1. THE EFFECT OF BANK COMPETITION AND RURAL BANKS ON WAGES: EVIDENCE FROM AGRICULTURAL FIRMS

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Abstract

Raising wages is crucial to reduce income inequality. This study investigates the effect and heterogeneity of bank competition and rural banks on wages using panel data from 101,131 agricultural firms in more than 3,000 counties of China from 1998 to 2015. We find that bank competition contributes to reducing wages and rural bank development raises wages by alleviating financing constraints. Decreased bank competition and rural bank development have a stronger effect in improving the wage of large firms than small and medium-sized enterprises and a stronger effect on the wage of private firms than SOEs and foreign firms. Bank competition has a stronger negative effect on the wage of old firms than that of new firms. The positive effect of rural bank development is stronger for new firms than old firms. Moreover, the expansion of city banks improves wages, whereas foreign banks have no effect on wages. This study provides policy implications of how optimizing rural financial system and business environment can improve wages and promote rural revitalization.

Keywords: bank competition, rural bank, branch, agricultural firm, financial constraint, wage

JEL Classification: E24, G21, G32

1. Introduction

Wages represent workers' share of national income and are a key issue in income distribution. Determining how to increase wages is key to increasing income and narrowing the income inequality. Developing countries propose increasing the proportion of wages in the initial distribution of national income to achieve sustained wage growth. However, amid economic uncertainty, the proportion of wages remains low in China. The most important tasks of Chinese rural revitalization is to solve the problems of agriculture, rural areas and farmers. Agricultural product processing industry has always been one of the basic industries of real economy and a great impact on economic growth and social stability (Liang *et al.*, 2022). It has the advantages of large size, obvious capital in rural economy and a driving effect on rural economy. Chinese

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government draws attention to rural through formulating policies with the purpose of promoting rural economic growth, thus increasing residents' income (Zeng and Yu, 2022). The growth of agricultural firms is a vital starting point to promote Chinese rural revitalization, and rural banks are an important factor affecting rural region and income (Li and Ma, 2021).

The increase of wages is inseparable from the growth of firms and the support of financial system. Chinese financial system has made remarkable achievements and met the demand of economic growth and financial stability (Brunnermeier *et al.*, 2022). In the process of Chinese economic reform, rural financial system is not perfect. Financial institutions cannot fulfill their responsibilities well, and their loans tend to support non-agricultural sectors. Therefore, the financial system cannot meet the needs of rural economic, and it is urgent to innovate financial services and change banking structure to meet the diversified needs of agricultural firms. Many developing countries are at a critical stage of economic growth power transformation (Matthess and Kunkel, 2020), and the lack of evidence about the impact of bank competition and rural banks on wages is regrettable to promote Chinese residents' income and rural revitalization.

Finance can attract other factors into firms, play an important role in market expansion and economic growth mode transformation and promote the increase of wages. The financial industry in developing countries is dominated by commercial banks, while governments have restrictions on foreign and private funds entering the banking industry (Lin *et al.*, 2016). Financial development reduces inequality, and there is a negative correlation between individual talents and income gap (Seven, 2022). In Chinese rural areas, apart from large banks, rural banks join in the fierce market competition, which makes the financing choices of agricultural firms more diversified. Studying the determinants of wages in firms is significant to improve fund allocation efficiency and income in developing countries.

Will the competition changes in the banking industry and the development of rural banks affect wages when controlling individual and regional differences? Does the effect show firm heterogeneity? This study uses the firm data of agricultural products processing industry to investigate the impact of bank competition and rural banks on wages. This study explores the mechanism by which bank competition and rural banks affect wages. It makes heterogeneity analyses based on different types of firms to test whether the impact of bank competition and rural banks changes with the differences of firm size, age and ownership.

This study contributes to the literature in the following respects. First, although wages are a hot issue, the relationship between financial development and wages is not adequately studied (Godechot, 2012; Guo *et al.*, 2021). The study provides a new perspective on income distribution and financial policy by investigating the impact of bank competition and rural banks on wages. Second, the research focuses on the relationship between financial development and wages at the provincial or urban level, and seldom involve the economic effects of rural banks (Wood, 2017). This study examines the effect of county level bank competition and rural banks on wages and the determinants of wages. Third, studies investigate the macro determinants of wages, ignoring the effects of firm characteristics (Larrain, 2015; Fauser and Gebel, 2023). This study analyze the impact of firm size, age and ownership on the effect of bank competition and rural banks on wages. Although studies of how finance affects wages are troubled by endogeneity concerns, this study uses instrumental variable method to alleviate such concerns.

2. Literature review and hypotheses

2.1. The impact of banking development on wages

The economic effect of financial development attracts the attention of academic circles (Love, 2003; Hsu *et al.*, 2014). There is no dispute about the economic effect of financial development,

but the impact on wages has not yet formed conclusions (Su *et al.*, 2019). Traditional financing theory holds that information asymmetry, agency problem and transaction cost are the main reasons for financing constraint (Myers and Majluf, 1984; Gertler, 1992). When the external financing of firms is constrained, they rely more on internal cash flow, thus affecting their production and operation. If the internal funds cannot meet the long-term investment project demand, prompting firms to give up their investment, it results in resource allocation distortion and wages decrease. Therefore, financing constraints have a negative impact on wages. The decrease of credit supply reduces wages and per capita capital of firms, because the rising shadow price of capital makes firms turn to labor-intensive industries and increases bankruptcy (Franklin *et al.*, 2020). Although imperfect financial market and weak handling of soft information by banks lead to financing constraints (Berger *et al.*, 2017), perfect financial structure, less government intervention and financial agglomeration help real economy obtain funds.

