

# Financial Development, Bank Ownership, and Growth. Or, Does Quantity Imply Quality?

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November 2007

## Abstract

In 1980, India nationalized its large private banks. This induced different bank ownership patterns across different towns, allowing credible identification of the effects of bank ownership on financial development, lending rates, and the quality of intermediation, as well as employment and investment. Credit markets with nationalized banks experienced faster credit growth during a period of financial repression. Nationalization led to lower interest rates and lower quality intermediation, and may have slowed employment gains in trade and services. Development lending goals were met, but these had no impact on the real economy.

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# 1 Introduction

Economists and states have long been interested in the relationship between financial development and economic growth, and promoting financial development has been an integral part of many countries' growth strategies. A body of literature since the work of King and Levine (1993) and Rajan and Zingales (1998) has found a positive link between financial development and growth, yet Levine (2004), reviewing the empirical literature, cautions that available evidence suffers from "serious shortcomings," and that "we are far from definitive answers to the questions: Does finance cause growth, and if so, how?" A critical impediment to a better understanding of this relationship is the lack of exogenous variation in variables of interest: the literature has relied primarily on evidence from cross-country comparisons.

This paper uses a policy experiment in India to evaluate the effect of government ownership of banks on financial and economic development. In 1980, the government of India nationalized all private banks with a deposit base above Rs. 2 billion, leaving comparable, but smaller, banks in private hands. Because the 1980 nationalization induced variation in the share of credit issued by public banks across credit markets in India, I am able to identify the causal effect of bank nationalization on economic outcomes. Credit markets with more nationalized banks lent more to government-targeted borrowers (agricultural and rural), had lower interest rates, and initially experienced faster financial development. This came at the cost of lower quality intermediation, and the increased pace of financial development was not maintained in the 1990s. Most strikingly, despite substantial increases in agricultural credit, there is no evidence of improved agricultural outcomes in markets with nationalized banks. Bank nationalization may have slowed the growth of employment in the more developed sectors of trade and services.

Government ownership of banks is common and pervasive, among the most important policy tools used to influence financial development. La Porta et al. (2002) calculate that in countries around the world the average share of equity of the ten largest banks held by governments was 42 percent in 1995. In socialist countries, proponents of na-

tionalization argued that economic planning required control of the banks (e.g., Lenin, Gershenkron, etc.). But even those who favored market-based systems found reasons to support public ownership of banks: government intervention in rural areas could both mobilize deposits and improve the lives of the poor; credit market failures and lender moral hazard problems were severe enough that regulation alone was felt insufficient; and some feared monopolistic behavior in the industrial credit market could limit entry. Proponents of nationalization succeeded in both developing and developed economies.

A small recent literature tests these hypotheses. La Porta et. al. (2002) estimate cross-country regressions, finding government ownership of banks negatively correlated with financial development and growth. Sapienza (2004) and Khwaja and Mian (2004) use micro-level data to compare public and private sector banks in Italy and Pakistan, respectively. Sapienza finds that public sector banks lend at lower interest rates, and with a bias towards poorer areas, compared to private banks, and that some lending appears to be politically motivated. Khwaja and Mian find that government-owned banks are more likely than private banks to lend to firms whose directors or executives have political affiliation, and less likely to collect on these loans. Two recent papers show that government bank lending varies with the electoral cycle. Dinc (2005), using evidence from 36 countries, shows that government banks lend more, relative to private banks, in election years. Cole (2006) demonstrates that government-owned banks in India are subject to substantial government capture, lending more in election years, and targeting these loans to “close” constituencies.

Indeed, it may even be that both theories are right: government ownership leads to capture and inefficiency, but also cures market failures. In this case, the desirability of government banks hinges crucially on the real effects of ownership.

Both the cross-country and micro-studies are valuable, but suffer short-comings. Causal interpretation of La Porta et. al. (2002) results is difficult: they find government ownership of banks correlated with many other factors thought to influence economic growth, such as state intervention in the economy, and marginal tax rates. Including either of

these measures in the cross-country growth regression renders the coefficient on government ownership of banks statistically indistinguishable from zero. Existing micro studies are vulnerable to two limitations: first, government ownership of banks is not random, and government banks may operate under different regulations, in different areas, etc., than private banks, rendering a comparison of outcomes difficult. Second, comparing public to private banks confound ownership effects with market effects. If public banks are found to have higher loan default rates, for example, this may be due to ownership of the bank, or because different types of firms choose to borrow from public vs. private banks, or because firms that borrow from both public and private banks prefer to default from public banks. Much of the present paper compares credit markets whose banks are 100 percent government-owned to those whose banks are entirely privately held.

By combining credit data with real outcomes, this paper adds to a small set of studies that use plausibly exogenous variation in financial development to study the effect of financial development on the real economy. Jayaratne and Strahan (1996), examines the effects of relaxing branch licensing requirements in the United States, finding that the resulting financial development increased growth rates. Burgess and Pande (2005) study the Indian government's requirement that all banks (public and private) open branches in rural areas, which increased the number of rural branches from 105 to 29,109 over a 13-year period. The expansion was driven by a policy rule, and generated trend breaks in financial development, which are used to identify the effects on poverty. The study finds that the expansion of credit significantly reduced poverty in rural areas, while having no effect on poverty in urban areas. Burgess, Pande and Wong (2005) provide evidence that the branch expansion increased lending to the poor, particularly for low caste groups.

The richness of data available in the present study provides a comprehensive picture of the effect of ownership on lending behavior. In particular, I measure whether nationalization achieved "social" goals of the government. By focusing on India, I avoid interpretation problems associated with cross-country regressions. This study is indeed useful to compare results obtained from a cross-country style approach with causal esti-

mates. Because the nationalization occurred according to a strict policy rule, and because public and private banks face identical regulation, differences in lending behavior and outcomes can be attributed to bank ownership, rather than characteristics of the bank (such as whether the bank was founded to lend to a particular sector, or faces different regulation). A drawback of this setting is that, because banks were nationalized according to their deposit base, the ‘treated’ banks are significantly larger than the ‘control’ banks.

Directly related is the debate on the merits of state ownership of any enterprise. Advocates believe that government ownership can solve market failures and enhance equity. Opponents worry that the soft incentives typically faced by public sector employees lead to inefficiency, and that public enterprises are subject to political capture. This is a vital question, yet there is relatively little careful empirical evidence on this issue.

This paper proceeds as follows. In the next section, I describe the Indian bank nationalization in detail, and discuss the data. Section 2.3 examines the effect of bank ownership on bank performance, compares the costs of government assistance to private banks to the cost of assistance to public banks, and describes how nationalization affected sectoral allocation of credit at the bank level. Section 3 links bank ownership to financial development, employment, and investment, by comparing credit markets whose bank branches were nationalized to outcomes in towns whose branches were not nationalized. I then conclude.

## **2 Indian Bank Nationalization and Data**

### **2.1 Bank Nationalization**

Formal banking in India dates back to at least the 18<sup>th</sup> century, with the founding of the English Agency Houses. Private and regional government banks followed, and by the time of independence in 1947, there were over fifty banks operating over 1,500 bank branches in India. In 1969, in the context of nationalization of several key industries, the government nationalized all banks whose nationwide deposits were greater than Rs. 500 million. This

resulted in the nationalization of 14 banks, or 54 percent of the branches in India at that time.

Prakash Tandon, a former chairman of the Punjab National Bank (nationalized in 1969), described in 1989 the rationale for nationalization as follows:

Many bank failures and crises over two centuries, and the damage they did under 'laissez faire' conditions; the needs of planned growth and equitable distribution of credit, which in privately owned banks was concentrated mainly on the controlling industrial houses and influential borrowers; the needs of growing small scale industry and farming regarding finance, equipment and inputs; from all these there emerged an inexorable demand for banking legislation, some government control and a central banking authority, adding up, in the final analysis, to social control and nationalization.<sup>1</sup>

Concurrent with nationalization, the Indian government sought to increase the geographic reach of the banking system. Prior to 1969, banks had grown organically, branching out from the place of their founding. This growth rarely included rural areas. The 1970s saw a tremendous growth in branch banking, driven primarily by a government directive that banks serve rural areas. This directive, which went into effect in 1977, was enforced through a licensing requirement: for every branch a bank opened in a location that already had a bank branch, a bank was required to open four branches in unbanked areas. The government assigned districts 'lead banks,' which could be either public or private, and typically already operated in or near the district. These banks were charged which coordinated branch expansion in the district. The lead bank selected locations for new branches, and then negotiated with other banks over which banks would open branches in which locations. In 1980, 52 percent of the towns which were served by only one branch owed their branch to expansion in the period 1977-1980. (Desai, 1987) The fact that the expansion locations were selected using the same criteria in each district suggests that, within a given district, the villages into which different banks expanded were similar.

In April of 1980, the government undertook a second round of nationalization, placing under government control the six private banks whose nationwide deposits were above Rs. 2 billion, or a further 8 percent of bank branches (6 percent of India-wide aggregate deposits and credit), leaving approximately 10 percent of bank branches (9 percent of aggregate deposits and credit) in private hands. This decree, issued by Indira Gandhi, was one of her first acts upon resuming the office of prime minister in 1980. The nationalization was implemented under the same legislative framework, with similar stated goals: “in order to further control the economy, to meet progressively and serve better the needs of the development of the economy and to promote the welfare of the people.” (Desai, 1987, p. 123).

The ranking of private banks, in terms of size, remained fairly constant following the first nationalization. Of the six banks that were nationalized in 1980, all but one had been among the six largest banks in 1970. The exception, Punjab and Sindh Bank, was number 11 in 1970, pushed Bank of Rajasthan (number 6 in 1970) out of the top 6.

The nationalized banks remained corporate entities, retaining most of their staff, with the exception of members of the board of directors, who were replaced by appointees of the central government. The political appointments included representatives from the government, industry, agriculture, as well as the public.

