

Incentive contracts and bank performance

*Evidence from rural China*¹

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Abstract

This paper, using unique survey data from the banking industry in rural China, investigates the effect of incentive contracts on performance. In the context of China's economic transition, we find that the incentive contracts have a positive effect on the bank manager's performance in deposit taking and non-performing loan reduction. This finding is robust when we control for the endogeneity of incentive contracts. Our empirical results present evidence on the positive effects of incentive-based banking reforms in rural China.

JEL classifications: D80, G21, P31.

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1. Introduction

China's economic transition is known for its so-called 'gradualist' approach to reforming traditional economic institutions. One of the distinguishing features of the transition is that top reformers encouraged officials in their respective sectors to use incentives to elicit more effort from lower-level cadres, managers and workers. For example, instead of directly privatizing state-owned enterprises (SOE), China gradually introduced incentives or incentive contracts that tied the bonuses of management and workers to the firm's performance (Naughton, 1995). Reformers also used incentives in their attempts to reform the political and fiscal relationship between China's central and local governments in the 1980s (Qian and Weingast, 1997; Whiting, 2001). Li and Zhou (2005) and Chen, Li and Zhou (2005) show that provincial leaders are more likely to be promoted when the gross domestic product (GDP) growth rates of their provinces are higher. Their finding suggests that the central government uses personnel control to motivate local officials to promote local economic growth. Jin *et al.* (2005) find that the central government reforms the fiscal system by signing a fiscal-sharing contract with each province, which specified a marginal revenue-retention rate for the provincial government.

Incentive contracts have also been introduced into the Chinese state-owned banks since the early 1980s. As a major reform initiative to improve the performance of state-owned banks, especially to target increasing deposits and reducing non-performing loans, the government initiated a bonus system for state-owned banks in the mid-1980s. Usually, the higher-level bank signs a so-called responsibility contract individually with each lower-level branch manager. The contracts, normally signed on an annual basis, specify a formula tying the bank manager's monetary rewards to performance. These contracts aim at providing managers with incentives without relinquishing ownership of the banks.

The purpose of this paper is to examine whether these incentive contracts help to improve bank performance, using a unique dataset from the banking sector in rural China. Estimating the effect of incentives on performance is never straightforward. As is well known, identifying such an effect is complicated by the simultaneity between performance and the terms of the contract (Chiappori and Salanie, 2003). It is possible that more able agents choose high-incentive contracts, or that principals assign high-incentive contracts to less able agents in order to induce more response from them. If an agent's ability is not fully controlled for in the empirical work, the relationship between incentives and performance may be the result of unobserved heterogeneity of abilities across agents. As is well discussed in the literature (for instance, Akerberg and Botticini, 2002),² simultaneity will bias the ordinary least-squares (OLS) estimations of the effects of incentive contracts on performance upward (downward) if more (less) able agents end up with high incentive contracts.

² Unobserved heterogeneity could also arise from differences in risk-aversion across agents.

In this paper, we control for simultaneity between contracts and performance by employing two-stage least-squares (2SLS) estimates. The key to using 2SLS is to find appropriate instrumental variables (IV). Some unique institutional features of China's banking industry provide us with a good chance of finding valid IVs. More specifically, in China's banking system one principal, the county bank in our sample, makes contracts individually with multiple agents, the bank branches of the various townships within the county. In addition, the location of bank branches is designed to minimize competition within the same financial institution. These features enable us to use the incentive contracts of other agents under the same principal as instruments to identify the effect of contracts on performance. The identification strategy, explained more fully below, basically assumes that the incentive contract between a principal (a county bank manager) and each agent (bank branch manager) is correlated with the contracts of other agents because they are all negotiated with and signed by the same principal; however, because of the absence of competition between branches of the same bank, the nature of the contract of other agents should not have an independent effect on the performance of any given agent.