The market power hypothesis holds that bank competition is beneficial to firms to improve financing availability and reduce debt costs and encourages banks to provide loans for small businesses (Santiago *et al.*, 2009; Wang *et al.*, 2020). Bank competition weakens the monopoly of large banks on the credit market, reduces the expected rate of return. When the competition in the banking industry boosts, banks provide preferential terms to compete for high-quality customers, which intensifies market competition and urges banks to provide funds for small businesses. Increased bank competition encourages banks to set up branches, increases the size of loans and reduces corporate financing constraints and capital costs. To compete for the loans market share of firms, banks optimize their business model and build a perfect financial service platform (Avramidis *et al.*, 2022). Therefore, the deregulation of banking in developed countries results in higher wage level of financial industry, and this effect is greater in friction and inefficient market (Boustanifar *et al.*, 2018).

The information hypothesis holds that monopolistic banking structure is conducive to the establishment of cooperative relations between financial institutions and firms, thus obtaining information and reducing the adverse effects of information asymmetry and moral hazard behaviour (Cetorelli and Gambera, 2001). When the market information is asymmetric, banking monopoly helps firms to overcome moral hazard and adverse selection and increases credit supply, while bank competition reduces the enthusiasm of banks to obtain firm soft information, reduce capital supply and financing efficiency (González, 2020). Banks with high market share charge lower loan interest rates, which are stronger in the competitive industry of strategic alternatives with the largest negative externalities (Saidi and Streitz, 2021).

Banks dominate the financial systems in many developing countries, and bank credit is the main financing mode of firms. These countries' banking has not reached the level of excessive competition, and the positive effects of bank competition outweigh the negative effects. The middle level of bank competition improves financial efficiency, which is the best state of financial structure (Biswas and Koufopoulos, 2020). Banks choose cross-regional operations to absorb deposits and issue loans, which promote bank competition (Gao *et al.*, 2019). Banks play a crucial role of financial stabilizer in rural economy, so bank competition increases and rural bank development can alleviate financing constraints and then increase wages.

The discussions suggest that bank competition and rural banks make firms' financing channels convenient, reduce debt costs and improve firms' operating efficiency and wages. The market power hypothesis is applicable in developing countries. We put forward the assumption.

Hypothesis 1. Bank competition and rural bank development improve wages.

2.2. Banking development, heterogeneity, and wages

Firm characteristics and public policies affect the lending relationship between banks and firms (Berger and Udell, 2002; Hsieh *et al.*, 2019). Digital finance increases rural residents' income,

especially high-income groups, and the heterogeneous impact of digital finance on income is reflected in region, education and finance (Li and Ma, 2021). The impact of the changes in banking on firms may be heterogeneous due to firm characteristics.

First, the monopoly of large banks destroys the balance of credit allocation, which makes the funds of banks lean towards large firms. In the heterogeneous market dominated by large banks, competition hinders firms with low transparency from obtaining funds, whereas in the homogeneous market dominated by small banks, competition helps firms with low transparency to obtain funds (Heddergott and Laitenberger, 2017). Moreover, financial openness promotes the growth of firms with low information asymmetry, such as large and listed firms (Park *et al.*, 2020). The presence of foreign banks reduces the entry rate and scale of information asymmetry industries and increase the exit rate of opaque industries (Havrylchyk, 2012).

The competition and deregulation of banks increase the possibility of local small businesses to obtain loans and reduce their dependence on trade credit. The effect is more profound in low-and middle-income areas (Avramidis*, et al.*, 2022). Compared with big banks, small banks have a comparative advantage in providing liquidity insurance for small businesses that suffered liquidity shocks during the financial crisis (Berger*, et al.*, 2017). Although China's banks have not fully met the financing needs of small firms with comparative advantages, the expansion of joint-stock and city banks alleviates financing constraints of these enterprises (Chong *et al.*, 2013). Low transparency and lack of collateral of small firms lead to information asymmetry and financing constraints, while bank competition helps these firms to obtain funds (Motta, 2020).

Second, the timing of firms' entry into product market is related to their financing ability (Cowling *et al.*, 2017), which may lead to differences in wages. Although newly established firms have a short time, less collaterals, incomplete information disclosure and high risk, making them not favoured by banks and reduce the availability of external financing, the expansion of bank branches alleviates their financial shortage. In contrast, obtaining funds is an obstacle to old firms' operations (Adegboye and Iweriebor, 2018), whereas old firms have more advantages, such as asset size and market opportunities, and fewer financing constraints than new firms do. Therefore, a high degree of bank monopoly may be conducive to the growth of the stable growth of old firms and bank competition may help new firms grow.

Third, it is more difficult for private firms to obtain financing than for SOEs (Song *et al.*, 2015). Private firms have financial repression, few financing channels and few contacts with banks. Bank competition helps reduce the unfair treatment faced by private firms, lowers the threshold for these enterprises to obtain funds (Liu and Li, 2020). Financing projects of SOEs or governments are necessary, because these projects focus on improving social welfare, whereas private firms mainly consider corporate profits. As the implicit guarantor behind SOEs, governments undertake the default and financing risks, which reduces the possibility of SOEs' bankruptcy. Hence, SOEs are favoured by financial institutions and obtain funds, and they are stability in the financial market and are less affected by banking than non-SOEs.