Nationalization was accompanied by a series of government regulations that sought to affect lending decisions. The government enacted ‘priority sector’ targets, which required banks to lend a certain share of credit to agriculture, small-scale industry, and other sectors. Banks that fell short of this target were required to lend the amount of the shortfall to the government at penalty (very low) rates.

Other government regulations limited interest rates, particularly for small loans, until the early 1990s. Beginning in the early 1990s, financial liberalization led to freeing of lending and deposit rates, greater bank autonomy, increased entry, and lower reserve requirements. (Reddy, 1998) All of these regulations, throughout the period of study, applied equally to public and private sector banks.

Between the 1969 nationalization and 2000, there were twenty-one private bank failures in India. Banerjee, Cole, and Duflo (2005) find that the cost to the government of making whole depositors in these failed banks was less than the cost of recapitalizing public sector banks (appropriately scaled). Dinc and Brown (2005) demonstrate that bank failures are very common worldwide, and political concerns affect the timing and costliness of bailouts.

## 2.2 Data

A major strength of this study is the richness and scope of banking data collected by the Reserve Bank of India. The “Basic Statistical Returns-2” contains information on bank lending. Each year, every bank branch in India is required to provide information on every loan in its portfolio to the Reserve Bank of India. This information includes the size of the loan, interest rate, and performance status, as well as various characteristics of the borrower, including industry (at the three-digit level), rural/urban status, etc.<sup>2</sup> The analyses in this paper are therefore based on a *census*, rather than sample, of loans in India. Finally, this is the only study of which I am aware that examines the sectoral allocation of credit, and the resultant implications for real economic outcomes.

The analysis covers over 2,400 banking markets of varying size. A potential difficulty in determining the effects of bank ownership on outcomes is the joint presence of public and private banks: private banks could, for example, make up for public bank deficiencies. Part of this study focuses on the 1,500 markets with only one branch, which allows me to measure the effects of going from 100 percent private ownership to 100 percent government ownership.

Data on bank branch locations, used to compute the market share of public and private banks in 1980, is from a directory of commercial banks, published by the RBI in 2000, which gives the opening (and closing) date of every bank branch in India, and indicates in which credit market each branch is located (Reserve Bank of India, 2000).

Annual aggregate deposit and credit data, by branch, are available from 1981-2000. These data are used to evaluate the effect of nationalization on the financial development,

and to control for initial conditions when evaluating the outcomes.

Data on bank balance sheets is also from the Reserve Bank of India: various issues of the “Statistical Tables Relating to Banks in India” (1963-1970) and “Banking Statistics” (1972-2000).

A final advantage of the data used by this paper is that much of the analysis is at the level of the village (or town), making for particularly compelling identification: while nationalization of the parent banks was a function of their size, there is no mechanical relationship between the size of a bank branch at the village level, and nationalization.<sup>3</sup> A limitation is that there are no datasets with information on firm productivity at the town level: thus I am unable to answer questions about firm performance.

The Appendix Table gives summary statistics.

## **2.3 Nationalization and Bank Performance**

### **Identification Strategy**

Comparing nationalized to non-nationalized banks in India is a promising approach to establish the causal relationship between financial development and bank ownership: exploiting within-country variation avoids many of the problems of cross-country regressions. Because the Indian bank nationalization followed a strict policy rule, it is unlikely that just the better (or worse)-performing banks were nationalized: there is no evidence to suggest the cut-off was chosen strategically, and because the policy was a surprise, banks would not have had the opportunity to “game” the cut-off criterion.

This identification strategy is most credible when it focuses on banks just above, and just below the cut-off. I define as “marginal” the group of banks that were closest to the size cut-off: this group includes the five smallest private banks that were nationalized, and the 18 largest private banks that were not. (Eighteen was chosen because the total assets of those 18 are approximately equal to the assets of the five smallest nationalized banks.<sup>4</sup>) This paper will focus exclusively on these “marginal” banks. While these are the banks closest to the cutoff, there is still substantial variation in size: the average deposit

book of a nationalized ‘marginal’ bank was 3.7 billion Rupees, while the mean for non-nationalized ‘marginal’ banks was 732 million Rupees. Figure 1 gives the distribution of bank sizes as of 1979. Each bar represents a single bank: they are ordered from smallest to largest. The six in black are those that were nationalized in 1980. Banks to the right were nationalized prior to 1980, while banks on the left were and remain private.

The identification strategy rests on the assumption that, conditional upon size, nationalized and non-nationalized banks are not materially different. This is a testable hypothesis: Table 1 compares the average size of deposits, number of branches, profits, deposits per branch, and return on equity of the nationalized and non-nationalized banks. Column (3) gives the p-value for a test of the difference in means. The banks that were to be nationalized were substantially larger (both deposits and number of branches), and had greater profits. However, once variables are scaled by bank size, there is no statistically significant difference between the private and nationalized banks: the amount of deposits per branch, and the return on equity for nationalized and non-nationalized banks are indistinguishable. This is shown by running the following regression (where  $y_{b,79}$  indicates bank  $b$  outcome in 1979),  $Nationalized_b$  is a dummy indicating whether bank  $b$  was nationalized:

$$y_{b,79} = \alpha + \beta * Nationalized + \varepsilon \quad (1)$$

Columns (4), (5), and (6) add to the equation a one-, two-, and three-order polynomial in the log-size of the bank’s deposits in 1979. The p-value of the test  $\beta = 0$  is reported for each variable and each specification. A linear control for size renders  $\beta$  insignificant for all variables in the comparison between nationalized and non-nationalized banks. This provides some evidence in support of the identification strategy. However, an important limitation is the relatively low number of banks: with only 23 banks, there is limited statistical power to test the identifying assumption.

### **Bank Growth**

Standard measures of bank performance, such as the return on equity, are of limited value in the Indian context, where accounting standards have historically been lax. To

determine whether public ownership of banks inhibits financial intermediation, I compare the growth rates of the banks that were just above and below the 1980 nationalization cut-off, using data from the Reserve Bank of India, for the period 1969 to 2000.

I regress the annual change in bank deposits, credit, and number of bank branches on a dummy for post nationalization ( $\text{Eighties}_t=1$  if the year is between 1980 and 1991), and a dummy for nationalization in a liberalized environment ( $\text{Nineties}_t = 1$  if the year is between 1992 and 2000), as well as a dummy for whether a particular bank was nationalized ( $\text{Nat}_b$ ). I split the post-nationalization period into two periods because the former period was characterized by continued financial repression, while substantial liberalization began in the early 1990s. Bank size may affect bank growth rates, I therefore include the deposits of the bank as of December 31, 1979,  $g(K_{b,80}) = \pi_0 K_{b,80}$ .<sup>5</sup> The regression thus measures whether the growth rates of nationalized banks were different from those of non-nationalized banks in three different periods: before nationalization, after nationalization in the 1980s, and the 1990s. The estimated equation is:

$$\ln(y_{b,t}/y_{b,t-1}) = \alpha + g(K_{b,80}) + \delta * \text{Nat}_b + \theta_1 * \text{Eighties}_t + \theta_2 * \text{Nineties}_t + \gamma_1 (\text{Eighties}_t * \text{Nat}_b) + \gamma_2 (\text{Nineties}_t * \text{Nat}_b) + \varepsilon_{b,t} \quad (2)$$

The parameters of interest are  $\delta$ ,  $\gamma_1$  and  $\gamma_2$ . The first ( $\delta$ ) measures whether the banks that were nationalized in 1980 grew at a different rate than non-nationalized banks *before* the 1980 nationalization, while  $\gamma_1$  and  $\gamma_2$  test for differential growth rates after nationalization. Standard errors are adjusted for auto-correlation within each bank.

Table 2 presents the results for growth in credit and deposits. As mentioned in section 2.3, an identification assumption crucial to this analysis is that prior to nationalization, nationalized and non-nationalized banks were similar. The first line of column (3) in each panel of Table 2 reports the estimate of  $\delta$  for measures of deposit and credit growth rates prior to nationalization. There were no pre-existing differences in bank growth rates prior to nationalization: the estimated value of  $\delta$  for deposits and credit is .04, indistinguishable from zero.

Following nationalization, the overall rate of growth in deposits and credit slowed substantially for all banks, but there was no differential effect for nationalized and private banks. (The estimated effects of nationalization are -.05 and -.04, not statistically distinguishable from zero.) In the nineties, deposit and credit growth slowed further still. Moreover, in this liberalized environment, nationalization had an effect on growth rates: deposits grew 8 percent more slowly, and credit 9 percent slower, in nationalized marginal banks, relative to non-nationalized marginal banks. These estimates are significant at the five percent level.

A more flexible specification would allow bank size to affect growth rates differentially: that is, it would allow variation in credit to depend on bank size differentially in each decade. I estimate equation (2), but replace  $g(K_{b,80})$  with three terms:  $\text{Seventies}_t * g(K_{b,80})$ ,  $\text{Eighties}_t * g(K_{b,80})$ , and  $\text{Nineties}_t * g(K_{b,80})$ . The bottom two panels of Table 2 present results from this regression. Once one includes these more flexible controls, there is no evidence of differential growth rates between nationalized and non-nationalized banks. The point estimates are close to zero, but with wider confidence intervals.

The results thus present suggestive evidence that nationalization affected growth rates, but the results are not robust to the alternative specification. The differential effect in the 1990s vs. the 1980s observed in Panel A may reflect the changing nature of banking in India. During the 1980s, it was relatively difficult for banks to compete: both lending and deposit rates were set by the RBI, and branch expansion was primarily limited to rural, unbanked locations. The 1990s saw the freeing of both lending and deposit rates, and allowed banks to expand where they would find it most profitable.