Drawing on unique survey data we collected from rural China in 1998, we empirically examine the effect of incentive contracts on the performance of banks. The survey data, specifically designed for the purpose of this study, provide detailed information on both bank performance and contracts of bank managers. We find that incentives in managerial contracts have a positive effect on performance. More specifically, a higher incentive in deposit attraction and loan quality leads to greater efforts related to these aspects. This finding is robust when we control for endogeneity. Our empirical results present evidence on the positive effects of incentive-based banking reforms in rural China since the early 1980s.

Our paper is among the very few that explicitly examine the effect of incentive-based reforms in the banking sector. Most empirical studies – both those in China and more generally – focus on the effects of incentive contracts in manufacturing industries.³ Studies on China's banking sector are needed because policy-makers and scholars are keen to know whether there have been any changes in these banks that have been notorious for their high level of non-performing loans. Our study fills this need, and shows a positive effect of incentive-based reforms on rural banks.⁴ The use of data from the banking industry also has another advantage for testing the effects of incentives on performance. Because all banks provide homogeneous

³ One exception, Cull and Xu (2000), find a positive association between bank credit and the productivity of state-owned enterprises (SOEs) in the 1980s and attribute this link partly to the incentives of bank employees to screen out bad projects. However, they also find that, as the state banks increasingly assumed bailout responsibilities for SOEs in the mid-1990s, the positive effects of banking reforms were declining. Because we focus on rural banks, which have no responsibilities to bail out SOEs, our finding that incentive-based reforms have a positive effect does not contradict their findings from urban banks.

⁴ Because our study only employs a single year of data, the general applicability of our results should be interpreted with care.

products, deposit taking and lending services, we can avoid the issue of product differentiation encountered in most studies of manufacturing industries.

The rest of the paper is structured as follows. The next section outlines some institutional background concerning the incentive contracts in China's rural banks. Section 3 describes the data. Section 4 presents regression results and Section 5 the conclusions.

2. Incentive contracts in the Chinese banking industry

To comprehend the impact of incentive contracts it is important to be familiar with the institutional background of China's banking industry, the place in which the incentive contracts that we are studying were designed and executed. To this end we begin by focusing on two financial institutions in rural China, the Agricultural Bank of China (ABC) and the Rural Credit Cooperatives (RCC), covered by the survey data.

The ABC is one of the four specialized state-owned banks in China.⁵ It serves the financial needs of both urban and rural areas. In contrast, RCCs exclusively target rural clients. The main difference between the ABC and RCCs lies in the nature of ownership: the RCCs have a collective ownership status allowing them more flexibility in complying with central financial policies. The RCCs were formerly under the supervision of the ABC, but attained the status of an independent financial institution in 1994. These two financial institutions currently dominate the formal financial system in rural China. As of the late 1990s, they accounted for nearly 80 percent of total rural deposits and loans (Brandt and Li, 2003; Brandt *et al.*, 2005).

The ABC has its headquarters in Beijing and has branch offices at locations corresponding to every administrative level.⁶ In contrast, RCCs are local financial institutions with their headquarters – called the Federation of RCCs (*xin yong lian she*) – at the county level. In general, both the ABC and RCCs have established branches (henceforth referred to as bank branches) in each township. The locations of bank branches reflect the territorial structure of the governmental system, and the scope of business is designed to minimize overlapping and competition within the same institution.

Before the economic reforms started, China's state-owned banks, just like other SOEs, were primarily subject to centralized management and economic planning. The government provided no incentives to motivate bank managers or workers to exert effort; their pay was predetermined and thus independent of performance. Since the early 1980s, however, China has sought to reform its banking sector. So

⁵ The other three specialized state-owned banks are the Industrial and Commercial Bank of China, the Construction Bank of China and the Bank of China.

⁶ The administrative levels in China are – from highest to lowest – central, provincial, prefecture, county and township.

far, the government's major reform involves the introduction of performance-based incentives for bank managers and workers; the managers are provided incentives, but the state has not relinquished ownership of the banks (Groves *et al.*, 1994). As a major reform initiative to improve the performance of state-owned banks, especially targeted at increasing deposits and reducing non-performing loans, the government initiated a bonus system for state-owned banks in the mid-1980s. Usually, the higher-level bank, a county bank in our case, signs a so-called responsibility contract individually with each township branch manager. The contracts, normally signed on an annual basis, specify a formula tying the bank manager's monetary rewards to performance. In other words, in most contracts there is a clear set of incentives.

