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Distortion in the Intermediate Market and Firm Innovation

Xiao Feng

School of Economics, Nankai University, Tianjin, China
Email: fengxiaonku@163.com

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Abstract

Using Chinese firm-level manufacturing production data during the period 1998-2007, we first estimate the firm-level distortion in intermediate input markets and then identify the effects of distortion on firm innovation. The results show that: 1) The distortion in the intermediate market significantly reduces the level of firm innovation, and these negative impacts are stronger in state-owned enterprises, industries with greater financing constraints, and firms in the western region. 2) The mechanism study shows that the distortion in intermediate goods market mainly affects firm innovation through three ways: increasing firm rent-seeking behavior, reducing capital intensity, and restricting the improvement of production efficiency.

Keywords

Distortion, Intermediate Goods Market, Innovation, Misallocation of Resources

1. Introduction

The world is undergoing profound changes unseen in a century. A new round of scientific and technological revolution and industrial transformation are the key factors affecting the great changes, and are directly related to the future and destiny of the country and the well-being of the people. Under this background, the 18th National Congress of the Communist Party of China clearly stated that "scientific and technological innovation is the strategic support for improving social productivity and comprehensive national strength, and must be placed at the core of the overall national development" and "adhere to the road of independent innovation with Chinese characteristics and implement the innovation-driven development strategy". However, the lame structure formed by "complete marketization of product market + semi-marketization of factors market"

has become an important issue that inhibits the improvement of total factor productivity of firms and constrains the entrepreneurial spirit of innovation. In recent years, with the steady progress of a number of measures, such as establishment and improvement of a multi-level capital market system, a unified urban and rural construction land market, and the reform of the household registration system, the reforms of the factor market including land, labor, capital, technology and data have yielded positive results. Factors quality and allocation efficiency have been significantly improved. However, at the same time, as the factor that accounts for the highest proportion in the production process, the factor allocation of intermediate inputs and their markets is rarely mentioned in policies or literature. Does the distortion exit in the intermediate goods market (IGM hereafter)? What is the trend and heterogeneity of the distortion? Does it also restrict the improvement of innovation capabilities, just like capital and labor market distortions? Given that the distortion between different factor markets is highly conductive and diffuse, it is clear that the answers to the above-mentioned basic questions are of great importance to deepen the reform of factor market-based allocation, stimulate the vitality and creativity of the whole society, and promote high-quality economic development.

Theoretically, distortion of IGM hinders the normal flow of production factors including intermediate products, capital and labor, thereby inhibiting the effective allocation of innovation resources such as R&D capital, and hindering the development of innovative activities. The mechanism includes the following three ways: First, distortion in IGM increases rent-seeking behavior. If firms can purchase intermediate inputs at a low price by acquiring buyer power, it will be more inclined to obtain low-cost factors of production through rent-seeking relationship and reduce innovation input (Baumol, 1990). Secondly, distortion in IGM reduces the capital intensity. Distortion in IGM (mainly refers to firms' buyer power in the intermediate goods market in this paper) jacks up the relative price of capital, leading firms to over-rely on the cost advantage formed by the lower prices of intermediate goods and thus reducing capital factor inputs, which is not conducive to the development of firm innovation behavior. Finally, the increase in the input of intermediate products and the distortion of capital factors greatly limit the improvement of the production efficiency of enterprises, thereby inhibiting the demand for subsequent technological innovation.

In terms of empirical evidence, this paper firstly follows the method of Morlacco (2019) to measure the degree of distortion in IGM at the firm level, based on the Annual Survey of Industrial Firms (ASIF) complied by the National Bureau of Statistics (NBS) of China from 1998 to 2007. Then we examine the time trend and differences across industries, regions, and ownership of distortion. Next, we focus on the impact of the distortion in the IGM on firm innovation. The research shows that the distortion in the IGM significantly reduces the innovation behavior of enterprises, and these negative effects are stronger in state-owned enterprises, industries with relatively large financing constraints, and the western region. Finally, the above three theoretical mechanisms are veri-

fied.