### 3 The Effect of Ownership on Credit Market Outcomes

So far, I have demonstrated that nationalized banks grew less quickly than private banks in the 1990s, and described evidence that they lent more to agriculture, rural areas, and the government, at the expense of credit to trade, transport, and finance. This does not, however, necessarily imply that nationalization has had a substantial impact on real outcomes: private banks could have met the growing economy’s need for credit, and the differences in sectoral lending could merely represent specialization (or “crowding out”) of credit by banks in areas in which they have a comparative advantage. I therefore focus on outcomes at the credit-market level.

A simple approach, analogous to cross-country analysis, would be to regress the outcome of interest in credit market  $c$  in 2000 on the share of branches that were government-owned in 1980,  $PubShare_{1980}$ , and additional control variables  $X_c$ .

$$y_{c,1992} = \alpha_d + \beta * Pubshare_{1980} + \gamma X_c + \varepsilon_c \quad (3)$$

However, this approach will not be valid if, as is likely to be the case,  $Pubshare_{1980}$  is correlated with other factors that affect  $y_{c,1992}$  that are not included in  $X$ . It is therefore difficult to causally interpret  $\beta$ —this is the major weakness of cross-country analysis.

In the remainder of the paper, I exploit the fact that the 1980 nationalization induced variation across credit markets in the share of public banks. This allows the measurement of the causal effect of nationalization, in a general equilibrium setting, on financial development, credit markets, and real outcomes.

#### 3.1 Identification Strategy and First Stage

Though much of India’s banking sector was nationalized in 1969, the banks that remained private grew quickly, and by 1980, there were 47 private banks in India, operating 4,428

branches. The median private bank in India was large, with 145 branches, and geographically diverse, operating in 118 distinct credit markets. Cities whose branches belonged to banks just above the nationalization cut-off were exposed to more nationalized credit than cities whose branches were just below the cut-off: I exploit this variation to estimate the causal impact of credit on economic outcomes.

The unit of observation in this section is a credit market. The Reserve Bank of India defines a credit market as an area in which someone could plausibly travel to visit a bank. Each is typically a village, town or city. The number of banks (in 1980) in a credit market range from zero (in many rural areas) to 972 (Mumbai or Bombay). The identification strategy in this section is similar in spirit to the one used above. The sample includes all credit markets that had at least one private bank prior to the 1980 nationalization, or 2,928 cities, villages and towns. Of these locations, 1,513 had only one branch, 465 had two branches, 624 had from three to ten branches, and 232 had more than 10 branches.

The most straightforward analysis involves the 1,513 banking markets served by just one branch, belonging to a marginal bank. All of these branches were private prior to the 1980 nationalization. In this case, a “regression-discontinuity”<sup>6</sup> design is suitable:

$$y_{c,d,92} = \beta * Nationalized_c + g(size_{c,80}) + h(deposits_{c,80}) + \delta_d + \varepsilon_{c,t} \quad (4)$$

where  $Nationalized_c$  is an indicator variable taking the value of one if the branch in city  $c$  belonged to a nationalized bank,  $size_c$  is the log deposits of the parent bank whose branch was located in city  $c$ , and  $\delta_d$  are district fixed-effects. Note that  $size_c$  is the total amount of deposits of all branches of the bank in India, not deposits in the villages’s branch, and that  $g(size_{c,80})$  indicates a third-degree polynomial in size. It is of course possible that additional branches opened up between 1980 and 1992, and these banks lending is included in all outcome measures. Throughout the remainder of this paper, outcomes are measured at the credit-market level.

It is important to emphasize that nationalization was assigned as a function of India-wide bank deposits, rather than the size of particular branches. Figure 2 gives the size distribution of the 1,513 credit markets which consisted of only one branch as of 1980:

the distribution in village size are very similar, with almost identical support. While a Kolmogorov-Smirnov test rejects equality of distribution of deposits between nationalized and non-nationalized banks, once one conditions on the district in which the branch is located, the difference in size between nationalized branches and non-nationalized branches is not statistically significant.<sup>7</sup> Since local levels of financial development may affect outcomes independently of bank ownership, I include a third-degree polynomial term in credit-market specific log deposits in 1980,  $h(\text{deposits}_{c,80})$ . Because outcomes may be correlated across banks, the standard errors from equation (4) are clustered at the bank level.

A different approach is necessary to include larger towns and cities which had more than one bank branch in 1980. The effect of nationalization would be picked up by including the share of branches nationalized in the market in 1980. However, it is again important to control for the fact that nationalized banks were in general larger than non-nationalized branches. One can no longer use a regression-discontinuity style approach, since the size of the banks in the credit market cannot be characterized by a single variable (the size of the parent bank): rather, it is characterized by a distribution of sizes of parent banks. One way to summarize this distribution would be to use the average size of parent banks of marginal branches in that district. However, the distribution of banks may matter: a city with two branches, one belonging to a large parent, and one to a small parent, may grow in a different way than a city with two branches belonging to medium-sized banks. As it is not possible to include distribution functions as control variables, I follow Chamberlain (1987) and approximate the density function by dividing banks into four groups: large public banks (the State Bank of India and the set of banks that was nationalized in 1969), large public banks nationalized in 1980, marginal banks (the small public banks nationalized in 1980, and the large private banks not nationalized in 1980), and small banks (all of which stayed private after 1980). Using the same definition of marginal as in section 2.3 gives the following three variables for each credit market  $c$  in

year 1980:

$SmallShare_{c,80}$  = Small banks market share (none nationalized in 1980)

$MargShare_{c,80}$  = Marginal bank market share (some nationalized in 1980; others not)

$LargeShare_{c,80}$  = Large bank market share (all nationalized in 1980)

Market share is measured by the number of bank branches, as credit data from 1980 are not available. The omitted category is large public sector banks. To measure the effect of nationalization on outcomes at the city level, I include an interaction term  $MargNat_c$ , which is defined as  $MargNat_c = (MargShare_c) * (Nationalized_c)$ , where  $Nationalized_c$  is the share of marginal branches in city  $c$  that were nationalized. This gives the following regression:

$$Y_{c,d,92} = \alpha + \pi_s SmallShare_{c,80} + \pi_m MargShare_{c,80} + \pi_l LargeShare_{c,80} + \gamma MargNat_{c,80} + \kappa * avsize_c + \delta_d + \varepsilon_{c,d,92} \quad (5)$$

The parameters  $\pi_s, \pi_m, \pi_l$ , and  $\kappa$  allow outcomes to vary with the size and distribution of banks operating in the district. The effect of nationalization is measured by  $\gamma$ , the coefficient on the interaction term. A simple example may be illustrative: suppose a town had two branches each from small, marginal, and large bank groupings, and that of these six branches, one was nationalized in 1980. Then  $SmallShare_{c,80} = MargShare_{c,80} = LargeShare_{c,80} = \frac{1}{3}$ . The term  $MargNat = \frac{1}{6}$ , and indicates the share of branches nationalized in the town.<sup>8</sup> Equation (5) is estimated using data from 2,443 credit markets, which I refer to as the “All-India” sample.

This section answers two related questions. First, how does the elimination of private banks, through the nationalization of all branches, affect economic outcomes? This can be measured by estimating equation (4) on the sample of towns that had only one branch in 1980. The second question, on the effect of nationalizing bank branches in an environment in which public credit may also be available, is answered by estimating equation (5) on the “All-India” sample.

The first-stage results are presented in Table 3. The dependent variable is share of credit in the town issued by public sector banks (both nationalized and state banks). Column (1) gives the results from equation (4), which includes the 1,513 towns and villages that, just prior to the 1980 nationalizations, had one private bank branch and no public branches. Not surprisingly, the nationalization dummy predicts very well the share of credit from public banks, with a point estimate of 1.00 and a standard error of .02. The  $R^2$  of the equation is .97; it is not one because in some villages, additional branches opened after 1980. Standard errors are clustered by parent bank.

Column (2) presents results from equation (5) for all cities, which, as of 1980, had at least one branch belonging to a “marginal” bank. As before, if the share of credit had been frozen over time at a level equal to the share of branches in 1980, the coefficient on MargNat would be exactly one.<sup>9</sup> The point estimate in column (2) is indeed exactly one, with a standard error of .01. Because the coefficients for the first stage for all three specifications are one, the subsequent analysis presents reduced form, rather than instrumental variable estimates. (In the reduced form, the outcome variable of interest takes the place of  $Y_c$  in equations (4) and (5), respectively). Standard errors in this specification are clustered by district.

In summary, the first stage is very strong: there is a tight relationship between branch nationalization in 1980 and share of credit issued by public-sector banks in 1992. This stasis is due to the heavy regulations concerning the opening of new branches, and the similar aggregate growth between public and private banks in the 1980s. The remainder of the paper examines the impact of nationalization on credit market and real outcomes.

### **3.2 Validity of the Identification Strategy**

The present setting offers some significant advantages over previous work, which has relied on variation whose source is not well understood. In India, public and private banks operated in an identical legal environment, were subject to the same regulations, and were governed by the same set of institutions. While the Indian bank nationalization was not

randomly assigned, it was based on an observable criterion (size), and not profitability, region of operation, or expected growth rates.

The banks had wide-ranging, overlapping branch networks. Many of the branches recently set up in rural areas were done so because of the government's branch licensing requirement, which obliged banks to open four branches in previously unbanked location for every branch a bank opened in a banked location. The government provided the same directives to public and private banks regarding where to open these branches.

The setting helps overcome two potential pitfalls in observational studies. First, one might be concerned that the nationalized banks operated in regions that were subject to different economic opportunities or shocks than the areas in which non-nationalized banks operated. The density of the branch network allows inclusion of a district fixed-effect, and the analysis thus exploits variation only within districts. Administrative districts (the unit below state) are relatively small, and 340 are represented in the dataset.

Second, one might be concerned that variation in initial conditions within the district affects subsequent performance. The richness of the data and the large sample size allows for non-parametric controls of the level of initial financial development in 1980.