The optimization of banking market structure has a stronger impact on firms with higher financing constraints, such as small, new and private firms, thus affecting their wage levels. These discussions lead to the following hypotheses.

Hypothesis 2. The expansion of city and foreign banks improves wages.

Hypothesis 3. The effect of bank competition and rural bank development on wages varies with the heterogeneity of firms.

3. Methodology and data

3.1. Methodology

This study constructs the following econometric models to investigate the effect of bank competition and rural banks on the wage of agricultural firms.

$$Wage_{i,t} = \alpha_0 + \alpha_1 Branch_{i,t} + \alpha_2 Control_{i,t} + \omega_i + \eta_t + \mu_k + \varepsilon_{i,t} \quad (1)$$

$$Wage_{i,t} = \alpha_0 + \alpha_1 Bank_{i,t} + \alpha_2 Control_{i,t} + \omega_i + \eta_t + \mu_k + \varepsilon_{i,t} \quad (2)$$

$$Wage_{i,t} = \alpha_0 + \alpha_1 Ln\_Bank_{i,t} + \alpha_2 Control_{i,t} + \omega_i + \eta_t + \mu_k + \varepsilon_{i,t} \quad (3)$$

where *j*, *i*, *t* and *k* represent the region, firm, year and industry, respectively. The explained variable, *Wage*, is the average wage of firms. Explanatory variables include bank competition (*Branch*), the percentage of rural bank branches (*Bank*) and the number of rural bank branches (*Ln_Bank*). If α_1 is positive and significant, bank competition and rural banks exert a positive effect on firm wages. *Branch* measures bank competition in the county-level administrative regions. *Bank* and *Ln_Bank* represent the development level of rural banks in the county-level administrative regions. Especially, rural banks include rural commercial banks, rural cooperative banks, rural credit cooperatives and village banks. These banks mainly set up branches in rural and township areas, mainly serving farmers, rural areas and agriculture.

Control represents a series of firm-level variables that affect wages. There are missing variables that may affect the results, and the error terms include unobserved regional and firm characteristics that are related to wages and banking development. The models control fixed effects ω, η and μ. ε denotes the random error term. Table 1 reports the variable definitions.

3.2. Variable measures

The explained variable. *Wage* is the average wage of firms and is to divide the wages payable by the number of employees. When measuring firm wage from the total amount, it leads to the total wages of large firms being higher than that of small firms. Therefore, this study measures the wage difference between firms by calculating the average wage in firms of different sizes.

The explained variables. Bank competition includes the change of banking structure and the increase of branches (Carlson and Mitchener, 2009; Cornaggia *et al.*, 2015). This study relies on aggregate measures of banking structure, which could interpret the common use of bank competition and rural banks at the county level. First, *Branch* measures bank competition in the region where the firms are located and its higher value means that the competition among banks is intensified. Second, *Bank* is the percentage of rural bank branches to the total number of bank branches at the county level. Third, *Ln_Bank* is the logarithm of the number of rural bank branches. The rising value of *Bank* and *Ln_Bank* indicates the expansion of rural banks.

This study controls firm characteristics that affect wages. Asset size, current asset, capital intensity, leverage and sales profit are added to the models to control the impacts of the financial status on wages. Large firms with more investment in R&D, higher pay can obtain better employees and improve wages. *Current* eliminates the impact of funds' liquidity on wages. *Capital* controls the impact of capital intensity. Debt level, *Leverage*, is related to cash flow and financing constraints and affects the investment in production and wages. As strong profitability promotes firms to improve employee benefits, *ROS* eliminates the impact of sales revenue on firm productivity. *Subsidy* reflects governments' supports. According to the firm cycle theory, the operating years affect financing constraints, and this study controls firm age. *Distance* is the distance between the region where the firm is located and the provincial capital. Firms closer to provincial capitals have more market opportunities.

Table 1. Variable definitions

Variable	Definition
Wage	Wages payable of a firm divided by the number of employees (unit: RMB10,000).
Branch	The logarithm of the number of commercial bank branches in a county.
Bank	The proportion of rural commercial banks, rural cooperative banks, rural credit cooperatives and village banks branches to all bank branches in a county.
Ln_Bank	The logarithm of the number of rural commercial banks, rural cooperative banks, rural credit cooperatives and village banks branches in a county.
Size	The logarithm of total assets (unit: RMB1,000).
Current	Current assets divided by total assets.
Capital	*Ln* (Fixed assets divided by the number of employees) (unit: RMB1,000).
Leverage	Liabilities divided by total assets.
ROS	Profit divided by sales revenue.
Age	*Ln* (Time elapsed from the year of a firm's establishment to the year of the observation).
Subsidy	When a firm receives government subsidies, it is equal to 1; otherwise, it is 0.
Distance	Distance from a firm's location to the provincial capital (unit: 100 km).
Cost	The interest expense divided by the debt.