Compared with existing research, the innovations of this paper focus on the following three aspects: First, unlike existing research that focuses on capital, labor and product market distortions, this paper quantifies the degree of distortion in China's IGM and finds that the distortion is also an important source of misallocation of resources. In fact, intermediate goods are the factor with the highest input share in the process of production. For example, the share of intermediate goods in firms' total output was about 78.03% during 1998-2007, while the counterpart figure for France manufacturing is only 38% over the same period (Morlacco, 2019). It is therefore of great practical importance to measure distortion in IGM, which is an important overlooked source of resource misallocation, like labor and capital market distortions. Secondly, this paper is the first time to promote firms' innovation ability from the perspective of market distortion in IGM. A lots of literature have discussed the impact of capital and labor market distortions on innovation, productivity improvement, industrial structure and economic growth (Banerjee & Munshi, 2004; Jeong & Townsend, 2007; Restuccia & Rogerson, 2008; Hsieh & Klenow, 2009; Bartelsman et al., 2008; Alfaro et al., 2008; Buera et al., 2011; Lu & Yu, 2015). Only a few pieces of literature have explored the impact of market distortions in IGM: Liu & Wu (2019) took the energy industry as an example and found that distortion in IGM hindered the improvement of production efficiency. Combined with firm-level data in the French manufacturing industry, Morlacco (2019) found that the buyer power of firm in the international IGM was significantly higher than that in the domestic IGM. The buyer power was conducive to improving the terms of trade, but at the same time, it reduced the output and production efficiency. Finally, in view of the obvious differences between firms in terms of ownership and financing constraints, this paper also examines the heterogeneous impact of distortions in IGM, which has important policy implications for reducing distortion and promoting innovation.

The remainder of the paper is organized as follows: Section 2 introduces our estimation method and describes stylized facts of distortions in IGM. Section 3 describes the data and model setting. Section 4 reports the empirical findings and Section 5 concludes.

2. Measurement and Stylized Facts

2.1. Measurement

To obtain firm-level distortion in intermediate markets, we follow the recent work of Morlacco (2019). Specifically, production function of firm i at time t is:

$$Q_{it} = Q\left(M_{it}, \mathbf{K}_{it}; \Theta_{it}\right) \tag{1}$$

where M_{it} is intermediate inputs, $\mathbf{K}_{it}$ is the vector of dynamic inputs, including capital and labor, Θ_{it} is state variables. Production function $F(.)$ is assumed to be continuous and twice-differentiable with respect to all of its argu-

ments.

An inverse supply curve faced by firm i is:

$$w_{it}^{M} = t_{it}^{M} W_{it}^{M} \left(\mathbf{M}_{t}; \mathbf{A}_{t} \right) \tag{2}$$

where $\mathbf{M}_{t} = \left(M_{it}, M_{-it} \right)$ represents the input quantities demanded by firm i and its competitor -i given supply shifters $\mathbf{A}_{t}$. We assume that input markets are imperfect competitive and firm i has monopsony power, that is, $\partial W_{it}^{M} / \partial M_{it} \neq 0$. t_{it}^{M} is exogenous policy factors that affect intermediate price, such as government subsidy or tax.

Now we consider the following cost-minimization problem: firm i select the optimal intermediate inputs given output and state variables in each period. Hence, the Lagrangian function is:

$$L\left(M_{it}; \lambda_{it}, \mathbf{K}_{it} \right) = t_{it}^{M} W_{it}^{M} M_{it} + \lambda_{it} \left(Q_{it} - Q_{it} \left(\cdot \right) \right)$$

The first-order-condition for intermediate material is:

$$\frac{\partial L}{\partial M_{it}} = t_{it}^{M} W_{it}^{M} + t_{it}^{M} \frac{\partial W_{it}^{M}}{\partial M_{it}} M_{it} - \lambda_{it} \frac{\partial Q_{it} \left(\cdot \right)}{\partial M_{it}} = 0 \tag{3}$$

