of distance-weighted-average copper capacity in the nearest 3 copper mines to the firm's closest $bank_b$. The first stage estimation is specified as:

$$Available\ silver_f = \alpha\ Available\ copper_b + \gamma' x_f + \varepsilon_f$$

Panel A reports the second stage results. Panel B reports the first stage results. Specifications (1) and (3) include city district, industry and firm nationality fixed effects. Specifications (2) and (4) include city district, and firm fixed effects. All variables are defined in detail in the appendix. The t-statistics, reported in parentheses, are based on standard errors clustered around firms. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Panel A – Social Unrest 2nd stage				
	Δlog(1 + Number of Unrests)			
	(1)	(2)	(3)	(4)
Available silver	-0.611**	-0.522		
	(-2.17)	(-1.13)		
Excess silver			-0.700**	-0.599
			(-2.16)	(-1.15)
District f.e.	Y	Y	Y	Y
Industry f.e.	Y	N	Y	N
Nationality f.e.	Y	N	Y	N
Firm f.e.	N	Y	N	Y
N	1,743	1,743	1,743	1,743
First stage F-stat	132.94	14.06	138.30	17.22

Panel B – Social Unrest 1st stage				
	1st stage Available silver	1st stage Available silver	1st stage Excess silver	1st stage Excess silver
	(1)	(3)	(2)	(4)
Available copper	-0.138***	-0.099***	-0.120***	-0.087***
	(-11.53)	(-3.75)	(-11.76)	(-4.15)
District f.e.	Y	Y	Y	Y
Industry f.e.	Y	N	Y	N
Nationality f.e.	Y	N	Y	N
Firm f.e.	N	Y	N	Y
N	1,743	1,743	1,743	1,743
R^2	0.89	0.56	0.93	0.02

Table 9 Impact of the Liquidity Shock on Social Unrest – IV Estimation - Duration
The table reports the estimates of:

$$\Delta Duration_f = \alpha + \beta Available\ silver_f + \gamma' x_f + \varepsilon_f$$

following the same specifications as in Table 5. We restrict the sample to Shanghai firms only. $Available\ silver_f$ is instrumented by copper availability $Available\ copper_b$, defined as the natural logarithm of distance-weighted-average copper capacity in the nearest 3 copper mines to the firm's closest $bank_b$. The first stage estimation is specified as:

$$Available\ silver_f = \alpha\ Available\ copper_b + \gamma' x_f + \varepsilon_f$$

Panel A reports the second stage results. Panel B reports the first stage results. Specifications (1) and (3) include city district, industry and firm nationality fixed effects. Specifications (2) and (4) include city district, and firm fixed effects. All variables are defined in detail in the appendix. The t-statistics, reported in parentheses, are based on standard errors clustered around firms. The symbols *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels.

Panel A – Social Unrest 2nd stage				
	Δlog(1 + Duration)			
	(1)	(2)	(3)	(4)
Available silver	-2.616***	-1.053		
	(-2.51)	(-0.66)		
Excess silver			-3.005***	-1.113
			(-2.49)	(-0.64)
District f.e.	Y	Y	Y	Y
Industry f.e.	Y	N	Y	N
Nationality f.e.	Y	N	Y	N
Firm f.e.	N	Y	N	Y
N	1,500	1,500	1,500	1,500
First stage F-stat	129.73	14.67	115.99	17.14

Panel B – Social Unrest 1st stage				
	1st stage Available silver	1st stage Available silver	1st stage Excess silver	1st stage Excess silver
	(1)	(3)	(2)	(4)
Available copper	-0.167***	-0.093***	-0.145***	-0.088***
	(-11.39)	(-3.83)	(-10.77)	(-4.14)
District f.e.	Y	Y	Y	Y
Industry f.e.	Y	N	Y	N
Nationality f.e.	Y	N	Y	N
Firm f.e.	N	Y	N	Y
N	1,500	1,500	1,500	1,500
R^2	0.42	0.56	0.38	0.16

Appendix A. Interpreting the effects of the Silver Purchase program: framework

A.1 Economic historiography of the Silver Purchase program

The argument that the Silver Purchase Program had negative effects on the Chinese economy can be traced back to contemporary commentators such as Lin (1936, pp. 5-77) and Leavens (1939, pp. 293-312).