Despite these advantages, there are some limitations. First, the study includes only 6 nationalized banks and 18 banks that remained private. While the standard errors in specification 4 are corrected for clustering at the bank level, this limitation should be kept in mind. Second, there are significant data limitations. There are no data on firm outcomes. The highest quality data is undoubtedly the credit data, but only branch-level aggregate data on deposits and credit are available in 1980. Sector-level data, and data on loan defaults, are available only starting in the 1990s. Thus, while it would be desirable to conduct all analyses on changes rather than levels, this is only possible for credit and deposit growth, and a limited number of variables from the census.<sup>10</sup>

Appendix Table A2 tests the identification strategy, using the data that is available from 1981. The first row tests whether the level of credit varied at the credit-market level, even without controls for the parent bank size. Column (1) reports results from a

regression of credit in 1981 in all one-branch towns on a dummy for whether the branch in that town was nationalized, including only district fixed-effects as a control. The point estimate is not statistically distinguishable from zero. Column (2) presents results from a regression of log credit in 1981 on SmallShare, MargShare, LargeShare, and MargNat, again including district fixed-effects, but not average size of parent bank, as controls.

Panel B of the column presents falsification exercises, using the identification strategies described in equations (4) and (5), for the set of variables available from the 1981 census. There is no statistically significant difference in the level of credit, or the share of individuals engaged as agricultural workers, cultivators, in small-scale industry, or in literacy rates. While the standard errors are not as small as might be desired, the results do suggest that there were not systematic differences between ‘treated’ and ‘control’ credit markets.

### 3.3 Financial Development

A major goal of nationalization was to increase the scope and scale of banking in rural areas. It was hoped this would mobilize deposits, as government banks would have lower minimum balance requirements. The government also sought to increase the growth rate of rural credit by shifting the portfolio allocations of nationalized banks.

To compare the results using the natural experiment to those obtained from OLS, I first estimate the relationship between government ownership of banks and financial development using equation (3). As a measure of financial development, I use the annual log growth rate of deposits and credit, in each credit market, over the period 1981 to 2000. Because there are no time-varying regressors, I estimate the equation using average annual cross-sectional growth (e.g.,  $\log(y_{1990}/y_{1981})/9$ ), rather than a panel, to avoid potential problems with serial correlation.

The effects of nationalization on financial development are estimated using equations 4 and 5. As a measure of financial development, I use the annual log growth rate of deposits and credit, in each credit market, over the period 1981 to 2000. Because the effects of

nationalization may be different under different regulatory regimes, I consider three time periods: the entire period (1981-2000), the time of “financial repression,” (1981-1990), and a time of financial liberalization (1991-2000). Because there are no time-varying regressors, I estimate the equation using cross-sectional growth (e.g.,  $\log(y_{2000}/y_{1981})/19$ ), rather than a panel of annual growth rates, to avoid potential problems with serial correlation.

Results are presented in Table 4. Panel A presents results for the entire time period, 1981-2000. For smaller towns (which had only one branch in 1980), bank nationalization appears to have had no effect on the overall speed of financial development. The impact of nationalization on deposits is precisely estimated at zero; the effect on credit is three percent, though not statistically distinguishable from zero. The all-India estimates controlling for average size of the parent banks of marginal branches, gives an effect of nationalization of 1 percent more credit, significant at the five percent level. These results contrast sharply with the OLS statistics, which find a strong negative relationship between government ownership and financial development.

Panel B restricts attention to the growth rate from 1981-1990, and finds a quite different result: towns whose branch was nationalized experienced an annual growth rate of credit approximately 2-3 percentage points higher than areas whose branches were not nationalized. Moreover, credit grew in areas in which branches were nationalized by approximately 11 percentage points *per year* faster in villages, and 4-5 percentage points faster for the all-India measures. This is a very large effect: over a nine-year period, the amount of credit increased by a factor of 1.5-2.5 more in cities whose branches were nationalized.

While credit grew much faster in the 1980s in areas with nationalized branches, this effect does not represent a sustained increase. Panel C, which demonstrates how the growth rate between 1991 and 2000 varied with nationalization, shows that nationalized credit markets grew much less quickly from 1991 to 2000: the annual growth rate was 2-4 percent lower. By 1991 ‘treated’ credit markets had been exposed to a decade of nationalization, and were no longer comparable to ‘non-treated’ credit markets: the results

in Panel C should therefore not be given a causal interpretation. One possible explanation may be that nationalized banks intentionally undid excessive expansion during the 1980s, as they sought to compete in a more liberalized environment.<sup>11</sup> A second possible cause may be that banks reigned in lending as they faced a harder budget constraint in the 1990s, and regulatory environment that induced banks to shift assets away from lending (Nag and Das, 2002). I conclude by noting that the wide divergence between the reduced form and OLS estimates for the 1981-1990, and 1991-2000 period cast doubt on results from cross-country analyses.

### 3.4 Lending

I now turn to how nationalization affected the composition and quality of lending in Indian credit markets. Disaggregated credit data are available only beginning in 1992—thus, the estimates in this section will necessarily be cross-sectional, rather than difference-in-difference. All regressions continue to control for the initial level of financial development in the credit market. Table 5 presents results for the share of credit lent by banks to key sectors of the economy. For presentational clarity, only the coefficients of interest—Nationalized for equation (4) and MargNat for (5)—are reported.

Nationalization was very successful at increasing the share of credit lent to agriculture. For the sample of one-branch towns, the share of credit granted to agriculture was 26 percentage points higher in towns whose branch was nationalized than in towns whose branch was not. (The average share of credit to agriculture in these locations was 38 percent.) For all India, the estimated effect is smaller, but still substantial: a 10 percent increase in the share of public sector banks led to a more than one percentage point increase in the share of credit going to agriculture. All effects are precisely estimated and significant at the five or one percent level.

Not surprisingly, nationalization had no discernible effect on the share of rural credit for towns with only one branch in 1980: these locations are classified by the RBI as rural, and a full 86 percent of credit granted in these towns went to rural areas. The effect in the

all-India estimates is, however, substantial. Nationalization of 10 percent of the branches in a city had an effect of increasing the share to rural areas by one percentage point.

Nationalization was thus quite successful in causing banks to focus lending on rural and agricultural areas. This was not the case for another primary goal of nationalization, to increase the flow of credit to activities associated with economic development: the estimated effect of nationalization on credit to small scale industry (a key priority ) and large industry are precisely estimated at zero. Nor is there any effect on the share of credit lent to trade and services.

What effect does ownership have on the price and quality of intermediation? Advocates of social banking often argue that high interest rates in rural areas, charged either by money lenders or a monopolistic bank, limit farmers' ability to invest, and therefore reduce agricultural output.

Interest rates in India are highly regulated, with concessionary rates mandated for various types of loans (small loans, agricultural loans, etc.). To capture the discretionary component of interest rates, I compute a "residual interest rate," which controls for loan characteristics that determine interest rates. I regress the interest rate of each loan on a wide range of control variables: an indicator for whether the borrower is in a small scale industry, borrower industrial occupation dummies (at a three-digit level), district fixed effects, size of loan, an indicator for whether the borrower is from the public or private sector, and dummies indicating whether the loan is given in a rural, semi-urban, urban or metropolitan area. Aggregating the residuals from this regression, at the credit market level, gives a measure of interest rates that is independent of loan characteristics.

Table 6 suggests that when given a chance, public sector banks will lend at a lower interest rate than private sector banks. Nationalization had no effect on interest rates in 1992, though interest rates were heavily regulated prior to October 1994. Once rates were deregulated, the presence of nationalized banks led to substantially lower interest rates. The size of the effect is identical in both specifications, and significant at the one percent level. A town with a public branch would receive credit at an interest rate of 1.7

percentage points lower than a town with a private sector bank. Note also that this is not attributable to differences in the lending portfolios (e.g., riskiness of the industry of the borrower) of public and private banks, since the residual interest rate was calculated conditional on the industry of use and size of the loan. This is a substantial difference, given that the interest rate at the time was around 15 percentage points, and is much larger in magnitude than the effect estimated by Sapienza (2004) for Italy, who found that government banks lent at rates approximately 20 to 50 basis points lower than private banks. The lower interest rates charged by public sector banks in the 1990s may have hindered their ability to grow, as the banks earned a lower return on their capital.

The second panel of Table 6 evaluates the quality of intermediation provided by banks, as measured by the share of credit marked as late by more than six months in 1992. The first three columns of Table 6 use the share of non-agricultural credit that is reported as at least six months late, while columns (4)-(6) give the effect for agricultural lending. The estimated effect of nationalization is consistently positive. For non-agricultural credit in the all-India sample, nationalized banks' lending portfolios have a 4-5 percentage point greater share of non-performing loans. For agricultural loans, the effect is even greater: 7 percentage points in the all-India sample, and 18 percentage points in one-branch towns. The combination of higher default rates, and lower interest rates, especially for agricultural credit, contributed to the balance sheet weakness in public sector banks in the 1990s.

The results provide some evidence in support of the development view of government ownership of banks: nationalization resulted in substantially faster financial development in the 1980s, lower interest rates, and shifted credit towards agriculture and rural areas. However, the gains in credit were not sustained, as nationalized markets suffered a severe contraction in credit in the 1990s. Second, the quality of intermediation provided by government banks was much lower: public sector loans were substantially more likely to default than loans issued by private sector banks. This contributed to a substantial drain on the public treasury, as the national government recapitalized these banks.

Strong evidence in favor of the political view is presented in Cole (2006). I demonstrate

that there are agricultural lending booms prior to state elections, and that these lending booms are targeted towards districts in which the majority party narrowly won or lost the previous election.

Nationalization thus caused an increase in quantity, but lowered quality, of financial intermediation. In the final section, I investigate how these credit market shocks affected sectoral employment and agricultural investment: were the effects of increased quantity greater or less than the costs of decreased quality?