Rearranging Equation (3) leads to

$$\lambda_{it} \frac{\partial Q_{it} \left(\cdot \right)}{\partial M_{it}} = t_{it}^{M} W_{it}^{M} \left(1 + \frac{\partial W_{it}^{M}}{\partial M_{it}} \frac{M_{it}}{W_{it}^{M}} \right) \tag{4}$$

where $\lambda_{it} = \frac{\partial L}{\partial Q_{it}}$ represents the marginal cost of production at a given level of output. Equation (4) means that the marginal cost of the input in equilibrium is equal to the input price W_{it}^{M} times t_{it}^{M} and a term which differs from one whenever $\frac{\partial W_{it}^{M}}{\partial M_{it}} \neq 0$. In other words, there exists a wedge between the marginal valuation of the input and its equilibrium price, which is expressed as ψ_{it}^{M} in following Equation (5):

$$\psi_{it}^{M} \equiv t_{it}^{M} \left(1 + \frac{\partial W_{it}^{M}}{\partial M_{it}} \frac{M_{it}}{W_{it}^{M}} \right) \tag{5}$$

We can use ψ_{it}^{M} to measure firm i's total distortions in intermediate markets, where term $\left(1 + \frac{\partial W_{it}^{M}}{\partial M_{it}} \frac{M_{it}}{W_{it}^{M}} \right)$ is the distortion caused by monopsony power and term t_{it}^{M} caused by government policies such as taxes or subsidies. How do we measure the magnitude of ψ_{it}^{M}?

Given markup in firm-level can be defined as price over marginal costs, i.e. $\mu_{it} = \frac{P_{it}}{\lambda_{it}}$, the estimation expression of firm-level distortions in intermediate markets: can be rewritten as:

$$\psi_{it}^{M} = \frac{\theta_{it}^{M}}{\alpha_{it}^{M} \mu_{it}} \tag{6}$$

where $\theta_{it}^{M} = \frac{\partial Q_{it}}{\partial M_{it}} \frac{M_{it}}{Q_{it}}$ is the output elasticity of intermediate and $\alpha_{it}^{M} = \frac{W_{it}^{M} M_{it}}{P_{it} Q_{it}}$ is the expenditure share for intermediate inputs. As the latter is directly observed in data, distortions can be readily calculated as long as output elasticity and markup are available. We estimate output elasticities using ACF approach, following Brandt et al. (2017) and we also try alternative measures as proposed by Olley and Pakes (1996) and Levinsohn and Petrin (2003) in the robustness check. We use a measurement of "accounting markup" by dividing total costs into total revenues to estimate markup, where total costs equal to expenditures on labor, intermediate inputs and capital times rental rate. We assume the rental rate to be 10% in the benchmark regression (e.g. Hsieh & Klenow, 2009) and to be 20% in the robustness check (e.g. Blaum et al., 2018).

2.2. Stylized Facts

1) Time trend. Figure 1 depicts the time-varying trend of market distortions in intermediate goods. It can be found that the average value of ψ_{it}^{M} is greater than 1, indicating that firms have buyer power in IGM. During 1998-2000, distortion in IGM was relatively stable, and then experienced a rapid decline in 2000-2003 since trade liberalization improved firm's access to foreign made inputs by lowering cost of imports, which leads firms now face less elastic input supply curves and thus larger monopsony power. However, after 2003, the distortion has shown a relatively stable trend, with little change between years.

2) Regional differences. As shown in Figure 2, the spatial difference in average distortion distributes in rundle: the west is the highest, followed by the middle, the east is the lowest. The reasons for the lowest distortion in IGM faced by firms in the eastern region are due to more intense market competition and a more fairer institutional environment (and thus less rent-seeking behaviors).

Ownership differences. We classify each firm in our sample as belonging to one of fiveownership types: state-owned enterprises (SOE), collective-owned

