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M E X I C O

Financial Market Discipline in Early 20th Century Mexico[1]

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Abstract

We test for the presence of market discipline in the banking sector in early 20th century Mexico. Using a panel of financial data from note-issuing banks between 1905 and 1910, we examine whether bank fundamentals influenced the pattern of withdrawals. When we do not control for exit, our estimation suggests that fundamentals were not a significant determinant of depositor behavior. Instead, bank specific fixed effects and systemic risk seem to have been the most important determinants of net changes in deposits. However this period included the banking crisis of 1907, and the subsequent exit of several banks, indicating that a sample selection bias may exist. Our results change substantially when we use a two step estimator to take this bias into account. We show that fundamentals were indeed an important determinant of bank withdrawals in this period, clearly indicating the existence of market discipline.

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1 Introduction

Recently, a great deal of attention has been paid to the issue of market discipline in the banking sector. Market discipline refers to the discriminating behavior on the part of private agents with respect to the risk taking behavior of individual banks. For example, riskier banks may need to offer higher interest rates to depositors in order to attract funds. Creditors may penalize excessive bank risk taking by withdrawing deposits.

Market discipline is an important ingredient in the design of optimal arrangements for supervision and prudential regulation of the banking industry. Indeed, as Martinez Peria and Schmukler (1998) point out, enabling market discipline may have several benefits. First, it may mitigate the moral hazard and excessive risk taking which is associated with the presence of deposit insurance and lender of last resort services. Second, the presence of market discipline may contribute to increased bank efficiency by pressuring relatively inefficient banks to become more efficient or to exit the industry. And third, enhancing market discipline may help to reduce the cost of government supervision and regulation.

In this paper we test for the existence of market discipline for note-issuing banks in early 20th century Mexico. We construct a panel data set with quarterly observations for twenty eight banks between 1905 and 1910 and focus on how changes in bank fundamentals { over time and across banks { affect bank deposits. We follow Martinez Peria and Schmukler (1998) in controlling for the macro-economic environment in which banks operate as well as for the behavior of deposits in the overall banking system. We also control for certain bank-specific effects. Moreover, in contrast to the earlier literature, we specifically take into account the selection bias introduced by the fact that four banks in our sample stopped functioning as note issuing banks in the period under study. Our data set is unique in that it contains data on banks after they ceased to issue notes and were converted into mortgage houses. This allows us to estimate the probability of exit and to condition on it while testing for the presence

of market discipline.

Several papers have found evidence of market discipline in historical and contemporary economies. Gorton (1999) shows that for the U.S., the discount on private bank notes between 1839 and 1858 was related to measures of riskiness of the issuing banks. For more recent times, Baer and Brewer (1986), Hannan and Hanweck (1988), Ellis and Flannery (1992), and Cook and Spellman (1994), find evidence that the market for uninsured and even insured deposits exacts a price for risk taking on behalf of banks. Goldberg and Hudgins (1996) show that the volume of uninsured deposits also depends on the health of deposit institutions. Park (1995) and Park and Peristiani (1998) demonstrate that an institution's risk taking behavior has an effect on both the price of and the demand for its uninsured deposits. According to Flannery and Sorescu (1996), the premium on subordinated notes and debentures is related to balance sheet measures of risk of bank holding companies. For emerging markets in Latin-America, both Schumacher (1996) and Martinez Peria and Schmukler (1998) find evidence of market discipline in the banking industry.

On the other hand, Billett, Garfunkel and Neal (1998) report that banks are able to circumvent the costs of increased risk-taking by increasing insured deposits at the expense of uninsured deposits. D'Amato, Grubisic and Powell (1997) show that contagion between banks, not market discipline, was an important determinant of depositor behavior in the 1994-95 banking crisis in Argentina.

Our results are as follows. We find considerable evidence of market discipline in early 20th century Mexico: bank fundamentals influenced depositor behaviour in a statistically significant manner. Controlling for the selection bias induced by exit is crucial in obtaining this result. If we do not account for this, bank fundamentals are not a significant determinant of depositor behaviour and the evidence for market discipline is very weak. However, using a two step estimator to control for selection bias reveals that bank fundamentals are indeed an important influence on deposits, suggesting that market discipline did play a role in determining depositor behavior.