Friedman and Schwartz (1963) and Friedman (1992) argue that the Silver Purchase program had a devastating effect on the Chinese economy. As silver was at the basis of the Chinese monetary standard, the outflow of silver corresponded to both a sharp contraction in the money supply and an appreciation of the Chinese dollar vis-à-vis major foreign currencies. The decline in money supply produced a sharp reduction of imports, domestic consumption, and investment. At the same time, the rising silver prices corresponded to an appreciation of the Chinese dollar, with detrimental effects for the export sector. As the Chinese dollar kept appreciating, exports fell dramatically. Compared to 1929, the export value of China's major goods such as silk and tea was down by 65% in 1935 (Yu, 1937, pp. 224-225).

Brandt and Sargent (1989) recognize that the Silver Purchase program led to an increase of silver prices and an outflow of silver from China. However, they argue that the program had mainly an effect on relative prices, but not on the real economy. With higher silver prices, Chinese banks could back up the same, or an even larger, amount of paper money with any given amount of silver. Chinese banks exploited the arbitrage opportunity offered by higher silver prices and sold part of the silver abroad. As the law allowed them, they substituted their silver reserves with Republic of China treasury bonds.

The Brandt and Sargent (1989) argument rests on two assumptions. First, from the perspective of investors, Chinese treasury bonds were "as good as silver" to back up the currency (i.e. the perceived risk of the government default was very low). This has become known as the "real bills" doctrine (e.g. Sargent and Wallace (1982)). Second, prices in China were flexible enough to insulate the real economy from any adverse effect driven by the outflow of silver and deflation. Consistent with this hypothesis, they show that in China M1 declines as a result of the outflow of Silver, but M2 remains constant or even increases during the 1930s. They also present macroeconomic evidence showing only a mild decline in GPD and other macroeconomic aggregates.

Burdekin (2008) presents evidence in line with the Friedman and Schwartz (1963) and Friedman (1992) hypothesis. He highlights how geographical differences in China are important in explaining the unfolding of the silver shock. Shanghai, for instance, received large quantities silver from the interior and, as a result, it was partially isolated from the shock until 1934. Internal areas experienced a sharp outflow of silver starting in 1933 which lead banks to financial distress and sharply reduced the price level. He also presents macro time series evidence that links the silver purchase program to deflation, exchange rate appreciation and banks distress in China

At the end of the day, whether or not the Silver Purchase program had an impact on the Chinese real economy remains an empirical question. We examine in our tests a specific

consequence of it: the silver outflow's effect on credit provision and social order. To the extent that silver was used to back the currency, an outflow of silver would drain banks of the necessary resources needed to support lending, thus leading to a credit crunch. Below we present a simple model, nesting the Friedman and Schwarz (1963) and Brandt and Sargent (1989) interpretations, that can be directly linked to our empirical analysis.

A.2 Impact of the Silver Purchase program on lending – theory

We consider a simple model illustrating the impact of the Silver Purchase program on the Chinese credit market, both under the Friedman and Schwartz (1963) and Friedman (1992) interpretation and the alternative interpretation of Brandt and Sargent (1989).

In 1930s China, modern banks serve two key roles: they generate the money supply, by issuing bank notes, and credit, by making loans. Consider for simplicity a bank financed entirely by bank notes, in an amount N. Under a pure silver standard, bank notes should be 100% backed by an equivalent amount of silver. In practice, the law allows the bank to issue a volume of notes larger than its silver reserves S, such that the silver reserves ratio $\sigma = S/N$ is greater than $\bar{\sigma} = 60\%$. The remaining $(1-\sigma)N$ is "collateralized" by treasury bonds with a total face value B. We allow banks to convert bonds with notes valuing bonds at their face value, which we normalize to 1.[20]

Suppose now that treasury bonds can be purchased on the market at a price $p_B \leq 1$, so that the market value of the bank's reserves is $S + p_B B$.[21] Having issued bank notes for a value N, the bank has a surplus $N - S - p_B S$ that can generate loans L; simple manipulations show that $L = (1-p_B)\frac{1-\sigma}{\sigma}S$. Thus, if government bonds trade at their face value and $p_B = 1$ (or if a 100% silver reserve is mandated), in this simplified setting the bank only generates the money supply, but not credit. This situation corresponds to the interpretation of Brandt and Sargent (1989), where shocks to the silver supply will not have any impact on lending.