Both the ABC and RCCs have a similar contracting system. The incentive contract usually consists of two parts: (i) a weighting system assigning individual weights to separate performance items specified in the contract, such as deposit growth and the percentage of non-performing loans and (ii) the amount of monetary reward per point. In general, the county bank sets performance standards, which commonly sums to a total of 100 points, the highest possible level of performance for a branch manager.

With a fixed monetary reward per point, the bonus that branch managers can expect at the end of the year depends on the total points assigned to them by the county bank; these are given according to the performance branch managers achieve during the entire year. The total number of points is equal to a weighted sum of the individual points based on the performance of each item specified in the contract. More specifically, the total points are calculated by the following formula:

$$p = \sum_j^K p_j w_j$$

where p_j represents individual performance points for item j ($j = 1, \dots, K$), and w_j is the individual weight corresponding to performance item j . The total reward for a branch manager is simply the product of the total number of performance points and the monetary reward per point, or

$$pA = \sum_j^K p_j w_j A,$$

where A is the monetary reward per point. The formula for paying the reward in practical terms embodies the incentives for the contract.⁷

⁷ For example, if a branch manager receives 90, 80 and 100 points, respectively, from deposit growth, percentage of non-performing loans and bank safety (assuming there are only three performance items specified in the contract), and if the weights for these three tasks are 25, 25 and 50 percent, respectively, then $p = 90 \times 0.25 + 80 \times 0.25 + 100 \times 0.5 = 92.5$. If the contract specifies a monetary reward of $A = 50$ yuan per point, then the manager should get 4,625 yuan in this example. The actual amount earned by the manager could differ if there is *ex post* renegotiation of the contracts.

We define w_jA as the incentive intensity of performance item j . Our empirical work will be focused on the effects of the incentive intensities on two performance items, deposit growth and loan performance, because these two performance indicators assume a significant role in China's banking sector. As will be shown in the survey data, the two measures rank highest among all the performance items specified in the typical bank contract. Their importance is also manifest in the fact that the People's Bank of China (PBC), China's central bank, evaluates the performance of the state-owned banks primarily by these two measures.⁸ These performance measures are also used at every layer of the banking hierarchy down to the township level.

The fact that profits, the most important performance indicator in any commercial bank, count for so little in the incentive weighting system at first seems puzzling. However, interviews during our fieldwork revealed that, in fact, it does make sense in the context of China's economic transition. Even to this day, due to the nature of bank ownership and government regulation, there are few activities under the control of the bank branch manager that can directly affect profitability. For example, bank branches are allowed little room for setting interest rates. The salary levels of employees and hiring and firing decisions are typically made by officials in the upper levels of the banks.⁹

Because profit is a poor measure of performance in Chinese state-owned banks, they have counted heavily on deposit growth and loan performance in evaluating the performance of bank branches. More specifically, because each bank branch's lending quota is explicitly tied to the amount of deposits it absorbs, it has strong incentives to attract deposits. Moreover, because interest rates are strictly regulated by the PBC, the percentage of loans repaid at maturity becomes a good measure for profitability, because improving loan repayment rates is one of the only ways to increase profitability.

3. The data

The authors and their colleagues collected the data from rural China during the summer of 1998. The survey randomly sampled 59 townships in 15 counties in Jiangsu and Zhejiang, two of China's most developed coastal provinces, one north and the other south of Shanghai. As discussed earlier, the hierarchical structure of

⁸ Annual reports issued by the central office of the ABC in Beijing provide a clue to the role and importance of deposit growth and loan performance. On both measures, the numbers, along with their order-rankings relative to the three other specialized state-owned banks, will always be cited as the main indicators demonstrating the ABC's performance during the financial year.