## 4 Real Outcomes

This final section provides evidence on how bank ownership affects economic, rather than financial, development. A major challenge is data: the unit of analysis is the town (or village), and the only data available at this level is census data. The towns must be manually matched by name.<sup>12</sup> Data on employment and agricultural investment from the 1991 census were manually matched to the banking data, using the bank branch addresses, as were data on employment from the 1981, 1991 and 2001 censuses. Of the 2393 credit markets in the banking data set, I was able to match 1,075 successfully to all three censuses.<sup>13</sup>

The measures available in the census are not ideal—there is no information about firms, for example—but they do provide information on the effects of ownership on employment and investment. Measures of economic development include share of male workers engaged in the following activities: agricultural laborers, cultivators, household industry, formal manufacturing, trade, and services (the latter three are available only for 1991). A greater share of employees in the latter four sectors will be taken as evidence of greater economic development. Agricultural laborers are landless laborers who work as sharecroppers or for wages, while cultivators own their own land. Agricultural laborers are often very poor, and a decline in their number could be taken as a sign of reduced inequality.<sup>14</sup>

Because agricultural credit was such an important part of the rationale for nationaliza-

tion, a second data set, the 1991 census village abstracts, was matched to credit markets. These data provide information about agricultural investment. Seven hundred and one villages were matched to the set of villages with only one branch.<sup>15</sup>

Table 7 presents the results. The first three columns present the cross-sectional relationship between nationalization and employment outcomes. The first column may be taken as a test of the identification assumption, as the 1981 census data were collected immediately after nationalization. The second and third columns give the cross-sectional estimates of ten, and twenty, years of exposure to nationalized banks. The real outcome data form a panel, and columns (4)-(6) present difference-in-difference estimates of the effect of nationalization. Equations (4) and (5), are estimated with changes, rather than levels, as the dependent variable. Column (4) and (5) give ten year changes (1981-1991, and 1991-2001), while column (6) gives the change in the dependent variable over a twenty year period (1981-2001).

Column (1) suggests that the identifying assumption holds: the share of people employed in agriculture and small-scale industry in 1981 is not systematically different between towns whose branch was nationalized and towns whose branch was not.

The first four rows present the effect of nationalization of banks on employment in agriculture. The point estimates in columns (2) and (3) are positive (and significant) suggesting that nationalization, with its focus on credit to agriculture, may have slowed the development process of exit from agriculture into other sectors. However, the cross-sectional estimated effects (columns (2) and (3)) are only slightly larger than the pre-existing (but not statistically significant) differences, and indeed the difference-in-difference estimates in columns (4)-(6) do not provide evidence for a systematic effect.

A second main goal of nationalization was to promote employment in small-scale industries. Column (1) indicates there were no significant differences in small-scale industry employment prior to nationalization. From 1981 to 1991 the level of credit lent by public banks doubled relative to private sector banks, while the share directed to small-scale industry did not change. Nevertheless, point estimates of the effect of nationalization

on employment in small-scale industry are, across all specifications and all time periods, statistically indistinguishable from zero, and nearly everywhere estimated quite precisely at zero.

As a final test of the effect of bank nationalization on employment, the bottom half of Table 7 looks at the cross-sectional effect on employment in industry, trade and services. These sectors are most associated with economic growth and financial development. The point estimates that towns whose bank branch was nationalized had a substantially lower share of employment in industry and trade. For the all-India sample (which includes cities and towns), these estimates are statistically and economically significant, with a 10 percent increase in the share of banks owned by the government leading to an approximately 0.2-0.6 percent decline in industrial or trade employment. Unfortunately, data on employment in these sectors are not available for 1981 or 2001, so it is not possible to estimate the effect in changes.

What were the effects of the very large increase in credit to agriculture? The presence of tubewells, and the share of land irrigated are used as measures of investment. These variables are important to development: tubewells provide (often safer) drinking water, while improved irrigation has led to substantial increases in output, and decline in output variability. Strikingly, while agricultural credit in villages whose branches were nationalized more than doubled over the period 1980 to 1990, relative to villages with private branches, there was no improvement in either of these measures. The results in Table 8 indicate that nationalization had no effect on the likelihood that a town possesses a tubewell, nor on the share of land under irrigation. The estimates are not as precise as the employment and credit market results, but do rule out substantial impacts: for example, nationalization, which more than doubled agricultural credit, did not affect the probability of having a tubewell by more than 16 percent, or the share of land irrigated by more than 20 percent.

The evidence presented here paints a discouraging picture for proponents of government ownership of banks. While nationalization initially spurred financial development,

and caused unprecedented amounts of credit to flow to agriculture, this came at a cost of lower quality intermediation. Moreover, a more than doubling of agricultural credit to villages led to no measurable increase in agricultural investment. Even the increase in credit was not sustained, as financial development was much slower in nationalized areas in the 1990s. Perhaps the most compelling evidence against the development view of government ownership of banks is its apparent deleterious effect on employment in trade and service industries: along with manufacturing, these are the industries most associated with financial development and growth.

## 5 Conclusion

Finding compelling answers to the question of what determines financial development, and how financial development affects real outcomes, is difficult. Cross-country regressions suggest plausible relationships, but may not provide evidence of causal relationships. Studies that examine bank behavior identify features of government ownership of banks, but may not capture general equilibrium effects. This paper uses a policy experiment in India that induced variation in bank ownership across credit markets. This variation provides credible estimates of the effect of government ownership of banks on financial development and real outcomes.

The identification is valid if the marginal nationalized banks are no different from marginal non-nationalized banks, after conditioning on size. I test this identification strategy in three ways: first, I show that, based on balance-sheet characteristics, nationalization and non-nationalized banks are similar. Second, I show that nationalized and non-nationalized banks were growing at similar rates in the decade prior to nationalization. Finally, I demonstrate that, at the time of the nationalization, the areas in which the nationalized bank branches were located were not different than the areas in which the private branches were located.

A limitation of the study is that the nationalized banks were larger than the non-

nationalized banks. While I include size controls, and standard errors are clustered appropriately, it is difficult to control perfectly for size. The study includes 25 banks, located in 2,443 credit markets in 340 districts.

I show that OLS panel estimates, the standard cross-country technique, may provide inaccurate estimates. An OLS approach suggests that bank nationalization had no effect on lending growth in the decade following nationalization. This contrasts greatly with estimates from the natural experiment, which show that nationalization led to a 5-10 percent increase in the annual rate of credit growth between 1980 and 1990. This positive effect on financial development was not sustained.

Government ownership did have a lasting effect on the sectoral allocation of credit, leading to increased lending to agriculture and rural areas. It also had a substantial effect on the price and quality of intermediation: markets with more government-owned banks had much higher delinquent loan rates, and lower average interest rates.

Finally, I document the effect that a shock to financial development has on real outcomes. By 1990, villages whose branches were nationalized had experienced a doubling in aggregate credit relative to villages whose branches were not nationalized. Moreover, a much higher share of this credit went to agriculture. Yet, I observe no increase in agricultural investment in villages whose branches were nationalized. It is certainly possible that the households receiving the greater amount of credit are better off (perhaps they used the money to send their children to school, or purchase medicine). But this increased lending did not affect agricultural investment, and increased the share of non-performing loans substantially.

These results complement Burgess and Pande (2005), which finds that rural branch expansion significantly reduced rural poverty, while aiding the diversification of the economy. Rural branches, particularly those owned by the government, lent substantial amounts. Yet, the findings here suggest that it was not necessary to open government-owned bank branches in rural areas. Had the government imposed the same regulations (requiring expansion into rural areas, and setting lending targets), without nationalizing banks, rural

areas may well have achieved the same, or better, outcomes.

I do not find large effects of changes in financial development. La Porta et. al. find that moving from 0 percent to 100 percent of banks owned by the government reduces the annual growth rate by -1.4 percent to -2.4 percent per year, depending on the time period. If nationalization had led to a 2 percent decline in growth rates in India, it would suggest that after twenty years, the level of economic activity in villages whose branch was nationalized should be over 30 percent lower than in villages whose branch was not. While GDP cannot be measured at the village level, the measured effect of nationalization on change in agricultural employment (which is closely correlated with economic growth) is not consistent with very large effects. One important reason is that the results in this paper include district fixed-effects, which control for any unobserved heterogeneity between districts: such an approach is not possible using cross-country variation. I do find some effects on employment in trade and industry in 1991, suggesting that government ownership of banks did hinder growth in sectors important to economic development.

The final analysis thus rejects a development view of government ownership of banks. Government ownership initially increased the quantity, and substantially lowered the quality, of financial intermediation. An enormous increase in credit to agriculture had no measurable effects on agricultural investment. Looking to the future, these results suggest that while the global trend towards privatizing government-owned banks will lead to reduced “social” lending, this may come at little or no cost to the beneficiary sectors. The quality of financial intermediation should improve. But the real effects may be much more modest than those suggested by cross-country regressions.

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# Notes

<sup>1</sup>Tandon (1989, p. 198).

<sup>2</sup>Banks were allowed to report loans smaller than Rs. 25,000 (ca. \$625) in an aggregated fashion until 1999, at which point loans below Rs. 200,000 (ca. \$5,000) were reported as aggregates.

<sup>3</sup>This point is developed in greater detail in section 3.2.

<sup>4</sup>The choice of how many banks to designate as marginal is a trade-off: a larger set gives more statistical power, but renders the largest and smallest banks more dissimilar. Robustness checks available from the author show that results presented here hold when different sets of banks as denoted “marginal.” (e.g., all six nationalized banks, or the four smallest, etc.) These results are available from the author.

<sup>5</sup>These results are robust to using a second- or third-degree polynomial, or a bank fixed effect.

<sup>6</sup>The identification strategy here is in the spirit of regression discontinuity, but does not match the standard case, because the number of banks above and below the cutoff is not large.

<sup>7</sup>The point estimate of a regression of deposits in 1980 on a dummy for nationalization is .109, with a standard error of .074. Appendix Table A2 performs the same test for credit, and finds no statistically significant difference.