Our results are important for three reasons. First, in the early 1900s, Mexico's economy was very similar to that of several current emerging market economies. After half a century of internal turmoil and armed con°icts with external powers, the government of Por¯rio Diaz (1876-1911) brought a period of unprecedented political stability to Mexico. The capital account was completely unrestricted. The development of the domestic ¯nancial system - albeit modest - and a boom in international investment translated into strong economic growth. At the same time, the economy was left highly vulnerable to external shocks. All of these are features that characterize today's emerging economies. Hence, our results and methodology may bear relevance to the study of market discipline in contemporary developing economies.

Second, our results imply that, when testing for market discipline in the banking sector, it is crucial to consider the selection bias introduced by exiting banks. Studies that do not account for such sample bias may yield misleading results.

Finally, our results shed some doubt on a thesis regarding the e±ciency of the Mexican banking system under Por¯rio Diaz put forward in Robitaille (1997). She studies the Banco Central, a private payments system that ensured at par circulation of the notes issued by Mexican state banks between 1899 and 1913 and contends that

> \considerable government intervention weakened the disciplinary role of Banco Central and thus made the system more prone to collapse."

However, the state banks covered by Banco Central constitute a large part of our sample and were - as we show - subject to market discipline. Hence, even if government intervention impaired the disciplinary role of the Banco Central, banks were still exposed to other disciplinary forces - those exacted by depositors. Therefore Robitaille's thesis may be an overstatement.

The remainder of the paper proceeds as follows. Section 2 lays out the historical background, while Section 3 presents the empirical speci¯cation. Section 4 describes the data and discusses the choice of explanatory variables. Section 5 then presents the estimation results. Concluding remarks are o®ered in Section 6.

2 Historical Background[1]

Following independence from Spain in 1821, Mexico went through a 50 year period of political instability, fueled by internal turmoil and wars with external powers. In 1876 General Porfirio Diaz seized power and was subsequently elected president, a position he held until the revolution in 1910. The "Porfiriato" was a period of political stability and economic growth. Internal tariffs were abolished, restrictions on international trade and investment were lifted, and the transport infrastructure was greatly expanded. The period was also characterized by development of the financial sector, albeit limited compared to other countries.

In the early 1900s, note-issuing banks were the predominant type of depository institution in Mexico, with banks of issue accounting for 92 percent of assets of chartered banks in 1897 (Robitaille 1997). There existed two types of banks of issue, "national" banks and "state" banks. The former were allowed to operate throughout the country, whereas the latter could not branch out of specific regions. There were two national banks: the Banco Nacional de Mexico (BANAMEX) and the Banco de Londres y Mexico, which together accounted for 80% of the assets of the banking system in 1897. BANAMEX, which had been created to secure international funding for Porfirio Diaz' government, enjoyed several special privileges. The minimum denomination of its notes was five times smaller than that of other banks, it was subject to a smaller specie reserve requirement than other banks, and only its notes were accepted by the Treasury for tax payments. In addition BANAMEX, unlike other banks, was allowed to use government bonds to back its notes.

Unlike the national banks, state banks were not allowed to branch outside specific - sometimes overlapping - regions, and were prohibited from operating in Mexico City. By 1906 there were 29 chartered note issuing banks, including the national banks (Robitaille 1997). Both types of banks issued notes which were backed by specie and

[1] This section relies heavily on Luce Jordan (1999), Maurer (1997), and Robitaille (1997), who provide extensive accounts of the history of Mexico's financial sector.

deposits. However, while the notes issued by the national banks circulated at par throughout the country, that was initially not the case for state bank notes. Indeed, the branching restrictions made it difficult for state banks' notes to be accepted widely.[2]