⁹ Profits also are a much noisier indicator than deposit growth and percentage of performing loans. Given this, it is not surprising that nearly half of the sample contracts assigned zero weight to profits. Hence, the fact that the empirical analysis using profits as a performance measure does not present any significant pattern itself is not surprising.

China's banking system resembles and parallels the government administrative system; thus, each township surveyed has one ABC branch and one RCC branch. In only three instances in all the surveyed townships was a bank branch missing and, in total, 57 ABC and 58 RCC branches were sampled.

The bank survey included two main components. The first, conducted through interviews with the township bank managers, entailed the acquisition of detailed information on the bank's incentive contracts, the background information of the bank manager, including his age, education level and years of residence in the township. The bank's accountant provided the second part of the data by filling out a set of tables from the bank's financial accounting records. Because some branches refused to show their accounting books, there are a certain number of missing values on performance data. As a result, most of our regressions have fewer (ranging from 63 to 86) observations than the total number of banks we interviewed (115).¹⁰ Our dataset is among the best datasets available for studying banks and the nature of banking reform in transition countries, including China.¹¹

Table 1 reports the summary statistics of the survey data and shows that the two performance variables, deposits and non-performing loans, are important categories and vary considerably across the sample households. On average, the deposits of the sample bank branches grew at 21 percent in 1997, a little slower than the provincial mean in both Jiangsu and Zhejiang at that time (approximately 24 percent). Non-performing loans, defined as the sum of the loans that were in two categories of loans, those that were non-reservable and non-payment, accounted for 15 percent of all the loans in the sample branches.¹² This number is relatively low by comparison with the national standard.¹³ Both performance measures exhibit a great deal of variation across bank branches in the sample. Deposits grew as fast as 86 percent in one bank branch and declined by as much as 41 percent in another. Some banks managed their loans so well that they had no non-performing

¹⁰ This may raise concerns about the selection bias problem. To examine whether missing data are random, we ran regressions with dummy variables for missing deposit growth and loan performance as dependent variables and other available information as independent variables. We did not find a strong association between these variables and the two dummies for missing variables. Thus, these test results suggest that selection may not be a serious issue for our sample.

¹¹ For datasets collected for the analysis of firms in transition countries, see Johnson *et al.* (2000, 2002) and McMillan and Woodruff (1999).

¹² China's definition of non-performing loans is different from the international standard; it is more 'benign' and 'optimistic'. Not all overdue loans are counted as non-performing loans in China, and loans are considered non-reservable if the overdue periods exceed three years, but the possibility of repayment is still positive. Loans are classified as non-payment loans if the borrowers go bankrupt and the possibility of repayment is zero. See Wei (2000) for more details on the definition of non-performing loans in China.

¹³ The information on non-performing loans in China's banking industry is confidential. The World Bank estimates that non-performing loans were about 20 percent of the total asset values of the four largest state-owned banks in 1996 (The World Bank, 1997, p. 45). Wei (2000) cited a research report, issued by the People's Bank of China, Hangzhou Branch (Hangzhou is the capital city of Zhejiang Province), indicating that the percentage of non-performing loans for the ABC's Hangzhou branch was 22.2 in 1997.

Table 1. Descriptive statistics

Variables	Mean	Standard deviation	Minimum	Maximum
Performance measures				
Deposit growth	0.21	0.21	-0.41	0.86
Proportion of non-performing loans	0.15	0.21	0.00	0.95
Proportion of performing loans	0.85	0.21	0.05	1.00
Incentive weighting system for bank managers				
A. Weight on deposit growth	0.25	0.15	0.00	0.75
B. Weight on percentage of non-performing loans	0.26	0.13	0.00	0.79
C. Monetary reward per point (yuan)	48.73	34.95	4.50	216.00
Incentive intensity on deposit growth (= A*C) (yuan)	12.91	13.09	0	63.00
Incentive intensity on percentage of performing loans (= B*C) (yuan)	12.82	13.16	0	64.80
Per capita township industrial output (thousand yuan)	22.92	20.04	0.35	98.51
Growth rate of per capita township industrial output	0.127	0.259	-0.488	0.495
Bank's total assets (million yuan)	118.6	133.5	4.4	724.8
Bank manager's education	12.6	1.7	9	19
Bank manager's age	39.9	7.8	28	60
Bank manager's county branch experience (1 = some experience, 0 = no experience)	0.09	0.28	0	1
County manager's incentives (bonus/wage ratio)	0.722	0.364	0.250	1.667