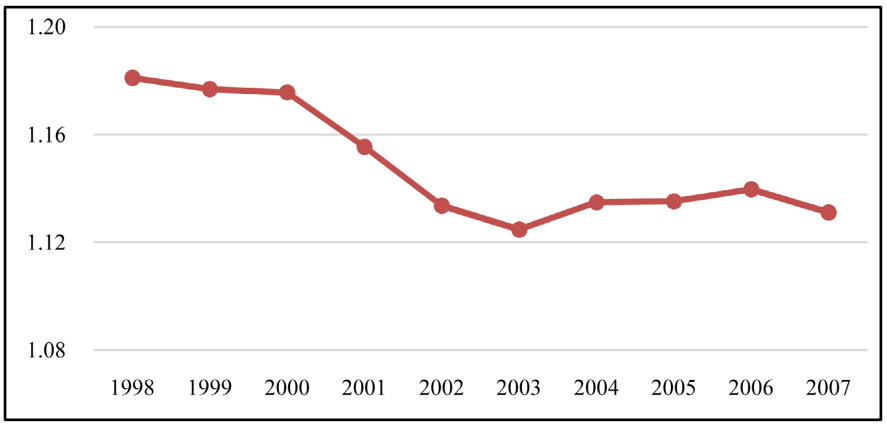

Figure 1. Time trend of distortions in IGM. Note: Data is sorted out according to the method in Chapter 2.1.

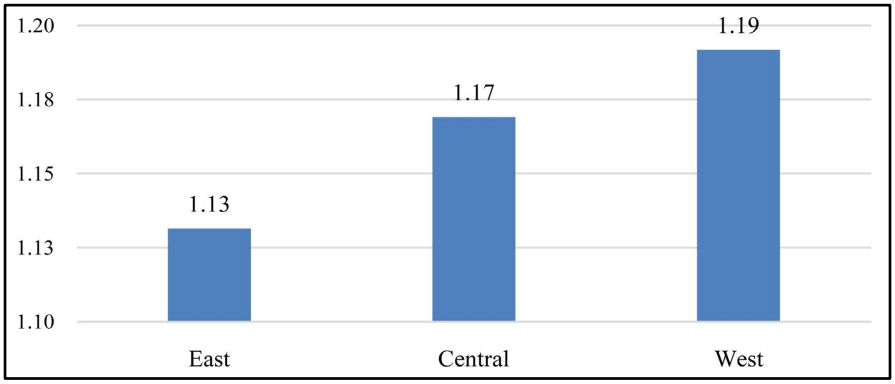

Figure 2. Regional differences in firms' distortions. Note: Data is sorted out according to the method in Chapter 2.1.

enterprises (COE) private firms, Hong Kong, Macao, Taiwan (HMT) and foreign firms. **Figure 3** presents the degree of market distortion of intermediate goods among firms with different ownership status. We find that SOEs faced the highest degree of distortion, followed by HMT and foreign firms, COEs and private firms present lower distortions.

3. Data and Model Settings

3.1. Data

We combine two different datasets in our analysis.

First, we use firm-level data from Annual Survey of Industrial Firms (ASIF) complied by the National Bureau of Statistics (NBS) of China during 1998-2007[1]. The database covers all SOEs, as well as large and medium-sized non-state-owned enterprises with annual sales above five million RMB (around 770,000 US dollars under current exchange rate). This dataset contains rich firm-level information, such as firm name, legal person code, year, output, asset, capital stock, employment, wage and R&D expenditure. We firstly follow the approach of Brandt et al. (2012) to clean the full sample.

Our second dataset is the patent database provided by the State Intellectual Property Office (SIPO) of China from 1998 to 2007. Following information is included: firm name, address, time, patent applicant, type (invention patent, utility model patent or design patent).

We merge the resulting firm-level dataset with the patent dataset using information both on the name and location of firms to ensure the accuracy of the matching result.

3.2. Model Settings

Consider the following specification for our empirical investigation:

[1]This paper only selects the data from 1998 to 2007 for two reasons: first, the key variable of intermediate inputs is missing in the database after 2007 and the quality of the data is questionable. Second, the focus of this paper is to reveal the impact of intermediate goods market distortions on firm innovation, so as to provide policy implications for deepening factor market reforms and stimulating social vitality and creativity.