3.3. Data

Agricultural firm data is from the Annual Survey of Industrial Enterprise. The sample covers six industries: agricultural and sideline food processing industry (code 13), food manufacturing industry (code 14), beverage manufacturing industry (code 15), tobacco products industry (code 16), textile industry (code 17), wood processing and wood, bamboo, rattan, palm and grass products industry (code 20). Firms with fewer than eight employees or with negative or missing values for total assets, fixed assets, current assets and operating income are deleted. Moreover, firm total assets, fixed assets and government subsidies are reduced by the 1998-based fixed assets investment price index. The variables are winsorized at the 1st and 99th percentiles. Firm wage is reduced by the 1998-based consumer price index. Bank branches data is from the financial license information of China Banking and Insurance Regulatory Commission. Using the geographical locations of bank branches, this study calculates the bank competition and rural bank development. The data of bank branches is matched with firm data at the county level based on firms' headquarters postcodes. We obtain 495592 firm-year observations of 101131 firms, which constitute an unbalanced panel covering the period from 1998 to 2015.

The mean of *Wage* is 1.341, while its maximum is 11.606, implying a large wage inequality among agricultural firms. The mean of *Branch* is 96.923, while its standard deviation is 91.667, showing that the bank competition in counties is different. The mean of *Bank* is 0.081, while its standard deviation is 0.171, suggesting that rural bank development varies in different counties. The average wage of agricultural firms is lower than that of manufacturing firms. The correlation coefficients between variables are less than 0.53, indicating that there is no multicollinearity.

Table 2. Summary statistics

Variable	Mean	SD	Max	Min	P25	Median	p75
Wage	1.341	1.562	11.606	0.042	0.579	0.938	1.468
Branch	96.923	91.667	1063.000	1.000	39.000	74.000	122.000
Bank	0.081	0.171	0.680	0.000	0.000	0.006	0.034
Ln_Bank	30.069	35.796	340.000	0.000	0.000	23.000	46.000
Size	87847.0	745450.0	1.21E+08	0.000	8006.0	19973.0	54935.0
Current	0.519	0.234	1.013	0.041	0.342	0.519	0.698
Capital	394.935	9743.511	3267827.0	0.000	73.459	148.855	307.763
Leverage	0.541	0.313	1.697	0.005	0.302	0.536	0.759
ROS	0.029	0.093	0.261	-0.534	0.003	0.026	0.068
Age	10.418	9.527	81.000	1.000	5.000	8.000	12.000
Subsidy	0.091	0.288	1.000	0.000	0.000	0.000	0.000
Distance	1.119	0.729	3.007	0.026	0.511	1.024	1.613
Cost	0.057	0.148	1.132	-0.005	0.000	0.019	0.049

Notes: The summary statistics of Branch, Ln_Bank, Size, Capital and Age are the original values.

4. Results and discussions

4.1. Baseline specification and results

Table 3 reports the results. In column (1), the coefficient of *Branch* is significantly negative. Commercial banks mainly set up branches in cities and few in rural areas, so bank competition has negative impact on the wage of agricultural firms. These banks attract rural funds to urban investment, which aggravates the financing constraints of agricultural firms. In columns (2) and (3), the coefficients of the percentage of rural banks, *Bank*, and the number of rural banks, *Ln_Bank*, are both significantly positive, indicating that rural banks is positively correlated with wages. Judging from the coefficients, every 1% increase in bank competition reduces wages by RMB3.3/employee, every 1% increase in the proportion of rural banks raises wages by RMB13.9/employee, and every 1% increase in the number of rural banks raises wages by RMB2.5/employee. These results support Hypothesis 1, which confirm that the interaction between banking development and real economy is applicable to the market power hypothesis.

Due to the small size and lack of hard information, agricultural firms have problems such as asymmetric information and difficulty in risk control. They often face credit constraints, whereas the boost of rural banks provides an opportunity for them to ease financing constraints and improve wages. Financial development is conducive to collecting geographical footprint, correcting resource mismatch, reducing information asymmetry and financial exclusion, thus

improving credit availability and alleviating financing constraints (Caggese, 2019). Increasing the number of financial institutions in the vicinity of firms improves bank competition, increases leverage ratio, reduces relational financing and raises the efficiency of capital allocation. Therefore, although agricultural firms face financing constraints, banks' expansion provides an opportunity for them to obtain funds and raise income (Dadzie and Ferrari, 2019).

The coefficients on *Size* are significantly negative, indicating a negative correlation between firm asset size and wages. The coefficients on *Current* and *Capital* are significantly positive, revealing that the higher the current assets and fixed assets per capita, the higher the wages. Firms with high capital intensity pay attention to equipment renewal and R&D activities, thus having higher productivity and wages. The coefficients on *Leverage* are significantly negative, implying that debt is negatively related to wages, and increased debt reduces wages. The coefficients of *ROS* and *Age* are significantly positive, suggesting that the stronger the profitability and the longer a firm operates, the higher the wages. The coefficients of *Cost* are significantly positive, revealing that debt costs are positively related to wages. Therefore, firm wage level is related to asset size, current assets, capital intensity, liability and financing costs, which provide evidence for promoting financial structure optimization and firm reform to improve wages and reduce inequality.

Table 3. Baseline regression results

	(1)	(2)	(3)
Branch	-0.037***		
	(0.009)		
Bank		0.138***	
		(0.029)	
Ln_Bank			0.025***
			(0.006)
Control variables	YES	YES	YES
N	495592	495592	495592
Adj. R^2	0.578	0.578	0.578

*Notes: Standard errors in parentheses. The explained variable is Wage. *** p<0.01; ** p<0.05; * p<0.1.*

This study transforms the effect of bank competition and rural banks on wages of column (1) and (2) into the marginal effects and plot them in Figure 1 and 2. The figures show that bank competition and rural banks raise wages, revealing that strengthening the construction of financial infrastructure in rural areas is an effective way to improve employees' wage.