<sup>8</sup>An alternative approach observes the following:  $\text{MargNat}_c = \text{MargShare}_c * \text{NatFraction}_c$ , where  $\text{NatFraction}$  is the fraction of marginal branches that were nationalized in credit market  $c$ . This alternative approach controls for smooth (quadratic) functions of both  $\text{MargShare}_c$  and  $\text{NatFraction}_c$ . The effect of nationalization is identified by the interaction  $\text{MargShare}_c * \text{NatFraction}_c$ . Results from this specification generally match those from equation (5), and are available from the author.

<sup>9</sup>Recall that the constant serves as the omitted category of large public banks. Thus, the coefficient on the constant should be one. Small banks were not nationalized; the presence of these in a district reduces the share of credit by public sector banks: thus  $\pi_s$  should be -1. Similarly,  $\pi_l$  should be zero, since shifting a bank branch from the omitted category to large public will not affect the share of credit from nationalized banks. Finally,  $\pi_m$  will be 1, while  $\gamma$  will be -1.

<sup>10</sup>Census data are available electronically only from 1991. The paper volumes, from which the 1981 data were collected, are not available together in one location. Moreover, it is often difficult to match

1991 towns to 1981. The data were collected from the paper volumes located at the Library of Congress, Harvard University's Library, and the New York Public Library.

<sup>11</sup>Against this hypothesis is evidence from Banerjee and Duflo (2004), which found that a public sector bank passed up many profitable lending opportunities in the 1990s.

<sup>12</sup>Matching was difficult for several reasons: town, village, districts and states changed names and borders frequently between 1981 and 2001; the transliteration of names varies; and village names were sometimes repeated within a state (and sometimes a district).

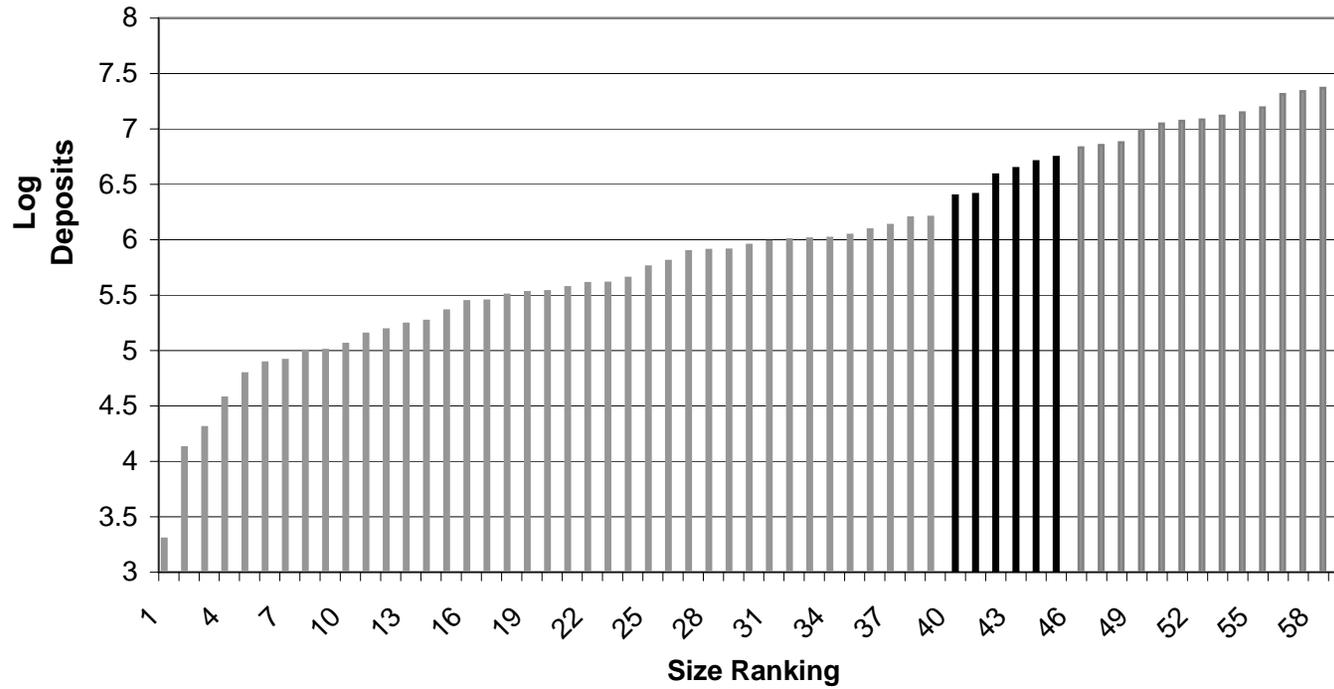
The 1981 census is available only in paper format, consisting of several hundred volumes. Approximately 90% of the required volumes were available at the Library of Congress, with the balance found at Harvard University's Lamont Library and the New York City Public Library.

<sup>13</sup>Larger credit markets, and those containing public sector banks were slightly more likely to be matched, though these relationships do not hold once one conditions on the district in which the branch was located. Due to difficulty in locating paper volumes, only 10% of the markets in Kerala were matched.

<sup>14</sup>The census also contains other measures that may be correlated with well-being, such as literacy rates and share of the population between 0-6 years. There was no relationship between these variables and nationalization.

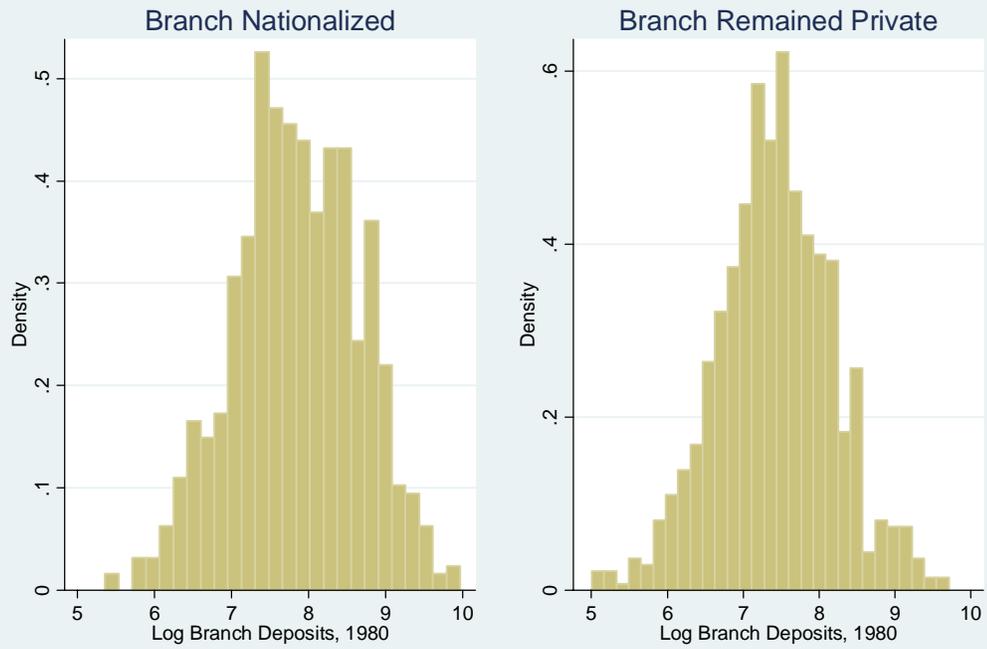
<sup>15</sup>Analysis of agricultural investment is limited to villages with one branch only in 1981, as an insufficient number of multi-branch credit markets could be matched to the village abstract dataset.

**Figure 1: Distribution of Bank Sizes, December 1979**



Note: Figure 1 gives the size (in terms of aggregate log deposits, as of 1979) of all scheduled commercial banks in India. The six banks highlighted in black were nationalized in 1980. The banks with a larger deposit base (to the right) were nationalized in 1969 or earlier, while the banks with a lower deposit base (to the left) were private and remained private following 1980.

Figure 2: Log Deposits in 1981 of Single-Branch Credit Markets



**Table I: Comparison of Nationalized and Non-Nationalized Banks Prior to Nationalization**

	<b>Banks Close to the Cut-Off</b>					
	Mean		P-Value of Tests of Difference including control polynomial:			
	Nationalized	Private	No Control	Linear	Quadratic	Cubic
Deposits	3,689,719	732,360	0.00			
# of Branches	420	148	0.00	0.48	0.78	0.78
Profits	4828	1135	0.00	0.66	0.64	0.65
Deposits / Branch	8864	5301	0.00	0.30	0.72	0.73
Return on Equity	0.0014	0.0017	0.44	0.60	0.57	0.58
Sample Size	5	18				

Note: Table I compares variables from the balance sheets of banks that were close to the nationalization cut-off. Columns (1) and (2) give the means for the group that was nationalized and the group that was not, while columns (3), (4), (5), and (6) give the p-value of a test of the hypothesis that the difference in means is zero. (The p-value from the hypothesis  $\beta=0$ , from equation 1 in the paper, is given). Columns (4), (5), and (6) include a linear, quadratic, and cubic (respectively) polynomial in log bank size.