In 1898 a group of 13 state banks created the Banco Central, with the intention of ensuring at par redemption of state bank notes in Mexico City. Banco Central operated much like the Suffolk Bank System of New England. Its operations greatly enhanced the acceptability of notes issued by state banks, and by the early 1900s, these notes circulated at par throughout the country. In 1904 the Banco Central established a limited mutual assistance scheme to provide additional protection to holders of notes issued by state banks. Under this scheme, if any member bank faced a bank run or had liquidity problems, it could utilize resources from a fund created for this purpose by all contributing members. Each member contributed 2% of the book value of its capital and had insurance cover up to 50% of the book value of its capital. The Banco Central also acted as a financial institution for Mexico City in its own right.

Until 1905, Mexico operated under a bimetallic standard, with a flexible exchange rate between gold and silver specie, the latter being the predominant commodity money circulating in the country. In 1905, the country joined the gold standard and fixed the exchange rate between silver and gold coins. However, between 1905 and 1907, the price of silver increased by about 17% and the real exchange rate between silver and gold appreciated considerably. Hence the book value of banks' capital, which consisted to a large extent of silver specie, rose drastically. This led banks to expand the volume of oustanding notes and increase the money supply. In addition,

[2] This distinctive institutional structure of the banking system in Mexico resulted from the divergent views of two finance ministers during the Porfiriato, Manuel Dublan (1886-1891) and Jose Limantour (1893-1910). The former favored a competitive banking system on the lines of the United States and encouraged the development of regional banks to compete with the national banks. The latter, however, was concerned about the stability of the banking system and perpetuated the special status of national banks. For more details on the development of the Mexican financial system see Maurer (1997) and Luce (1999).

they also expanded their scale of operations by attracting additional capital in the form of new shares { to a great extent held by foreigners.

In October 1907, a crisis hit the U.S. banking industry, brought on by a sharp decline in the international price of copper. Banks which had invested in copper futures su®ered heavy losses. This crisis also interrupted capital °ows to Mexico. As a consequence, domestic interest rates rose drastically from 6 to 10 percent. The price of government bonds in international markets declined from 34 to 31 pounds sterling. The price of silver also dropped by 25% between 1908 and 1910. This reversed the e®ects of the earlier appreciation and was a further cause of capital out°ow. In addition, region speci¯c factors, such as a decline in the price of hemp and droughts in some areas, exacerbated these problems for banks which operated in predominantly agricultural areas.

Several banks faced problems in honoring their liabilities. The Banco de Oaxaca was forced to declare bankruptcy in 1909, as was the Banco de Chiapas. The Banco de Morelos and the Banco de Aguascalientes su®ered bank runs. The latter was purchased by the Banco de Jalisco in December 1908. The Banco de Sonora took heavy losses when several of its clients in the mining industry declared bankruptcy. Two banks in the Yucatan were a®ected by the hemp crisis and were merged into one in 1908. The Banco de Campeche and the Banco de Michoacan went bankrupt, and subsequent government intervention converted them into mortgage banks. By 1909, seven of twenty-nine note-issuing banks had faced government intervention, been bought by another bank or closed down. The government also bailed out the Banco Central when it faced severe liquidity problems in 1908.

Given that there was repeated government intervention in the banking system, and that the Banco Central operated an insurance scheme for its member banks, one might expect that private agents had little incentive to impose discipline on the Mexican banking industry in this period. In addition, loans by regional banks were often highly concentrated by industry, as a consequence of the poor diversi¯cation of

the regional economy. This left them more vulnerable to macroeconomic shocks. We now turn to a formal test of the hypothesis of market discipline.

3 The Empirical Specification

We test for the presence of discipline in the market for short term deposits in the last seven years of the "Porfiriato" by studying the evolution of deposits for twenty seven note-issuing banks and the Banco Central.[3] In particular, we test whether deposits respond to changes in bank fundamentals measuring idiosyncratic risk. We follow Martinez Peria and Schmukler (1998) in controlling for systemic risk in the banking sector as well as for macroeconomic indicators. We also control for certain bank-specific effects, reflecting the type of bank { national versus state { and certain regional factors. The latter are important because of the branching restrictions on state banks which imposed a severe constraint on state banks' ability to diversify their portfolio.