Figure. 1. Marginal effect of bank competition on wages

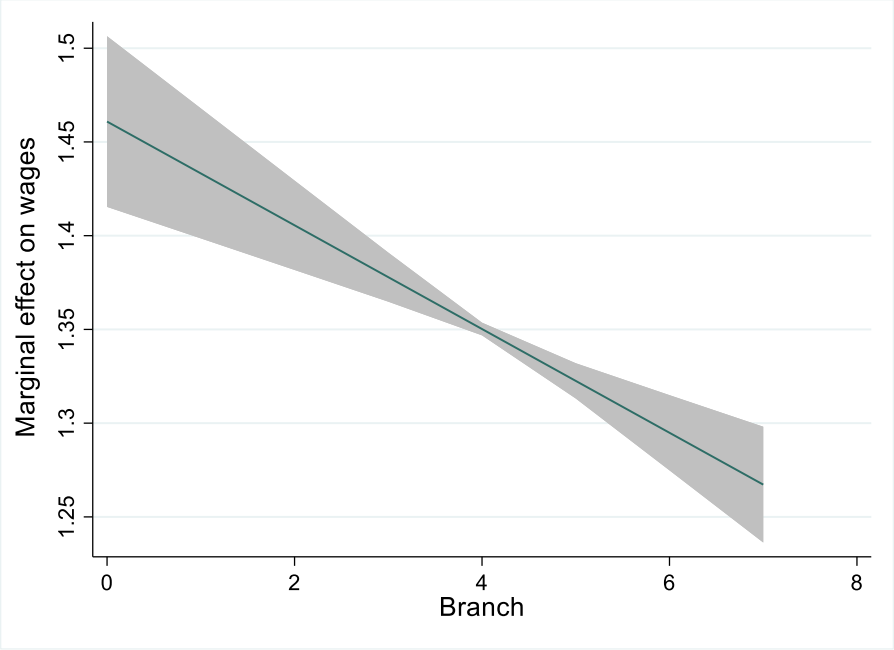
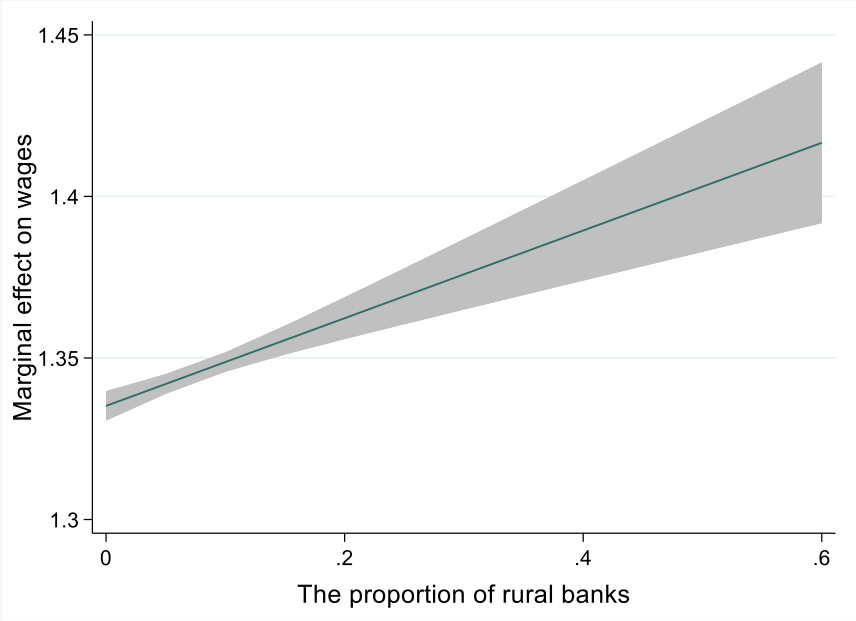


Figure. 2. Marginal effect of rural finance on wages



4.2. Robustness tests

To mitigate potential estimation errors caused by the measurement of explanatory variables, this study uses the percentage of city bank branches in the number of bank branches at the county level, *City*, and the percentage of foreign bank branches in the number of bank branches at the county level, *Foreign*, as explanatory variables for robustness tests. Columns (1) and (2) of Table 4 reports the results.

Table 4. Robustness and endogeneity test results

	(1)	(2)	(3)	(4)	(5)
City	0.323***				
	(0.090)				
Foreign		-0.246			
		(0.919)			
Branch			-0.055***		
			(0.010)		
Bank				0.226***	
				(0.059)	
Ln_Bank					0.031***
					(0.009)
Control variables	YES	YES	YES	YES	YES
N	495592	495592	333209	333209	333209
Adj. R^2	0.578	0.578	0.565	0.565	0.565

*Notes: Standard errors in parentheses. *** p<0.01; ** p<0.05; * p<0.1.*

The coefficient of *City* is significantly positive, indicating that the expansion of city banks increases the wage of agricultural firms. Every 1 % increases in the proportion of city banks improves wages by RMB32.3/employee. The coefficient of *Foreign* is negative, but it does not pass the significance test, showing that foreign banks have no impact on wages. This failure is related to the service orientation of foreign banks. These banks have less contact with agricultural firms than domestic banks, so it is difficult to obtain relational loans for them.