**Table II: Growth Rate of Nationalized and Non-Nationalized Banks**

Panel A: Controlling for Bank Size								
Deposits Growth					Credit Growth			
	Small	Marginal	Marginal* Nationalized	Large	Small	Marginal	Marginal* Nationalized	Large
1970s	0.19 *** (0.07)	0.20 ** (0.09)	0.05 (0.03)	0.19 * (0.11)	0.14 ** (0.07)	0.16 * (0.09)	0.05 (0.03)	0.16 (0.11)
1980s	-0.03 (0.03)	-0.06 *** (0.01)	-0.04 (0.04)	-0.06 *** (0.00)	0.00 (0.02)	-0.05 *** (0.01)	-0.03 (0.04)	-0.04 *** (0.00)
1990s	0.02 (0.05)	-0.02 (0.01)	-0.08 * (0.04)	-0.05 *** (0.00)	0.03 (0.06)	-0.01 (0.02)	-0.09 ** (0.04)	-0.07 *** (0.00)
Panel B: Controlling for Bank Size * Decade								
Deposits Growth					Deposits Growth			
	Small	Marginal	Marginal* Nationalized	Large	Small	Marginal	Marginal* Nationalized	Large
1970s	0.08 (0.13)	0.05 (0.19)	0.02 (0.04)	0.00 (0.24)	0.03 (0.13)	0.00 (0.18)	0.01 (0.04)	-0.05 (0.23)
1980s	0.09 (0.14)	0.10 (0.19)	0.00 (0.05)	0.15 (0.25)	0.13 (0.13)	0.13 (0.18)	0.01 (0.04)	0.19 (0.22)
1990s	0.24 * (0.13)	0.28 (0.17)	-0.01 (0.05)	0.33 (0.22)	0.25 (0.17)	0.29 (0.23)	-0.02 (0.06)	0.31 (0.29)

Note: Table II compares the growth rate of deposits and credit, at the bank level, for several groupings of banks. "Small" banks were never large enough to be eligible for nationalization; "marginal" banks include those that were just above or below the cutoff for nationalization. "Marginal\*Nationalized" banks were those marginal banks that were nationalized. Finally "Large" indicates the largest private bank that was nationalized in 1980. Each panel reports results from two regressions, one for deposit growth, and one for credit growth. Columns (1), (2), and (4) of the first line (1970s) give the average growth rate for the small, marginal, and large groups in the 1970s. The second line gives the *differential* growth rate (relative to the 1970s) for the 1980s and 1990s. Finally, column (3) gives the differential growth rate between marginal non-nationalized and marginal nationalized. Panel A includes a linear control for log deposits as of 1980, while panel B includes a linear control for deposits as of 1980 interacted with three decade dummies (1970s, 1980s, and 1990s).

**Table III: Nationalization First Stage**

Dependent Variable: Share of Credit Granted by Public Branches in 1992		
	One-Branch Towns	Control for Size
	(1)	(2)
<b>One-Branch</b>		
Nationalized	1.00 *** (0.02)	
Parent Size	0.97 (3.30)	
Parent Size <sup>2</sup>	-0.08 (0.23)	
Parent Size <sup>3</sup>	0.00 (0.01)	
<b>All-India</b>		
Share of Branches, Marginal & Nationalized Parent		1.00 *** (0.01)
Share of Branches, Marginal Parent		-0.90 *** (0.03)
Share of Branches, Small Parent		-0.76 *** (0.14)
Share of Branches, Large Parent		-0.16 ** (0.07)
Ave. Size of Marginal Parent Bank		-0.04 *** (0.01)
R <sup>2</sup>	0.97	0.94
N	1513	2443

Notes: The dependent variable is share of credit issued by public banks in 1992. The unit of observation is the credit market.

Each column represents a regression.

Column (1) presents results from a regression for villages that had one marginal private bank prior to the 1980 nationalization. A marginal bank was one whose size placed it just above, or just below, the cutoff line for nationalization. The independent variable of interest is a dummy for whether the branch was nationalized. Control variables include a cubic polynomial in the log size of the parent bank of the branch as of 1980.

Column (2) presents the results for all towns that had at least one marginal private bank in 1980. The independent variable of interest is share of branches in the credit market that were both marginal and nationalized. Control variables are: the average size of the parent banks of marginal branches, the share of branches whose parents belonged to large banks, share of branches whose parents belonged to medium banks, and share of branches whose parents belonged to small banks.

All regressions include district fixed effects and a cubic polynomial in the log level of deposits in the credit market in 1980.

**Table IV: Bank Nationalization and Financial Development**

Panel A: 1980-2000	Deposit Growth 1981-2000			Credit Growth 1981-2000		
	OLS	REDUCED FORM		OLS	REDUCED FORM	
	(1)	One-Branch	Control for Size	(4)	One-Branch	Control for Size
Nationalized	-0.01 *** (0.002)	0.00 (0.01)		-0.01 *** (0.003)	0.03 (0.02)	
Parent Size		-2.31 * (1.39)			-1.08 (2.10)	
Parent Size <sup>2</sup>		0.17 * (0.10)			0.08 (0.15)	
Parent Size <sup>3</sup>		0.00 * (0.00)			0.00 (0.00)	
Marginal & Nationalized			0.00 (0.00)			0.01 ** (0.01)
Share Marginal			-0.02 ** (0.01)			0.01 (0.01)
Share Small			0.01 (0.01)			0.04 * (0.02)
Share Large			-0.04 ** (0.02)			0.03 (0.03)
Ave. Size of Marginal			0.00 (0.00)			-0.01 ** (0.01)
R <sup>2</sup>	0.39	0.57	0.48	0.26	0.43	0.28
N	11916	1513	2443	11840	1512	2443

Notes: The dependent variable is the annual growth rate of deposits or credit. The unit of observation is the credit market. Each column represents a regression.

Columns (1) and (4) report OLS regressions of growth in deposits or credit on the share of bank branches that were government-owned in the credit market as of 1980.

Columns (2) and (5) present results from a regression for villages that had one marginal private bank prior to the 1980 nationalization. A marginal bank was one whose size placed it just above, or just below, the cutoff line for nationalization. The independent variable of interest is a dummy for whether the branch was nationalized. Control variables include a cubic polynomial in the log size of the parent bank of the branch as of 1980, and a cubic polynomial in deposits as of 1980.

Columns (3) and (6) present the results for all towns that had at least one marginal private bank in 1980. Control variables include share of branches whose parents belonged to large banks, share of branches whose parents belonged to medium banks, and share of branches whose parents belonged to small banks, (share belonging to already nationalized banks is the omitted category), as well as a cubic polynomial in 1980 deposits at the credit market level.

All regressions include district fixed effects.

**Table IV, Continued : Bank Nationalization and Financial Development**

Panel B: 1980s	Deposit Growth 1981-1990			Credit Growth 1981-1990		
	OLS	REDUCED FORM		OLS	REDUCED FORM	
	(1)	One-Branch (2)	Control for Size (3)	(4)	One-Branch (5)	Control for Size (6)
Nationalized	0.00 (0.004)	0.02 (0.02)		0.00 (0.005)	0.11 *** (0.03)	
Parent Size		-4.79 ** (2.06)			-1.85 (3.25)	
Parent Size <sup>2</sup>		0.35 ** (0.15)			0.15 (0.24)	
Parent Size <sup>3</sup>		-0.01 ** (0.00)			0.00 (0.01)	
Marginal & Nationalized			0.02 ** (0.01)			0.05 *** (0.01)
Share Marginal			-0.06 *** (0.01)			-0.01 (0.02)
Share Small			-0.03 ** (0.01)			0.01 (0.02)
Share Large			-0.08 *** (0.03)			0.08 ** (0.03)
Ave. Size of Marginal			0.00 (0.01)			-0.02 (0.01)
R <sup>2</sup>	0.39	0.54	0.44	0.26	0.43	0.33
N	11918	1513	2443	11837	1512	2442
<b>Panel C: 1990s</b>	<b>Deposit Growth 1991-2000</b>			<b>Credit Growth 1991-2000</b>		
	OLS	REDUCED FORM		OLS	REDUCED FORM	
	(1)	One-Branch (2)	Control for Size (3)	(4)	One-Branch (5)	Control for Size (6)
Nationalized	-0.03 *** (0.003)	-0.01 (0.02)		-0.03 *** (0.004)	-0.04 (0.03)	
Parent Size		-0.46 (1.68)			-0.72 (3.15)	
Parent Size <sup>2</sup>		0.03 (0.12)			0.05 (0.23)	
Parent Size <sup>3</sup>		0.00 (0.00)			0.00 (0.01)	
Marginal & Nationalized			-0.01 * (0.01)			-0.02 * (0.01)
Share Marginal			0.02 ** (0.01)			0.04 *** (0.01)
Share Small			0.06 * (0.03)			0.07 (0.04)
Share Large			-0.03 (0.03)			-0.06 (0.04)
Ave. Size of Marginal			-0.01 ** (0.00)			-0.01 (0.01)
R <sup>2</sup>	0.27	0.48	0.37	0.18	0.35	0.28
N	12483	1513	2443	12482	1513	2443

Notes: See Panel A for Notes

**Table V: Sectoral Allocation of Credit**

	Agricultural Credit	
	One-Branch Towns	Control for Size
	(1)	(2)
<b>Agricultural Credit</b>		
Nationalization	0.26 ** (0.11)	0.12 *** (0.02)
N	1513	2443
<b>Rural Credit</b>		
Nationalization	0.06 (0.07)	0.10 ** (0.04)
N	1513	2443
<b>Small-Scale Industry</b>		
Nationalization	0.01 (0.02)	0.01 (0.01)
N	1513	2443
<b>Industrial Credit</b>		
Nationalization	0.01 (0.01)	0.01 (0.01)
N	1513	2443
<b>Credit to Trade</b>		
Nationalization	0.01 (0.03)	0.00 (0.01)
N	1513	2443
<b>Credit to Services</b>		
Nationalization	-0.01 (0.02)	0.00 (0.01)
N	1513	2443

Notes: The dependent variable is agricultural or rural credit in 1992. The unit of observation is the credit market. Each cell represents a regression. The independent variable of interest, whose coefficient is reported in the table, is the share of bank branches in a credit market nationalized in 1980.

Column (1) presents results from a regression for villages that had one bank branch, which was "marginal," prior to the 1980 nationalization. Column (2) presents the results for all branches that had a least one marginal branch in 1980.