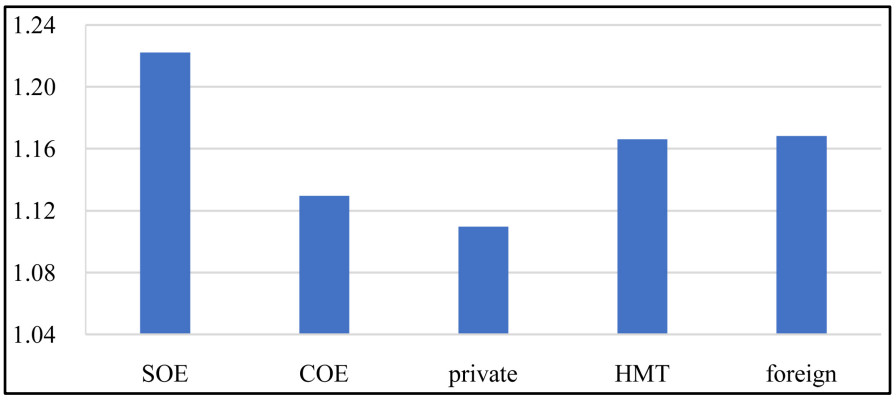

Figure 3. Ownership differences in firms' distortions. Note: Data is sorted out according to the method in Chapter 2.1.

$$lnpatent_{ft} = \beta distortion_{ft} + X'_{ft}\psi + \gamma_f + \gamma_t + \varepsilon_{ft} \quad (7)$$

where subscripts f and t indicate firm and year, respectively. $lnpatent_{ft}$ is the innovation activity of firm f in year t. We use the log number of patent applications as a direct measure for innovation, following the innovation literature (Aghion et al., 2005). $distortion_{ft}$ is the degree of distortion in IGM estimated using the method in Section 2. X represents other firm-level factors that affect innovation activity, such as per capita capital intensity (*avek*), firm size (*lnl*), establishment time (*lnage*), export status (*expdummy*), profit rate (*profit*), financing constraints (*cons*), and ownerships (*SOE*, *private or foreign*). Fixed effects in firm (γ_f) and time level (γ_t) are included to control for any common shocks. Finally, ε_{ft} is an error term. We cluster standard errors at the firm level to address potential serial correlation.

4. Empirical Analysis and Findings

4.1. Baseline Results

Table 1 presents the estimation results of Equation (7). We start with a simple OLS regression that only includes firm and year fixed effects (FEs) in Column (1) and add firm controls in Column (2). The estimated coefficient on *distortion* is -0.004, and statistically significant at 1% level, implying that distortion in IGM discourages innovation. In addition, exporters and more capital intensive, larger, younger, and higher profit margin, private and foreign firms innovate more, on average, while firm financing constraints do not have statistically meaningful impacts. We take Column (2) as our preferred baseline results.

In view of the explanatory variable, the number of patents filed by firms, is a nonlinear panel of count variables, columns (3)-(4) use a fixed effects Poisson regression to improve the estimation efficiency. Our main variable of interest, *distortion*, keeps its magnitude and statistical significance.

4.2. Robustness Checks

1) Alternative measures of distortion. First, thus far, markup in regression is

Table 1. Baseline results.

lnpatent	(1)	(2)	(3)	(4)
	OLS		Poisson	
distortion	−0.005***	−0.004***	−0.002***	−0.002***
	(0.001)	(0.001)	(0.000)	(0.000)
avek		0.011***		0.005***
		(0.000)		(0.000)
lnl		0.020***		0.008***
		(0.001)		(0.000)
lnage		−0.004***		−0.002***
		(0.001)		(0.000)
expdummy		0.006***		0.002***
		(0.001)		(0.000)
profit_rate		0.000*		0.000
		(0.000)		(0.000)
cons		0.000		0.000
		(0.000)		(0.000)
private		0.002*		0.000
		(0.001)		(0.001)
foreign		0.007*		0.001
		(0.004)		(0.002)
Firm + *YearFE*	Y	Y	Y	Y
N	1,485,376	1,480,976	1,485,376	1,480,976
R^2	0.511	0.513	0.467	0.469

Note: Robust standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

obtained by dividing total sales by total costs where we assume the rental rate to be 10% as in Hsieh and Klenow (2009). Now we assume a value for rental rate equal to 20% (e.g. Blaum et al., 2018). After recalculating firm's distortion in IGM, we regress the level of *lnpatent* on *distortion*, along with a set of firm-level characteristics. As shown in Columns (1)-(2) of **Table 2**, distortion has negative effect on innovation. Next, we use LP production function to recalculated input-output elastics, distortion and repeat the regression. According to this measurement, the average distortion is 1.225, which is significantly greater than 1, indicating that firms indeed have distortion in the intermediate input markets. As shown in Columns (3)-(4), we find that the impact of distortion reduction remains significant. Analogously, Columns (5)-(6) show the results of production function estimation using OP method, the coefficients of our regress or of interest remain negative and statistically significant, suggesting that our findings are not driven by specific measurement of distortions.