The cross-regional operation of banks intensifies market competition, forming a new way for firms to obtain financing and reduce borrowing costs (Rice and Strahan, 2010). The main goal of setting up bank branches is to absorb deposits and issue loans (Thorsten *et al.*, 2010), whereas bank mergers and acquisitions and other business activities increase systemic risks, confirming the hypothesis of concentration-fragility (Weiss *et al.*, 2014). The deregulation of China's city banks began in 2006, which affected financing constraints from two points of view. First, these banks are closely link with governments, which are channels for governments to expand investment and promote economic growth and sources for firms to obtain financing. Second, city banks' expansion reduces ownership discrimination, size discrimination and relationship discrimination. The competition between banks reduces financing constraints, which is beneficial for small and external financing-dependent firms to obtain funds.

4.3. Endogeneity tests

The omission of variables and reverse causality lead to endogenous problems, and one of the challenges in this study is identifying the causal relationship between financial development and wages. Raising wages may increase firms' demand for funds, leading to intensified competition in the banking industry and increased rural banks. Since the current wage at the firm level cannot affect the regional bank competition and rural banks in the previous period, this study lags the variables by one period to reduce endogenous bias.

Columns (3) to (5) in Table 4 show the estimated results. The coefficient of bank competition, *Branch*, is significantly negative, indicating that decreased bank competition is conducive to raising the wage of agricultural firms. The coefficients on *Bank* and *Ln_Bank* are significantly positive, which confirm the positive correlation between rural banks and wages.

4.4. Impact mechanism tests

This section analyses the mechanism through which bank competition and rural banks impact wages from the perspective of funds allocation. If bank competition and rural bank development result in higher wages by reducing firm financing constraints, the effects play a great role in raising the wage of employees for financing-dependent firms. This study uses SA index as a proxy for financing constraints and uses the median of SA to classify the observations into two groups (Hadlock and Pierce, 2010) [1]. Table 5 reports the results.

Table 5. Regression results for the impact mechanism

Group	(1)	(2)	(3)	(4)	(5)	(6)
	Firms with high financing constraints			Firms with low financing constraints		
Branch	-0.033**			-0.015		
	(0.014)			(0.011)		
Bank		0.141**			0.123***	
		(0.067)			(0.046)	
Ln_Bank			0.036***			0.015**
			(0.010)			(0.007)
Control variables	YES	YES	YES	YES	YES	YES
N	244568	244568	244568	234358	234358	234358
Adj. R^2	0.623	0.623	0.623	0.550	0.550	0.550

*Notes: Standard errors in parentheses. The explained variable is Wage. *** p<0.01; ** p<0.05; * p<0.1.*

The coefficient of *Branch* is significantly negative in column (1) and fails the significance test in column (4), implying that bank competition decreases the wage of firms with high financing constraints, but has no effect on the wage of firms with low financing constraints. The coefficients of *Bank* and *Ln_Bank* are significantly positive, revealing that rising the percentage of rural banks and increasing the number of rural banks promote wages. The coefficients of the two groups

[1] *SA = −0.737×ln(Asset) + 0.043×ln²(Asset) − 0.004×Age, where Asset is the size of firm assets (unit: million RMB), and Age is the age of the firm.*

reveal that bank competition has a negative effect on the wage of firms with high financing constraints, while rural bank development has a stronger positive effect on the wage of firms with high financing constraints than those with low financing constraints. Rural bank development alleviates firm financing constraints, which makes them have cash flow to raise wages.

There are discriminations in financial market, and large firms and SOEs have more connections to obtain banks funds than small and private firms do (Bliss and Gul, 2012). The increase of small and rural banks improves the possibility and size of firms' obtaining funds. Allowing banks to set up inter-state branches promotes firms to obtain loans and innovate, especially those firms that rely on financing and are close to bank branches (Amore *et al.*, 2013). Compared with trade credit financing, it is found that bank credit financing cannot effectively supervise firms and worsen the agency relationship between shareholders and creditors (Song and Su, 2022).

In addition, this study constructs mediating effect models to investigate the impact mechanism of bank competition and rural banks on wages.

$$Loan_{i,t} = \alpha_0 + \alpha_1 Branch_{i,t} + \alpha_2 Control_{i,t} + \omega_i + \eta_t + \mu_k + \varepsilon_{i,t} \quad (4)$$

$$Loan_{i,t} = \alpha_0 + \alpha_1 Bank_{i,t} + \alpha_2 Control_{i,t} + \omega_i + \eta_t + \mu_k + \varepsilon_{i,t} \quad (5)$$

$$Loan_{i,t} = \alpha_0 + \alpha_1 Ln\_Bank_{i,t} + \alpha_2 Control_{i,t} + \omega_i + \eta_t + \mu_k + \varepsilon_{i,t} \quad (6)$$

$$Wage_{i,t} = \alpha_0 + \alpha_1 Branch_{i,t} + \alpha_2 Control_{i,t} + \alpha_3 Loan_{i,t} + \omega_i + \eta_t + \mu_k + \varepsilon_{i,t} \quad (7)$$

$$Wage_{i,t} = \alpha_0 + \alpha_1 Bank_{i,t} + \alpha_2 Control_{i,t} + \alpha_3 Loan_{i,t} + \omega_i + \eta_t + \mu_k + \varepsilon_{i,t} \quad (8)$$

$$Wage_{i,t} = \alpha_0 + \alpha_1 Ln\_Bank_{i,t} + \alpha_2 Control_{i,t} + \alpha_3 Loan_{i,t} + \omega_i + \eta_t + \mu_k + \varepsilon_{i,t} \quad (9)$$

Loan is new loans obtained by firms from financial institutions. Table 6 reports the results.