**Table VI: Interest Rate and Quality of Intermediation**

	Agricultural Credit	
	One-Branch Towns	Control for Size
	(1)	(2)
<b>Average Market Interest Rate</b>		
Interest Rate, 1992	0.007 (0.006)	-0.001 (0.002)
N	1507	2437
Interest Rate, 2000	-0.017 *** (0.006)	-0.017 *** (0.002)
N	1448	2393
<b>Share of Credit in Arrears, 1992</b>		
Non-Agricultural	0.038 0.034 1223	0.042 * 0.022 1908
Agricultural Credit	0.185 *** 0.046 857	0.067 ** 0.028 1533

Notes: Table VI reports the effect of nationalization on interest rates, and late loan repayment, in credit markets in India. The notes to Table V provide details of the regressions.

**Table VII: Effect of Bank Nationalization on Employment and Employment Growth**

<b>Panel A: Share of Employment in Agricultural Labor, Cultivators, and Small-Scale Industry</b>							
		<b>Agricultural Labor</b>		<b>Cultivators</b>		<b>Small-Scale Industry</b>	
		<u>One-Branch</u>	<u>Control for Size</u>	<u>One-Branch</u>	<u>Control for Size</u>	<u>One-Branch</u>	<u>Control for Size</u>
<b>Levels</b>							
1981	Nationalization	-0.02 (0.07)	0.01 (0.03)	0.05 (0.10)	0.06 (0.04)	0.06 (0.04)	0.00 (0.02)
1991	Nationalization	0.02 * (0.01)	0.03 ** (0.02)	0.00 (0.02)	0.04 ** (0.02)	0.01 (0.01)	0.00 (0.01)
2001	Nationalization	0.03 (0.03)	0.01 (0.02)	0.02 (0.02)	0.02 (0.01)	0.00 (0.00)	0.00 (0.01)
<b>Changes</b>							
1981-1991	Nationalization	0.03 (0.05)	0.02 (0.02)	-0.03 (0.07)	0.01 (0.02)	-0.05 (0.04)	0.01 (0.01)
1991-2001	Nationalization	0.01 (0.02)	-0.02 (0.02)	0.02 (0.02)	-0.01 (0.01)	0.00 (0.00)	0.00 (0.00)
1981-2001	Nationalization	0.06 (0.08)	-0.01 (0.03)	-0.01 (0.07)	-0.02 (0.03)	-0.04 (0.03)	0.01 (0.02)
<b>Panel B: Share of Employment in Industrial, Trade, and Services</b>							
		<b>Industrial Employment</b>		<b>Trade Employment</b>		<b>Service Employment</b>	
		<u>One-Branch</u>	<u>Control for Size</u>	<u>One-Branch</u>	<u>Control for Size</u>	<u>One-Branch</u>	<u>Control for Size</u>
<b>Levels</b>							
1991	Nationalization	0.01 (0.01)	-0.02 ** (0.01)	-0.01 (0.01)	-0.04 *** (0.01)	0.00 (0.00)	0.00 (0.01)

Notes: Each cell represents a regression, and reports the estimated effect of bank nationalization on the dependent variable. The dependent variables are the share of the population involved in each employment sector, for the time period given at the left of the table. The unit of observation is the credit market.

The columns labeled "One-Branch" present the specification that includes all villages that had one bank branch, whose parent bank was close to the 1980 nationalization cut-off. The dependent variable whose coefficient is reported is a dummy variable taking the value of one if the branch in that village is nationalized, and zero if the branch remains part of a private bank. The columns labeled "Control for Size" present results for all villages and towns in India that had at least one marginal branch. The coefficient reported is on the share of bank branches in that market nationalized in 1980.

All regressions include district fixed effects and a cubic polynomial in the log level of deposits in the credit market in 1980. Sample sizes are given in the appendix table.

**Table VIII: Effect of Nationalization on Agricultural Investment**

	Share of Towns with	Fraction of Land
	Tubewell	Irrigated
	One-Branch Towns	One-Branch Towns
<b>One Branch</b>	(1)	(2)
Nationalized	0.00 (0.08)	0.00 (0.10)
Parent Size	116.98 (164.40)	80.14 (62.50)
Parent Size <sup>2</sup>	-7.87 (11.12)	-5.42 (4.19)
Parent Size <sup>3</sup>	0.18 (0.25)	0.12 (0.09)
R <sup>2</sup>	0.38	0.79
N	701	636

Notes: The dependent variable is a dummy of whether the town has a tubewell or the fraction of land irrigated in 1991. The unit of observation is the credit market. Each column represents a regression.

Each column presents results from a regression for villages that had one marginal private bank prior to the 1980 nationalization. A marginal bank was one whose size placed it just above, or just below, the cutoff line for nationalization. The independent variable of interest is a dummy for whether the branch was nationalized. Control variables include a cubic polynomial in the log size of the parent bank of the branch as of 1980.

All regressions include district fixed effects and a cubic polynomial in the log level of deposits in the credit market in 1980.

**Appendix Table I: Summary Statistics**

<b>Panel A: Bank Growth</b>			
	Mean	Std. Dev	N
Annual Change in Log Credit (Nominal)	0.19	0.10	978
Annual Change in Log Deposits (Nominal)	0.18	0.12	978

<b>Panel B: Credit Market and Real Outcomes</b>						
	One-Branch Credit Markets			All Credit Markets		
	Mean	Std. Dev	N	Mean	Std. Dev	N
<b>Dependent Variables</b>						
Share of Credit from Public Branches, 1992	0.49	0.49	1513	0.60	0.43	2443
Deposit Growth, 1981-2000	0.17	0.04	1513	0.16	0.03	2443
Credit Growth, 1981-2000	0.14	0.05	1513	0.14	0.04	2443
Share of Credit to Agriculture, 1992	0.38	0.23	1513	0.33	0.22	2443
Share of Credit to Rural Areas, 1992	0.86	0.34	1513	0.55	0.50	2443
Share of Credit to Small Scale Industry, 1992	0.06	0.09	1513	0.09	0.10	2443
Share of Credit to Industry, 1992	0.07	0.12	1513	0.14	0.17	2443
Share of Credit to Trade, 1992	0.09	0.09	1513	0.10	0.08	2443
Share of Credit to Services, 1992	0.05	0.06	1513	0.05	0.06	2443
Interest Rate, 1992	0.00	0.02	1507	0.00	0.02	2437
Interest Rate, 2000	0.01	0.01	1448	0.01	0.03	2393
Share of Non-Agricultural Credit Late, 1992	0.09	0.16	1223	0.10	0.14	1908
Share of Agricultural Credit Late, 1992	0.10	0.21	857	0.12	0.20	1533
<b>Independent Variables</b>						
Nationalized	0.47	0.50	1513			
Average Size of Parent Branch	14.90	0.80	1513			
Share of Branches, Marginal & Nationalized Parent				0.27	0.41	2443
Share of Branches, Marginal Parent				0.71	0.34	2443
Share of Branches, Small Parent				0.00	0.03	2443
Share of Branches, Large Parent				0.00	0.03	2443
Ave. Size of Marginal Parent Bank				13.90	0.98	2443

<b>Panel C: Employment and Employment Growth</b>						
	One-Branch Credit Markets			All Credit Markets		
	Mean	Std. Dev	N	Mean	Std. Dev	N
Share of Population Employed in:						
1981 Agricultural Labor	0.23	0.16	652	0.13	0.13	1067
1981 Cultivation	0.25	0.14	656	0.15	0.15	1075
1981 Small Scale Industry	0.04	0.06	648	0.03	0.05	1067
1991 Agricultural Labor	0.15	0.08	888	0.10	0.08	1402
1991 Cultivation	0.17	0.10	888	0.11	0.10	1402
1991 Small Scale Industry	0.01	0.02	888	0.01	0.02	1402
1991 Industry	0.05	0.04	888	0.07	0.05	1402
1991 Trade	0.05	0.03	888	0.08	0.05	1402
1991 Service	0.06	0.03	888	0.08	0.05	1402
2001 Agricultural Labor	0.16	0.16	1058	0.09	0.12	1804
2001 Cultivation	0.16	0.13	1058	0.09	0.12	1804
2001 Small Scale Industry	0.02	0.03	1058	0.02	0.03	1804

<b>Panel D: Agricultural Investment</b>			
	One-Branch Credit Markets		
	Mean	Std. Dev	N
1991 Share of Towns with Tubewell	0.31	0.46	701
1991 Fraction of Land Irrigated	0.44	0.39	636

**Appendix Table II: Test of Identification Assumptions**

	One-Branch Towns	All Towns/Villages
	(1)	(2)
<b>Panel A: Without Size Controls</b>		
<b>Log Credit in 1981</b>		
Nationalization	0.14 (0.12)	-0.01 (0.10)
N	1513	2840
<b>Panel B: Falsification Exercise</b>		
<b>Log Credit in 1981</b>		
Nationalization	-0.21 (0.15)	0.00 (0.08)
N	1513	2443
<b>Share Agricultural Workers, 1981</b>		
Nationalization	-0.02 (0.07)	-0.01 (0.02)
N	652	1067
<b>Share Cultivators, 1981</b>		
Nationalization	0.05 (0.10)	0.03 (0.02)
N	656	1075
<b>Share Small-Scale Industry, 1981</b>		
Nationalization	0.06 (0.04)	0.00 (0.01)
N	648	1067
<b>Share Literate, 1981</b>		
Nationalization	0.09 (0.06)	0.01 (0.02)
N	656	1074

Notes: This table tests whether the share of marginal banks nationalized was correlated with credit market or labor conditions in 1981. Panel A is an OLS regression of the log amount of credit in 1981 on the share of marginal branches nationalized, and includes only district fixed effects as controls. Panel B uses the identification strategy described in the text to conduct a falsification exercise.

Column (1) presents results from a regression for villages that had one bank branch, which was "marginal," prior to the 1980 nationalization. Column (2) presents the results for all branches that had a least one marginal branch in 1980.