loans at all, while others did so poorly that 95 percent of the loans were non-performing. To make interpretation of our empirical results easier, we turn the loan performance into a positive measure, the proportion of performing loans, which equals 1 minus the proportion of non-performing loans.

Our data also show the differences in the nature of incentives faced by the sample bank branches (Table 1). Overall, deposit growth and the proportion of non-performing loans are the two most important items in the weighting system, with a magnitude of 25 and 26 percent, on average. In some cases, the weight is as high as 75 percent for deposit growth and even higher for the proportion of non-performing loans. Profits also enter into some contracts, but the weight assigned to profits is generally low, less than 10 percent on average, and nearly half of the sample branches assigned zero weight to profits (not reported). The remaining weights – less than 40 percent on average (not reported) – are mainly non-business oriented, such as bank safety, administrative and party duties. Since these non-business activities are hard to measure, we focus our analysis on examining the effect of incentive contracts on the two performance items that are relatively more important and more easily measured. The average reward per point specified in the contract is 48.73 yuan. An average branch manager during the survey year received 94.1 points, which paid the manager a bonus of 4,248 yuan (which is about one quarter of the manager's base salary).

4. Incentives and performance

In this section, we will test the effect of incentives on bank performance. Before presenting the regression results, we will first show some simple descriptive statistics.

Importantly, simple descriptive results show that bank performance increases with incentive intensities. To show this we divide the sample into quartiles according to incentive intensity, in ascending order. Table 2 shows that, for each successive incentive activity quartile, both deposit growth and loan performance increase. The sharpest increase in performance in deposit growth occurs with the shift from the

Table 2. Incentive intensity and performance

<i>Ex ante</i> incentive intensity	Deposit growth	Proportion of performing loans
Quartile 1	0.115 (0.153)	0.625 (0.321)
Quartile 2	0.148 (0.139)	0.849 (0.194)
Quartile 3	0.208 (0.230)	0.899 (0.136)
Quartile 4	0.243 (0.197)	0.915 (0.086)

second to the third quartile and in loan performance with the shift from the first to the second quartile. Although not accounting for other factors, it is clear that our data show a positive correlation between the incentives and bank performance.

In order to test whether the positive correlation of the descriptive data still holds after controlling for a number of related variables, we first use OLS to estimate the following linear equation:

$$y_i = a_0 + a_1X_i + Z_i a_2 + \varepsilon_i, \quad (1)$$

where y_i is the performance of bank branch i , measured by two alternative indicators – deposit growth and the percentage of performing loans; X_i is the incentive intensity faced by branch manager i ; Z_i is a vector of other control variables affecting the performance of bank i , including branch bank size (measured by its asset value), the level of the town's industrial development (measured by per capita industrial output and its growth rate), the manager's age, years of education, and county branch experience (1 if he has worked in the county and 0 otherwise) and a provincial dummy (1 = Zhejiang, 0 = Jiangsu); a_0 , a_1 and a_2 are the coefficients to be estimated; and ε_i is the error term. In this and all following regressions, we report Huber–White robust t -statistics, which are heteroscedasticity consistent.

The OLS regressions show that bank performance generally increases with incentives (Table 3). The coefficients of the own incentive intensity variables are positive and significant for the two performance measures for all specifications. Drawing on the significant coefficients in columns 2 and 4, we see that when incentive intensity increases by 10 yuan (both the mean and standard deviation are 13 yuan), deposits grow 4 percentage points faster, and the proportion of performing loans increases by 12 percentage points.