Table 2. Alternative measures of distortion.

lnpatent	(1)	(2)	(3)	(4)	(5)	(6)
	Rental rate = 20%		Production function: LP		Production function: OP	
distortion	−0.005***	−0.005***	−0.004***	−0.003***	−0.004***	−0.003***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Firm controls		Y		Y		Y
Firm + Year FE	Y	Y	Y	Y	Y	Y
N	1,485,347	1,480,960	1,493,033	1,488,592	1,484,827	1,480,410
R^2	0.511	0.513	0.511	0.512	0.511	0.512

Note: Robust standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

2) Alternative measures of innovation. Next, we further tested whether the above conclusions depend on the measurement method of innovation. First, we use log invention patents (*lnip*) as a measure of firms' innovation activity since it captures the quality of innovation better than patents in utility model or design. The regression results of columns (1)-(2) in Table 3 once again show that the distortion in IGM is not conducive to enterprise innovation. Then following Liu and Ma (2020), we replace the explanatory variables with the logarithm of firms' expenditure on R&D (*lnrd*), and log new products output. All the results shown in Columns (3)-(6) confirm that the market distortion of intermediate products reduces innovation and our results are found to be robust to these alternative measures.

3) Endogeneity issue. To address the possible endogeneity issue due to missing variables and two-way causal relationship, which could bias our results, we use the instrumental variable method to test the robustness of the above conclusions.

First, we use one-period lag of the distortion in IGM as an instrumental variable. The regression results of columns (1)-(2) in Table 4 still show that the distortion discourages innovation.

Secondly, following Card and Krueger (1996), we calculate the degree of market distortion of intermediate goods at the city-industry level and use it as an instrumental variable (IV) of firm-level distortion: firm-level distortion is relatively independent, but closely related to the corresponding value at the city-industry level. Therefore, using this instrumental variable to perform two-stage least squares regression can effectively overcome the endogeneity problem. The specific formula of IV is as follows:

$$X_f = \frac{1}{N-1}\sum_{\substack{n\in N \\ n\neq f}} distortion_n$$

where X is firm-level instrumental variable and N represents the number of firms at the city-industry level. As shown in the columns (3)-(4) in Table 4, the estimated

Table 3. Alternative measures of invention.

	(1)	(2)	(3)	(4)	(5)	(6)
	lnip		*lnrd*		*lnnp*	
distortion	−0.123***	−0.112***	−0.001***	−0.001**	−0.184***	−0.161***
	(0.011)	(0.011)	(0.000)	(0.000)	(0.011)	(0.011)
Firm controls	Y	Y	Y	Y	Y	Y
Firm + Year FE	Y	Y	Y	Y	Y	Y
N	891,632	888,751	1,485,376	1,480,976	1,288,990	1,286,380
R^2	0.626	0.630	0.467	0.469	0.683	0.691

Note: Robust standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table 4. Endogenous problems.

lnpatent	(1)	(2)	(3)	(4)
L. distortion	−0.083***	−0.048**		
	(0.019)	(0.019)		
distortion			−0.005***	−0.004***
			(0.001)	(0.001)
Firm controls		Y		Y
Firm + Year FE	Y	Y	Y	Y
N	995,568	993,454	1,482,781	1,478,394
R^2	−0.005	0.000	0.000	0.002

Note: Robust standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

coefficient of *distortion* is still significantly negative at the 1% statistical level, that is, the distortion in IGM significantly inhibits innovation.