The ability to make loans derives from the "arbitrage" between the face and market value of the non-silver collateral. However, to the extent that the bank's silver reserves do not cover the full amount of bank notes in circulation N, the bank is exposed to a "run." If all holders of notes want to convert them into silver, the bank has a silver shortage $(1-p_B)(1-\sigma)N$. Let π denote the probability of a run, and assume that the bank faces a

[20] This assumption is based on historical evidence. Cheng (2003, p. 160) reports that the banks converted bonds with notes valuing the bonds at their face value (even when they were traded below par), but usually bonds were recorded on the assets of the banks at their market values. Between 1927 and 1928, the Nationalist government also introduced legislation intended to regulate the banking sector. In particular, the registration of new financial institutions had to follow new and detailed procedures, and banks were subject to capital requirements (Chen, 2003, p. 90-91). The government also created a banking supervisory authority, called Bureau of Financial Supervision, with the intention of investigating the business of the all Chinese banks. However, the authority never had neither the power nor the capacity to carry out its duties. While the four government banks covered a relevant role in placing treasury bonds on the market, there was no modern central bank entrusted to set interest rates or regulate the money supply.

[21] We are using silver as the numeraire, so that p_B is in fact the market price of government bonds relative to the market price of silver.

quadratic cost $\frac{\gamma}{2}[(1-p_B)(1-\sigma)N]^2$ in the event of a run. This can be interpreted either as the bank requiring an equity injection to overcome the shortfall or as an early liquidation of the outstanding loans.

Summing up, the bank finances with an amount of notes N its investment in reserves $S + p_B B$ plus loans L, facing the expected cost of a run equal to $\pi\frac{\gamma}{2}[(1-p_B)(1-\sigma)N]^2$. Denoting the marginal return on loans by r_L, the bank's profit function is thus: $\Pi(\sigma, S) = r_L L + S + p_B B - N - \pi\frac{\gamma}{2}[(1-p_B)(1-\sigma)N]^2$. Expressing all the relevant quantities in terms of S and the reserve ratio σ, the bank's problem is:

$$\max_{\sigma}(r_L - 1)(1-p_B)\frac{1-\sigma}{\sigma}S - \pi\frac{\gamma}{2}\left[(1-p_B)\frac{1-\sigma}{\sigma}S\right]^2. \quad \text{(A.1)}$$

The bank's optimal reserve and lending policy is thus determined, subject to the reserves constraint $\sigma \geq \bar{\sigma} = 60\%$.

Assume, as in Khwaja and Mian (2008), a linear loan demand $r_L = \bar{r} - \alpha_L L$, which the bank takes as given (i.e. a competitive credit market). Under this assumption, solving (B.1) the bank holds a fraction of silver reserves:

$$\hat{\sigma} = \max\left\{\bar{\sigma}, \left[1 + \frac{\bar{r}-1}{S(1-p_B)(\alpha_L + \pi\ )}\right]^{-1}\right\}. \quad \text{(A.2)}$$

If the reserves constraint is not binding, it will make an amount of loans equal to:

$$\hat{L} = (\alpha_L + \pi\gamma)^{-1}(\bar{r} - 1). \quad \text{(A.3)}$$

If the reserves constraint is binding, $\hat{\sigma} = \bar{\sigma}$ and the bank makes an amount of loans:

$$\hat{L}' = (1-p_B)\frac{1-\bar{\sigma}}{\bar{\sigma}}S. \quad \text{(A.3')}$$

Thus, if collateral other than silver is "as good as silver" ($p_B = 1$), as assumed by Brandt and Sargent (1989), shocks to the silver supply cannot affect the credit market – they just affect the money supply. In contrast, if $p_B < 1$, shocks to the silver supply will be reflected in the credit supply as soon as the reserves constraint becomes binding.

These observations allow us to understand the impact of the Silver Purchase. Suppose that the above model is played over two dates $t = 0, 1$ (before and after the Silver Purchase). At each date the bank can lend on the credit market, and firms demand loans; assume that, prior to the Silver Purchase, the bank's reserves constraint is not binding, i.e. $S > \bar{\sigma}N$, and the credit market equilibrium is described by (B.3).