Because branch managers behave in a multitasking context, the incentive for one task may have a cross-effect on the other one: the incentives on deposit growth (loan performance) may also affect loan performance (deposit growth). To directly test whether multitasking is important here, we augment the regression model by including both incentive intensities in columns 3 and 6.¹⁴ It is not clear *a priori* what sign should be expected from the cross-incentive measures. If efforts to increase deposit growth and to ensure loan performance are substitutes, the sign should be negative, as an increase in the power of incentives in one dimension will crowd out efforts in the other dimension. Conversely, complementarity between efforts would imply positive cross effects. The regression results in columns 3 and 6 show some weak evidence of complementarity because both cross effects are positive and one of them is significant at the 10 percent level.

The performance of the regression analysis can also be seen by the findings associated with the control variables (Table 3). Bank size (measured by bank assets)

¹⁴ We thank a referee for making this suggestion.

Table 3. OLS regressions examining the effects of incentive contracts on bank deposit growth and proportion of performing loans

Independent variables	Dependent variables					
	Deposit growth			Proportion of performing loans		
	(1)	(2)	(3)	(4)	(5)	(6)
Bank manager's incentive intensity on deposit growth	0.004*** (4.69)	0.004*** (4.04)	0.003*** (4.49)			0.002* (1.91)
Bank manager's incentive intensity on loan performance			0.001 (0.50)	0.012*** (3.25)	0.012*** (2.73)	0.009* (1.81)
Bank's assets		-0.220 (1.18)	-0.220 (1.17)		0.294 (1.44)	0.380* (1.69)
Township per capita industrial output		-0.001 (0.06)	-0.001 (0.12)		0.011 (0.91)	0.013 (1.02)
Growth of township per capita industrial output		0.124* (1.85)	0.125* (1.84)		0.108 (1.06)	0.110 (1.07)
Bank manager's education		0.026 (1.67)	0.027 (1.67)		-0.003 (0.12)	-0.005 (0.19)
Bank manager's age		-0.003 (1.41)	-0.003 (1.34)		-0.002 (0.39)	-0.002 (0.48)
Bank manager's county branch experience		-0.243** (2.41)	-0.243** (2.39)		0.122*** (3.00)	0.147*** (3.16)
Bank type (RCC = 0, ABC = 1)	0.112*** (2.67)	0.169*** (4.02)	0.173*** (3.78)	0.026 (0.57)	0.041 (0.74)	0.005 (0.07)
Province dummy (Jiangsu = 0, Zhejiang = 1)	-0.017 (0.41)	-0.020 (0.41)	-0.017 (0.35)	-0.070* (1.71)	-0.020 (0.32)	0.004 (0.06)
Observation	70	63	63	86	70	70
R ²	0.23	0.46	0.46	0.16	0.26	0.28

Notes: We report Huber-White robust t-statistics in parentheses. Significance levels 0.1, 0.05 and 0.01 are noted by *, **, and ***, respectively.

has a positive effect on loan performance, but a negative effect on deposit growth, although both effects are insignificant. The level of a township's per capita industrial output has no significant effect on either of the performance measures, but its growth has a positive and significant effect on deposit growth. A bank manager's education and age do not have a significant effect on either of the performance measures. Interestingly, the bank manager's county experience has a negative

effect on deposit growth but a positive effect on loan performance. A possible interpretation is that township managers from the county do not have much knowledge about local clients and thus perform poorly in attracting deposits. However, less information on local clients may force the managers from the county to be stricter in screening loan applications, which leads to better loan performance. Table 3 also shows that ABC branches have an edge over RCC branches in attracting deposits, but the two institutions do not differ statistically in terms of loan performance.