Moreover, and in contrast to the earlier literature, we explicitly account for the selection bias introduced by banks that exit the industry during the period under study. These banks were restructured and continued operating as mortgage banks, but were prohibited from issuing notes and taking deposits. Hence, we have data for these banks after they stopped being deposit institutions and can therefore estimate the probability of exit.

We want to estimate the following equation

$$W_{it} = \alpha + \beta' SYS_t + \gamma' MACRO_t + \delta' BANK_{it-1} + \mu' DTYPE_i + \eta' DZONE_i + u_{it}: \quad (1)$$

Here W_{it} represents the change in deposits of bank i between time t and $t-1$. SYS_t

[3] Although there were 29 note issuing banks in this period, we drop Banco de Oaxaca and Banco de Chiapas from our sample, for reasons that we shall present in the next section. In addition, the two banks in the Yucatan which were merged in 1908 are treated as one throughout the sample.

stands for the systemic risk in the banking system, while $MACRO_t$ is a vector of macro-economic variables. Both systemic risk and macroeconomic variables change over time but are common for individual banks. $BANK_{it\,i\,1}$ is a vector of bank fundamentals. This vector is included with a lag, to account for the fact that information on balance sheet is available to the public with some delay. Finally, $DTYPE_i$ is a dummy variable indicating whether bank i is a national or a state bank or the Banco Central, while $DZONE_i$ is a dummy for the geographical region in which bank i operates.

The selection problem arises because we do not observe W_{it} for the entire sample of banks. Indeed, we know changes in deposits at time t only for those banks that did not exit at the end of time t ¡ 1. Hence the variable W_{it} is truncated and we only observe it conditional on the fact that the bank was functioning in the period. In other words, the equation we have to estimate is

$$W_{it}|_{B_iCO} = \alpha' SYS_t + \beta' MACRO_t + \gamma' BANK_{it\,i\,1} + \mu' DTYPE_i + \delta' DZONE_i + u_{it}|_{B_iCO_t}; \tag{2}$$

where $W_{it}|_{B_iCOt}$ denotes the change in deposits, conditional on the fact that bank i continues to operate at time t: The error term in this equation is unlikely to be mean zero and the estimates are likely to be biased. We use the Heckman (1979) two step estimator to estimate this bias by determining D_{it}; the probability that bank i operates at time t, on the basis of certain bank indicators. To do so we de¯ne

$$D^{\alpha}_{it} = \phi' X_{it} + v_{it}; \tag{3}$$

where D^{α}_{it} is a latent variable, the value of which determines whether bank i continues functioning. X_{it} is a matrix of variables that can be observed for all banks at all times, independent of whether they are functioning as a deposit institution or a mortgage house. D^{α}_{it} is not observable, but we de¯ne the observable dummy variable D_{it} as

follows:

$$D_{it} = 1 \quad if \quad D_{it}^{\alpha} > 0$$
$$D_{it} = 0 \quad if \quad D_{it}^{\alpha} < 0:$$

D_{it} indicates whether bank i issues deposits at time t or not

In addition we assume that the error terms have a bivariate normal distribution, i.e.

$$\begin{pmatrix} u_{it} \\ v_{it} \end{pmatrix} \sim BVN\left(0; \begin{bmatrix} \sigma_u^2 & \sigma_{uv} \\ \sigma_{uv} & \sigma_v^2 \end{bmatrix}\right) \forall i, \forall t. \tag{4}$$

Given the specification of the selection equation and the assumptions on the distribution of the error terms, we can write the conditional expectation of the error term in (2) as

$$\begin{aligned} E(u_{it}|_{B_i CO}) &= E(u_{it}|D_{it} = 1) \\ &= E(u_{it}|v_{it} > -\gamma' X_{it}) \\ &= \frac{\sigma_{uv}}{\sigma_v}\left(\frac{\phi\left(\frac{-\gamma' X_{it}}{\sigma_v}\right)}{\Phi\left(\frac{\gamma' X_{it}}{\sigma_v}\right)}\right) \end{aligned} \tag{5}$$

where $\phi(\cdot)$ and $\Phi(\cdot)$ denote the standard normal density and distribution respectively.