At $t = 1$, the bank's silver reserves are hit by a shock bringing them down to $S - \Delta S$, so that the bank might need to adjust its lending decisions.[22] The shock to reserves captures the attempt by notes holders to convert them into silver, to profit from the Silver Purchase. It is apparent from the above expressions that the silver shock will affect equilibrium loans only if

[22] Equivalently, one could rewrite the model having the bank purchase additional silver on the market in order to make new loans, so that a rise in the market price of silver restricts the lending supply. This would have identical predictions on the impact of the Silver Purchase program on banks with high and low ex ante silver reserves (in this case, of course, the numeraire would necessarily be a variable other than silver, e.g. the government debt).

the bank becomes constrained; this requires $(S-\Delta S)<\bar{\sigma}(N-\Delta S)$, i.e. $\Delta S>\frac{\bar{r}-1}{(1-\bar{\sigma})(1-p_B)(\alpha_L+\pi\gamma)}$. In that case, the change in equilibrium lending becomes:

$$\Delta\hat{L}=(1-p_B)\frac{1-\bar{\sigma}}{\bar{\sigma}}(S-\Delta S)-\frac{\bar{r}-1}{\alpha_L+\pi\gamma}. \quad \text{(A.4)}$$

Thus, a lower pre-1933 level of silver reserves S is associated with a larger reduction in lending $\Delta\hat{L}$.

To take the above expression to the data, we follow Khwaja and Mian (2008) and Schnabl (2012) and we assume that, while each bank i lends to only one firm j, any given firm can borrow from multiple banks. Furthermore, we allow for a shock to loan demand bringing it to $\bar{r}_j+\Delta\bar{r}_j-\alpha_L L$, so that the above expression becomes:

$$\Delta L_{ij}=(1-p_B)\frac{1-\bar{\sigma}}{\bar{\sigma}}(S_i-\Delta S)-\frac{\bar{r}_j+\Delta\bar{r}_j-1}{\alpha_L+\pi\gamma}. \quad \text{(A.5)}$$

We thus estimate, in section IV.A:

$$\Delta L_{ij}=\delta S_i+\eta_j+\varepsilon_{ij}, \quad \text{(A.6)}$$

i.e. regress changes in loans from bank i to firm j around the Silver Purchase program on the bank's pre-shock silver holdings S_i, including borrowing firm fixed effects η_j. As we discuss in the text, the above is equivalent to a differences-in-differences setup, where the bank's pre-Silver Purchase program silver reserves are the continuous treatment.

Appendix B. Variable Definitions

Variable	Definition
Total loans	The natural logarithm of 1 plus the total annual amount of outstanding loans of a given bank in a given year.
Loan amount	The natural logarithm of 1 plus the loan amount granted by a given bank to a given firm.
Number of unrests	The number of labor unrests that occur at a given plant in a given year.
Duration	The number of days under labor unrest that a given plant experiences in a given year.
Silver	The natural logarithm of 1 plus the silver reserves of a given bank in 1931, or the earliest available date prior to 1933 (in our sample, never later than 1932).
Excess silver	The natural logarithm of 1 plus the silver reserves in excess to compulsory reserves prior to 1933.
Available silver	The natural logarithm of the inverse distance-weighted average silver reserves around a given firm's plant. For each firm plant f in the sample, it is computed as: $$Available\ silve_{\ f} = \sum_{b} \frac{Silver_b/d(f,b)}{\sum_b 1/d(f,b)}$$ where $Silve_{\ b}$ denotes the silver reserves of bank b as of 1931, or 1932 if not available, and $d(f,b)$ the distance between plant f and bank b (measured in km).
Available copper (Loan)	The natural logarithm of the inverse distance-weighted average copper capacity of the nearest 3 copper mines around a given bank.
Available copper (Labor unrest)	The natural logarithm of the inverse distance-weighted average copper capacity of the nearest 3 copper mine to a given firm's closest bank.
Bank size	The natural logarithm of 1 plus a given bank's equity (log of Ch$ 10 MM).
Equity ratio	Equity divided by total assets (expressed in percentage points).
Cash ratio	Cash holdings divided by total assets (expressed in percentage points).
ROA	Net income divided by total assets (expressed in percentage points).
No ret. earnings	Indicator variable equal to 1 if a bank has 0 retained earnings in a given year, and 0 otherwise.
No notes	Indicator variable equal to 1 if a bank has not issued any bank notes, and 0 otherwise.