While the benchmark regressions are of interest, as discussed above, it is possible that endogeneity could affect the estimated relationship between incentives and performance if the specification omitted any relevant variables that affect performance and are correlated with incentives. For instance, the ability of the manager, which is not perfectly observed, almost certainly affects performance as well as the choice of contract. If more able managers have a greater propensity to choose high-powered contracts because they believe that they can deliver good performance more easily, then the measured positive effect between incentives and performance may actually be largely driven by the unobserved heterogeneity in abilities across branch managers. In this case, the coefficient on the incentive intensity variable would be biased. In fact, according to the contracting literature, the unobserved heterogeneity in ability usually leads to an overestimation of the effect of incentives (Chiappori and Salanie, 2003). On the other hand, omitted variables could also bias the incentive effect downward. For example, if county bank managers provide stronger incentives to township managers of lower ability in order to induce more effort from them, it is also plausible that by omitting a good measure of managerial ability, the coefficient on the incentive intensity variable will be biased downward. Thus, the challenge here is to disentangle the incentive effect from the selection effect.

In order to control for endogeneity, we use a 2SLS model. The key to using a 2SLS model is to find appropriate IVs to identify the independent effect of incentive intensities. A good IV in our analysis needs two characteristics: it should be correlated with the incentive intensity variable, but it should have no independent explanatory power on the bank's performance except through its effect on incentives. To this end, we use the average incentive intensities of other township branches under the same principal (county bank) and county dummies as IVs.

In fact, we believe, the average level of incentive intensities of other bank branches in the county is a good IV according to the two criteria. First, there is a correlation between the incentive intensity faced by the manager of each bank branch and those faced by the other managers that have contracts signed with the same principal. The county bank manager does not randomly assign an incentive to each township; rather, the terms of the contracts that she signs with her township subordinates reflect her own incentives, which in turn is driven by the contract that she signed with her own superior at the prefectural level (the county bank manager is also involved in an agency relationship with her own principal at

a higher level). Therefore, her incentives, shaped by her personal characteristics (age, for example, as an indicator of career concerns) and incentive intensities that were embodied in the contract that she signed with a higher-level principal will be reflected in the formation of incentive intensities offered to her subordinates in lower-level townships. Thus, the incentive intensities of different managers that report to the same principal (as well as county dummies that measure county financial policies or characteristics of county bank managers) will have explanatory power for the incentive intensities of each individual township branch.

Second, if the incentive intensities of other agents facing the same principal can serve as a valid IV, then they must be uncorrelated with performance, except through the agent's own incentive contract. As discussed in Section 3, the locations of bank branches of both the ABC and the RCCs are designed to minimize overlapping and competition among them. Hence, it may be reasonable to believe that the incentive intensities of contracts in one township do not directly affect the performance of bank branches in other townships. One concern is that the incentive intensities of other townships in a county are correlated with the incentives of the county bank manager, who might directly affect the performance of the township branch of interest. To control for such direct impact, we include a measure of county manager incentives in the second stage regression. Specifically, we use the ratio of bonus to fixed wage of the county bank manager as the measure for the county bank's performance incentive. Controlling for the incentives of country bank managers, it is reasonable to assume that the incentive intensities of other township branches are uncorrelated with the performance of the township branch of interest.

A test of whether these measures are statistically good IVs is conducted in two steps. In step one we run the first stage regression to determine if the IVs are jointly significant. The results show that they are indeed individually and jointly significant. To test if the set of IVs are statistically exogenous, we apply a Hausman test (Hausman, 1983). The test results show that these IVs can be excluded for the deposit growth regressions, but they cannot be excluded from the loan performance regressions.¹⁵ Taking this into consideration, we will use the entire set of IVs for the deposit growth regressions, and only the variable measuring the average incentive of neighbouring bank branches for the loan performance regressions.

Results from 2SLS regressions continue to show that incentives have a large effect on bank performance. Table 4 shows that the estimated coefficients on incentive

¹⁵ The test statistic is NR^2 , where N is the number of observations and R^2 the measure of goodness of fit of the regression of the residuals from the performance equation on the exogenous variables. The test statistic is chi-square distributed with degrees of freedom equal to the number of over-identifying restrictions. The test statistics for deposit growth are smaller than the critical value for the 5 percent level, indicating that we cannot reject the null hypothesis that there is no correlation between the instruments and the error term from the deposit growth equation. However, the test statistics for loan performance are larger than the critical value.