Substituting (5) into (2) we get

$$\begin{aligned} W_{it}|_{B_i CO} = {} & \alpha' SYS_t + \beta' MACRO_t + \delta' BANK_{it-1} + \mu' DTYPE_i + \\ & \eta' DZONE_i + \theta\left(\frac{\phi\left(\frac{-\gamma' X_{it}}{\sigma_v}\right)}{\Phi\left(\frac{\gamma' X_{it}}{\sigma_v}\right)}\right) + \varepsilon_{it}; \end{aligned} \tag{6}$$

where

$$\tilde{A}\left(\frac{\circ\!\!\int X_{it}}{\sigma_v}\right) = \frac{\phi\left(\frac{\circ\!\!\int X_{it}}{\sigma_v}\right)}{\Phi\left(\frac{\circ\!\!\int X_{it}}{\sigma_v}\right)}$$

$$\lambda = \frac{\sigma_{uv}}{\sigma_v};$$

and ε_{it} is an error term orthogonal to the other variables.

Our estimation therefore proceeds in two steps. We first estimate the vector $\frac{\circ}{\sigma_v}$ by a probit on (3) and use it to construct a measure of the bias. Using this estimate of the bias, we estimate the coefficients of (6) for banks which functioned through the sample period. This gives us consistent estimates of the parameters.

4 Data

As mentioned earlier, we use quarterly data on 27 of the 29 note issuing banks, and the Banco Central, from 1905 to 1910. Banco de Chiapas and Banco de Oaxaca were dropped from the sample because no information about them is available after they went bankrupt in 1908, and hence they could not be included in the probit. However, since these were very small banks[4] their exclusion is unlikely to affect our estimations significantly. In addition we only have data for the Banco de Guerrero from its inception in the third quarter of 1906 to the first quarter of 1910.[5] The starting date of the sample was chosen to coincide with the adoption of the gold standard.

[4] Banco de Chiapas accounted for 0.17% of the total assets of the banking system between 1905 and 1908. The corresponding figure for Banco de Oaxaca was 0.68%.

[5] While we have data for the third quarter of 1910 as well, the data for the second quarter are missing. Thus some variables which measure changes between the second and the third quarters cannot be constructed. Hence the last usable observation is the first quarter of 1910.

4.1 Explanatory variables

We now turn to a description of the explanatory variables used in the estimation. The dependent variable in the withdrawals equation is always the change in short term bank deposits between time t and t ¡ 1 as a ratio of the total assets of each bank.

4.1.1 Systemic Risk

Following Cerda (1992), we measure the level of public con¯dence in the system by the amount of metallic money in the hands of the public. This was measured as the total amount of metallic money in existence at time t less the amount of metallic money held by the banks. A more conventional measure would include all components of M1, such as bank notes (see, for example, Martinez Peria & Schmukler 1997). However, in the Por¯riato bank notes represented idiosyncratic rather than systemic risk. A higher level of metallic money in the hands of the public would indicate a lower degree of con¯dence in the banking system.

4.1.2 Macro Variables

We use two variables to re°ect macroeconomic conditons in this period. The ¯rst is the price of silver, which, as mentioned earlier, was the principal component of bank reserves. While a high price of silver would raise the value of banks' reserves, it would also induce the public to substitute it for other assets including bank deposits. The second variable we use is the price of public bonds, which were traded on the London stock market. This serves as an indicator of the interest rate in this period. The price of silver was obtained from the Historical Statistics of the INEGI and the monthly price of bonds is calculated as the average of the monthly highs and lows published by the Boletin Financiero y Minero.