Table 6. Regression results for the impact mechanism

	(1)	(2)	(3)	(4)	(5)	(6)
Branch	0.125***			-0.036***		
	(0.006)			(0.007)		
Bank		0.225***			0.132***	
		(0.024)			(0.031)	
Ln_Bank			0.021***			0.030***
			(0.003)			(0.004)
Loan				0.012***	0.010***	0.010***
				(0.002)	(0.002)	(0.002)
Control variables	YES	YES	YES	YES	YES	YES
N	480737	480737	480737	480737	480737	480737
Adj. R^2	0.740	0.740	0.740	0.626	0.626	0.626

*Notes: Standard errors in parentheses. The explained variable is Loan in columns (1) to (3). The explained variable is Wage in columns (4) to (6). *** p<0.01; ** p<0.05; * p<0.1.*

The coefficient of *Branch* is significantly positive in column (1) of Table 6, implying that bank competition is beneficial for firms to obtain loans. The coefficients of *Bank* and *Ln_ Bank* are significantly positive in columns (2) and (3), revealing that rising the percentage of rural banks and increasing the number of rural banks promote firms to obtain loans. The results of columns

(4) to (6) show that the coefficients of *Loan* are significantly positive, indicating that the increase for loans obtained by firms improves wages. The results show that bank competition and rural bank development encourage firms to obtain loans, which improves firms' wages.

5. Heterogeneity tests

This section examines the heterogeneity in the causal effect of bank competition and rural banks on wages for firms with different characteristics.

5.1. The effect of firm size

The summary statistics show that the wage level of large firms is the highest, followed by medium-sized firms and that of small firms is the lowest, and these differences did not narrow during the study period. Small firms face more information asymmetry than large ones, making the financing difficulty and cost of small firms higher than that of large ones. Therefore, compared with large firms, banking development is more likely to affect the wage of small firms. The competition of banking industry and the development of rural banks may alleviate the disadvantageous position of small firms and provide financial guarantee for their wages increase.

In order to verify whether the effects of bank competition and rural banks on wages vary with firm size, this study divides the observations into small, medium, and large firms according to assets scale. Firms with assets less than 40 million yuan are small firms, with assets between 40 million and 400 million yuan are medium firms and with assets over 400 million yuan are large firms.

Table 7 reports the results.

Table 7. Regression results for firm size

Group	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
	Large firms			*Medium firms*			*Small firms*		
Branch	-0.171* (0.091)			-0.022* (0.012)			-0.011 (0.008)		
Bank		0.449* (0.251)			0.113** (0.053)			0.065* (0.036)	
Ln_Bank			0.044 (0.043)			0.028*** (0.007)			0.003 (0.006)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	27420	27420	27420	288256	288256	288256	140089	140089	140089
Adj. R^2	0.779	0.779	0.779	0.588	0.588	0.588	0.410	0.410	0.410

*Notes: Standard errors in parentheses. The explained variable is Wage. *** p<0.01; ** p<0.05; * p<0.1. The table does not show the results of control variables.*

The results of column (1) and (4) show that the coefficients of *Branch* are significantly negative, indicating that bank competition decreases the wage of large and medium-sized firms. The coefficients of *Bank* are positive in columns (2), (5) and (8), indicating that rising the percentage of rural banks results in higher wages for firms of different sizes. In column (6), the coefficient of *Ln_Bank* reveals that increasing the number of rural banks improves the wage of medium-sized firms.

The decrease of bank competition and the expansion of rural banks have a stronger positive effect on the wage of large firms than those of small and medium-sized enterprises. The coefficients' absolute value of *Bank* and *Ln_Bank* on large firms is larger than that on small and medium-sized enterprises, suggesting that the positive effect of rural banks on wages is stronger in large firms with low information asymmetry. The results support Hypothesis 3. As large firms have the advantages of size effect, collateral and market opportunities, they are facing less risks and constraints (Borisova *et al.*, 2015). Therefore, in areas with more branches of banks, large firms obtain more funds, and their wages are higher than those of small firms are.

5.2. The effect of firm age

Old firms have high transparency, more market information and business networks and is easier for them to obtain bank loans, whereas new firms that have just entered the market face more information asymmetry and financing constraints than the old ones. This study divides the observations into old and new firms according to the median of firm age (7 years) and explores whether the effects of bank competition and rural banks on wages vary according to the firm age.

Table 8 shows the results.

Table 8. Regression results for firm age

Group	(1)	(2)	(3)	(4)	(5)	(6)
	Old firms			New firms		
Branch	-0.043***			0.002		
	(0.014)			(0.010)		
Bank		0.052			0.193***	
		(0.064)			(0.043)	
Ln_Bank			0.011			0.025***
			(0.009)			(0.007)
Control variables	YES	YES	YES	YES	YES	YES
N	260117	260117	260117	216037	216037	216037
Adj. R^2	0.678	0.678	0.678	0.579	0.579	0.579

*Notes: Standard errors in parentheses. The explained variable is Wage. *** p<0.01; ** p<0.05; * p<0.1. The table does not show the results of control variables.*

The coefficient of *Branch* is significantly negative in column (1) and fails the significance test in column (4), indicating that bank competition has a negative effect on the wage of old firms and has no effect on wages for new firms. In columns (5) and (6), the coefficients of *Bank* and *Ln_Bank* are significantly positive, suggesting that rural banks are positively related to wages, and rising rural bank branches increases the wage of new firms.