Table 4. Two-stage least-squares regressions examining the effects of incentive contracts on bank deposit growth and proportion of performing loans

Independent variables	Dependent variables					
	Deposit growth			Proportion of performing loans		
	(1)	(2)	(3)	(4)	(5)	(6)
Bank manager's incentive intensity	0.004*** (4.39)	0.004*** (4.05)	0.004*** (2.90)	0.012*** (3.23)	0.012** (2.61)	0.007** (2.25)
County manager's incentives			-0.028 (0.30)			-0.062 (1.43)
Bank's assets		-0.222 (1.19)	0.009 (0.03)		0.294 (1.44)	0.196 (1.40)
Township per capita industrial output		-0.001 (0.09)	-0.001 (0.07)		0.011 (0.89)	0.010 (0.98)
Growth of township per capita industrial output		0.124* (1.85)	0.126 (1.40)		0.108 (1.06)	0.127 (1.31)
Bank manager's education		0.026 (1.66)	0.009 (0.59)		-0.003 (0.12)	0.011 (0.67)
Bank manager's age		-0.003 (1.43)	-0.003 (1.14)		-0.002 (0.39)	0.003 (0.78)
Bank manager's county branch experience		-0.242** (2.41)	-0.229** (2.17)		0.122*** (3.00)	0.084** (2.39)
Bank type (RCC = 0, ABC = 1)	0.112*** (2.67)	0.168*** (4.02)	0.215*** (4.47)	0.027 (0.60)	0.041 (0.74)	0.071 (1.57)
Province dummy (Jiangsu = 0, Zhejiang = 1)	-0.016 (0.40)	-0.019 (0.40)	-0.007 (0.12)	-0.068 (1.65)	-0.020 (0.31)	-0.053 (1.36)
Observation	70	63	49	86	70	64
Over-identification test						
Test statistics (chi-squared)	9.57	5.51	5.36			
Critical value for 5 percent significance level	12.59	12.59	12.59			

Notes: The instrument variables used for regressions (1)–(3) are the average incentives of neighbouring township banks in the same county and county indicators. The instrument variables used for regressions (4)–(6) are the average incentives of neighbouring township banks in the same county. We report Huber–White Robust *t*-statistics in parentheses.

Significance levels 0.1, 0.05 and 0.01 are noted by *, **, and ***, respectively.

intensity are all positive and are significant at least at the 5 percent level. The magnitudes of the incentive effects are also similar to those of OLS regressions for both the deposit growth and performing loans equations. Our finding that the 2SLS estimates do not differ much from the OLS estimates suggest that endogeneity of contracts is not a serious problem for our estimation. Also note that the incentive of county bank managers does not have any significant effect on township performance.

5. Conclusions

In this paper, we have examined the effect of incentive contracts on the performance of Chinese banks by drawing on unique survey data. The empirical analysis of this paper shows, as have other studies on contracts, that incentive contracts are important in improving bank performance through attracting deposits and reducing non-performing loans. The effect of incentive contracts is robust after we control for endogeneity. Our study provides further evidence from transition countries, China's banking industry in this case, that incentives matter. From this perspective, China's bank reforms, like earlier incentive-based enterprise and fiscal reforms, are moving in the right direction.

While the incentive contracts are effective in raising bank performance in the short run, they may have some costs. When they are given strong incentives to reduce the non-performing loan ratio, the bank managers may be led to increase the denominator in the ratio, namely, the total size of lending, instead of reducing the numerator by improving the quality of loans. Of course, this problem will be greatly alleviated if the principal and the agent could commit to a long-term contract because in that case the agent would take account of the long-term adverse effect of increasing loans without improving the quality of loans. However, in reality, it is often very difficult for them to commit to such a long-term contract and the agent is often myopic in his investment decision. Identifying the side effects of incentive contracts in China's banking industry will be an interesting topic for future research.

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