4.1.3 Type and Zone Dummies

We use a dummy for the national banks since, as mentioned earlier, they faced very different operating conditions from the state banks. In addition, we use a dummy for the Banco Central which, apart from its regular banking operations, also functioned as a clearing house for the notes of state banks.

Four zone dummies were used to capture the idea that the operations of state banks were restricted to specific regions. These regions were not very diversified economically and the fortunes of particular banks were closely tied with the economy of the region. The industry and commerce dummy was used for the six banks which functioned in the states with a high level of commerce and manufacturing. These were Aguascalientes, Guadalajara, Veracruz, Monterrey, Tamaulipas and the state of Mexico. The mining dummy was used for states with mining operations, which were typically heavy in foreign investment. These states included Chihuahua, Sonora, Durango and Coahuila. The agricultural activity dummy was used for banks in the Yucatan, Campeche, Morelos, Guerrero and Tabasco, and the underdevelopment dummy for banks which operated in states with a very low level of industrialization and/or old mines which did not yield much return. These states were Michoacan, Le¶n, Puebla, Quer¶taro, Guanajuato, Zacatecas, Hidalgo and San Luis Potosi¶.

4.1.4 Bank Fundamentals

We use the following variables to measure bank fundamentals.

(1) The ratio of the change in emission of bank notes of bank i between period t and t ¡ 1 to the total change in emissions by all banks in this period. This ratio measures the level of confidence in each bank relative to the total banking system. On the other hand, the scheme of at par redemption guaranteed by the Banco Central, subsidized relatively inefficient banks. A disproportionately high level of emissions by a particular bank in any period could also be an indicator of free riding.

(2) The short term assets to liabilities ratio for each bank. Short term assets

include commercial paper, debt outstanding and investment in stocks and bonds.[6] Short term liabilities consist of sight deposits, loans taken out by the bank and reserves.

(3) The ratio of loans to total assets for each bank, which indicates the composition of assets and measures the banks' exposure to risk. Total assets include cash and metallic reserves, commercial paper, total loans outstanding, real estate and property. The loans include commercial paper, loans with collateral, mortgage loans and other loans.

(4) The equity capital to net assets ratio which indicates the degree of capitalization for each bank.

(5) The ratio of change in metallic money held by the bank to total assets. The numerator represents the proportion of liquid, risk free assets to total assets. Total assets are de¯ned as in (3).

(6) The ratio of liabilities to total loans. The liabilities consist of notes issued, sight and term deposits, loans taken by the bank and reserves. This variable also measures liquidity and riskiness of the bank.

(7) The extent of insurance coverage. This was the ratio of 50% of the book value of capital to the sum of notes issued and short term deposits of banks. This variable is de¯ned by the mutual insurance scheme run by the Banco Central, which guaranteed 50% of the book value of capital, and measures the insured portion of the banks' deposits and issued notes.

Summary statistics of all the variables, before and after the crisis of 1907 are presented in Table 1. As we can see, the deposits in the banking system grew slower in the period after the crisis. The data also suggest that banks increased their own liquidity after the crisis, as evidenced by the increase in the metallic reserves to assets ratio as well as the liabililities to loans ratio. Bank note issue was signi¯cantly reduced

[6]While all loans were required to be of less than six month duration, this rule was regularly °outed during the Por¯riato (Maurer 1997). Hence the loans referred to may not all be short term.

Table 1: Summary Statistics of Banks and Macroeconomic Conditions

	Before Crisis 1905.1-1907.2	After Crisis 1907.3-1910.4
Change in Short Term Deposits/Assets	0.461	0.402
Bank Fundamentals		
Assets/Liabilities	1.423	1.413
Change in Metallic Money/Assets	-0.757%	0.172 %
Liabilities/Loans	0.955	1.030
Total Loans/Assets	0.861	0.843
Capital/Assets	0.239	0.290
Coverage	0.560	0.715
Change in Emission of BankNotes Relative to Total Change	-0.716	-2.403
Systemic Risk	0.492	0.486
Macroeconomic Variables		
Price of Silver	28.625	26.562
Price of Public Bonds	35.606	34.987

Note: These figures are moving averages over a period of 4 quarters.

after the crisis. In addition, there was a decline in the loans to asset ratio, indicating a decline in bank lending. There also seems to have been a reduction in the assets of the banking system, as suggested by the increase in the capitalization ratio and the decline in the assets liabilities ratio. The insurance coverage ratio increased in this period.