The coefficients show that the development of rural banks has a stronger positive effect on the wage of new firms than those of old ones. The boost of rural banks branches makes banks pay attention to previously neglected agricultural firms to expand their market share, which enables the new firms to get the support of banks and raise wages. Similarly, bank competition enhances the commercial density by improving the loans acquisition ability of new firms, while the effect weakens with increased stock market size due to the importance of information symmetry to relational lending (Elitcha, 2021).

5.3. The effect of firm ownership

There are differences in the funds provided by banks to firms with different ownership. They are more willing to provide loans to SOEs with more collateral and less risk (Le *et al.*, 2019), whereas it is difficult and costly for private firms to obtain external financing (Borisova*, et al.*, 2015). To explore whether there is ownership heterogeneity in the effect of bank competition and rural banks on the wage of agricultural firms, this study divides the observations into state-owned, private and foreign firms according to their controlling shareholders (Shailer and Wang, 2015). Table 9 reports the results.

Table 9. Regression results for firm ownership

Group	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	SOEs			Private Firms			Foreign Firms		
Branch	0.019 (0.030)			-0.032** (0.012)			-0.010 (0.025)		
Bank		-0.253 (0.180)			0.244** (0.052)			0.116 (0.107)	
Ln_Bank			-0.023 (0.033)			0.043** (0.008)			0.018 (0.017)
Control variables	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	37234	37234	37234	243782	243782	243782	81761	81761	81761
Adj. R^2	0.645	0.645	0.645	0.550	0.550	0.551	0.613	0.613	0.613

*Notes: Standard errors in parentheses. The explained variable is Wage. *** p<0.01; ** p<0.05; * p<0.1. The table does not show the results of control variables.*

In column (4), the coefficient of *Branch* is significantly negative, showing that it is a negative correlation between bank competition and wages, and increased bank competition decreases private firms' wages. In columns (5) and (6), the coefficients of *Bank* and *Ln_Bank* are both significantly positive, indicating that rising the percentage of rural banks and increasing the number of rural banks improve the wage of private firms.

The coefficients suggest that bank competition decreases the wage of private firms, but it has no effect on the wage of SOEs and foreign firms. Rural banks play a greater role in promoting the

wage of private firms than SOEs and foreign firms. Compared with SOEs and foreign firms, private firms have more information asymmetry and financial risk and are vulnerable to financial market fluctuations. SOEs firms and foreign firms, because of the supports of governments, banks and parent companies, have strong ability to resist external shocks and are less influenced by bank competition and rural banks than private firms are (Miocevic and Srhoj, 2023).

Conclusions

With the enhancement of economic financialization, financial market is in the hub position of capital allocation. Banks dominate the financial system in developing countries. It is an inherent requirement to improve wages and narrow income inequality through the structural reforms of banking system and analyse the impact of bank competition and rural bank branches on wages. By matching agricultural firms with financial license information, this study investigates the effect and heterogeneity of bank competition and rural banks on wages in China, which has policy significance for increasing wages and reducing income inequality.

Above results confirm the crucial role of bank competition and rural banks in raising wages and support the market power hypothesis. First, the decrease of bank competition contributes to improving firms' wages. The increase of the percentage and number of rural banks result in higher wages by alleviating financing constraints. The results of robustness and endogenous tests confirm the conclusions. Second, city banks' expansion improves wages, while the presence of foreign banks has no effect on wages. Third, the micro-level evaluation of the heterogeneous influence of bank competition and rural banks on wages shows that increased bank competition has a decreasing effect on the wage of large, medium-sized, and small enterprises, while rural banks have an increasing effect on the wage of small, medium, and large firms. The decrease of bank competition has a stronger positive impact on the wage of old firms than on that of new ones, whereas the development of rural banks has a stronger positive impact on the wage of new firms than on that of old ones. The decrease of bank competition and the expansion of rural banks have a stronger positive effect on the wage of private firms than on that of SOEs and foreign firms.

These conclusions provide new ideas for optimizing financial policy and increasing wages. First, banks should improve the ability of financial services to the real economy, promote bank competition and optimize rural financial system, which can help firms to obtain loans, improve R&D investment and raise wages. Second, we should lower the barriers to entry for private capital in the financial industry. This encourages the growth of small and medium-sized financial institutions, leading to an optimized financial structure that can help alleviate the financing constraints faced by small and private firms, ultimately improving their production efficiency and wages. In addition, it is essential to establish a fair business environment and a sound legal system. This includes strengthening information disclosure and ensuring policy stability, which helps reduce the unfair treatment experienced by small and private firms. Governments should pay attention to these firms when formulating financial policies to promote economic growth and wages.

Nevertheless, the focus of this study is to estimate the effects of bank competition and rural banks on wages of agricultural firms, while ignoring the impact of applying fintech on firms and its mechanism. Future study should examine the effect of fintech on firm growth.

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