The amount of metallic money in the hands of the public, which is our measure of systemic risk, seems to have marginally declined in this period. This is somewhat surprising. However, we find that there was a small drop in the period immediately after the crisis and a subsequent increase due to a fall in the price of silver. The average figure reflects both of these effects. As mentioned earlier, the price of silver fell between 1908 and 1910, which is reflected in the data. The price of public bonds also fell, implying an increase in the interest rates.

5 The Results

We present our results in Table (2). The top panel describes the result of three estimations, the first of which does not take the selection bias into account, i.e we estimate equation (1). The second and the third column are results for equation (6) after estimating a probit on equation (3). The columns differ only in the variables used in the probit[7] which is used to estimate the selection bias. T ratios are presented below the coefficients. The second panel gives the F tests for joint significance of each group of variables in each estimation. In each case, the dependent variable is the ratio of the change in deposits between period t and $t - 1$ as a proportion of total assets.

As we can see from the first column, apart from the loans to asset ratio, the variables which represent bank fundamentals are not significant. All of the coefficients,

[7] The independent variables used in the first specification of the probit are the liabilities to loans ratio, the ratio of the change in metallic reserves to total assets and the assets to capital ratio. All coefficients are positive and significant. The second specification uses the assets to liabilities ratio and the change in metallic reserves to total assets.

Table 2: Withdrawals Equation

	Dependent variable W_{it}		
Fundamentals:			
Emission	-0.0620	-0.0629	-0.0742
	-1.2605	-1.2841	-1.4955
Loans/Assets	-0.0455	-0.0496	-0.0454
	-2.6225	-2.6877	-2.5413
Coverage	0.0046	0.0114	0.0050
	1.6794	2.3303	1.8492
Dummies:			
National	0.1129	0.1130	0.1435
	4.5013	4.5193	4.3792
Banco Central	0.0920	0.0939	0.1215
	3.8084	3.8561	3.8374
Mining	0.0877	0.0873	0.1172
	3.8050	3.8093	3.8188
Industry	0.0852	0.0864	0.1154
	3.7702	3.8022	3.7840
Agriculture	0.0733	0.0730	0.1060
	3.7604	3.7415	3.7277
Underdevelopment	0.0849	0.0834	0.1146
	3.7308	3.7079	3.7517
Systemic Risk	-0.0983	-0.0982	-0.1015
	-2.8861	-2.9284	-2.9263
Macroeconomic Variables			
Price of Silver	0.0006	0.0007	0.0006
	1.3210	1.5091	1.3605
Public Bonds	-0.0005	-0.0004	-0.0005
	-1.4456	-1.5837	-1.3991
Bias Term		-0.0332	-0.3016
		-2.5222	-1.9649
R^2	0.0899	0.1020	0.0993
No. of obs	626	626	626
Tests of Joint Signi¯cance			
Fundamentals	6.1929	8.4690	6.3924
2.60y			
Zone & Type	6.6959	7.0334	7.0166
2.10y			
Macro	1.3649	1.7892	1.4299
3.00y			
Systemic Risk	13.8388	13.9788	14.8035
3.84y			

Note: T Statistics below coe±cients. y represents the critical values.

however, have the expected sign. The relative emission of new bank notes enters negatively, suggesting that the issue of new bank notes re°ects a free rider problem, rather than con¯dence in the bank. The loans to assets ratio is signi¯cant and negative since it represents low liquidity and high risk. The coe±cient on the insurance coverage ratio is also positive, as we may expect, but not signi¯cant.

The macroeconomic variables are neither individually nor jointly signi¯cant. The coe±cient on the price of public bonds (which is inversely related to the interest rate) is negative, while that on the price of silver is positive.

The zone and type dummies are all signi¯cant. Among the regional dummies, the agriculture and underdevelopment dummies are the smallest, suggesting that operating in an agricultural area or an underdeveloped region was less advantageous to a bank than operating in states with well developed industry, mining or commerce. The dummies for the Banco Central as well as for national banks are large and signi¯cant, suggesting that these banks enjoyed an advantage due to their special position. The coe±cient on systemic risk has a negative sign, as expected, and is strongly signi¯cant.

This estimation suggests that apart from the loans to assets ratio, bank fundamentals were not important in determining the behaviour of bank deposits. Bank speci¯c e®ects, as represented by the zone and type dummies, exerted a very strong in°uence, as did the level of public con¯dence in the system. Macroeconomic variables such as the price of silver and the price of public bonds were not signi¯cant.

We now turn to the results which include the selection bias. The second column shows that including the bias term increases the signi¯cance of the results on fundamentals substantially. The e®ect of the insurance coverage ratio is much larger and the coe±cient is now signi¯cant. The magnitude of the coe±cients of the loans to assets ratio and the bank notes emission both increase slightly, although the latter is still not signi¯cant. The coe±cient on the bias term is strongly signi¯cant. The regional and bank speci¯c dummies are basically unchanged. The macroeconomic

variables are still not signi¯cant, while the coe±cient on the systemic risk variable continues to be negative and signi¯cant.

The third column shows the results with an alternative speci¯cation of the bias term. The coe±cient on the bias term is again large and signi¯cant. The results for the fundamental variables are improved, although not to the same extent as with the previous speci¯cation of the bias term. The coe±cients on the dummies are slightly larger although the agriculture and underdevelopment dummy continue to exert the least in°uence. Systemic risk is still negatively related to the change in deposits and the macro variables continue to be, both individually and jointly, not signi¯cant.

We see, therefore, that accounting for selection bias reveals that bank fundamentals exert a strong in°uence on deposits. This implies that depositors were able to penalize banks which indulged in excessive risk taking, as evidenced from the negative coe±cients on the loans to asset ratios and the emission of bank notes, and the positive coe±cient on insurance coverage. All this suggests that depositor discipline played an important role in the market for short term deposits. It is also worth re-emphasizing that our data set is very unusual in that it allows us to account for the selection bias induced by exit, in a way that other studies are unable to (see for example, Schumacher 1996).

6 Conclusions

Our analysis reveals that despite considerable government intervention, market discipline played an important role in determining bank withdrawals in Por¯rian Mexico. The presence of a partial insurance scheme as well as the at par clearing house system of the Banco Central, which e®ectively subsidized less e±cient banks, did not hinder depositors from discriminating against and punishing such banks. We also do not ¯nd any evidence of contagion between banks. In fact, the most important determinants of deposit behavior seem to be bank fundamentals, a measure of systemic risk, the

selection bias induced by exit as well as the type and zone dummies.

What could account for the presence of depositor discipline in Mexico in this period? Maurer (forthcoming) shows that banks competed ¯ercely in loan markets whenever possible. The state banks faced competition from the local branches of national banks. In addition, the states of Chihuahua, Nuevo Leon and Yucatan had multiple state banks. There is no reason to believe that such competition did not exist in the market for deposits as well. In addition, the presence of silver as legal tender meant that there existed outside substitutes to bank deposits as stores of wealth.

There is also some evidence that the insurance scheme guaranteed by the Banco Central was not very credible (Maurer forthcoming). The Banco Central was chronically short of funds, so much so that it had to be bailed out by the government in 1908. Members were not required to deposit reserves in the Banco Central and it had to o®er an 8% interest rate to attract deposits. In addition, it lacked legislative powers usually associated with a payments system. Unlike the Su®olk Banking System of New England, it could not assume control over member operations in emergencies. It also had no special access to members' books. All this conspired to weaken the role of the Banco Central as a regulator of banks. As we show, this role was, at least in part, taken up by the market.

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