4.3. Heterogeneous Effects

1) Effects by ownership type. As mentioned above, firms with different ownership status experience different degrees of distortion: SOEs face the highest degree of market distortion, while private and foreign firms are less distorted. Therefore, we expect that the negative impact of the distortion of IGN on innovation is stronger in subsample of SOEs. To verify this conjecture, we repeat the regression in Column (2) of **Table 1** for each subsample. The results are reported in Columns (1)-(3) of **Table 5**. The coefficient on *distortion* is significantly negative only for SOEs subsamples. The possible reason is that SOEs could buy intermediate inputs at lower prices as the result of the existence of buyer's market power, which forms cost advantages and weakens firms' innovation incentives. Conversely, the innovation activities of private and foreign firms, especially foreign firms that present the highest level of innovation and are more reliant on the home country's intermediate goods market, are less affected since they experience weaker buyer power and distortion.

Table 5. Heterogeneous effects.

lnpatent	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	SOE	Private	foreign	small FC	large FC	east	central	west
distortion	−0.011***	−0.001	−0.001	−0.002	−0.005***	−0.004***	−0.004**	−0.005**
	(−0.015)	(−0.002)	(−0.001)	(−0.002)	(−0.006)	(−0.004)	(−0.006)	(−0.008)
Firm controls	Y	Y	Y	Y	Y	Y	Y	Y
Firm + Year FE	Y	Y	Y	Y	Y	Y	Y	Y
N	236,173	910,058	301,772	668,112	692,184	1,073,065	254,759	153,129
R^2	0.565	0.496	0.542	0.580	0.525	0.512	0.520	0.507

Note: Standardized estimated coefficients in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

2) Effects of sector financing constraints. We then examine the heterogeneous effects of distortion in IGM by sector financing constraints. As we all know, innovation is inseparable from financial support. However, at present, financing is difficult and expensive, which seriously restricts the development of firm innovation. We conjecture that the lack of innovation funds magnifies negative impact of the distortion in IGM on innovation, especially for firms in industries with relatively large financing constraints. Therefore, we divide the sample into two subsamples accordingly and repeat the regression of our preferred baseline specification for each subsample. As shown in columns (4)-(5) of Table 5, the effect of distortion on firm innovation is significantly stronger for industries where firms are facing large financing constraints.

3) Effects by region. Finally, we examine the heterogeneous effects of distortion by regions since the research above has shown that distortion varies substantially: firms in the western region are facing the highest distortion. As shown in columns (6)-(8) of Table 5, while the coefficient on distortion is positive for all groups of firms, the point estimate for firms in the west region is large than that for the east and central firms.

4.4. Mechanism

We now extend our discussion to investigate the three possible mechanisms by which the distortion of IGM could affect firms' innovation behavior: increase of rent-seeking behavior and decline in capital intensity and production efficiency.

First, if firms can purchase intermediate inputs at a low price by acquiring buyer power, then they tend to be more inclined to obtain low-cost factors of production through rent-seeking relationship and reduce innovation input (Baumol, 1990). We use the share of management cost in total output as firm's rent-seeking cost measure. The regression results of columns (1)-(2) in Table 6 show that firms with stronger buyer power in the intermediate goods market have higher rent-seeking costs. Absolutely, it discourages firms' innovation activities.

Table 6. Mechanism.

	(1)	(2)	(3)	(4)	(5)	(6)
	rent-seeking		*avek*		*tfp*	
distortion	0.104***	0.105***	−0.117***	−0.088***	−0.455***	−0.456***
	(0.292)	(0.292)	(0.003)	(0.003)	(0.002)	(0.002)
Firm controls		Y		Y		Y
Firm + Year FE	Y	Y	Y	Y	Y	Y
N	1,488,210	1,483,229	1,488,205	1,483,226	1,378,361	1,373,821
R^2	0.710	0.712	0.860	0.900	0.918	0.918

Note: Robust standard errors in parentheses, ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Secondly, the distortion of IGM jacks up the relative price of capital, also leading firms to over-rely on the cost advantage formed by the lower prices of intermediate goods and thus reducing capital factor inputs, which discourages firms' innovation. Columns (3)-(4) in Table 6 examine the effects of distortion on firms' capital intensity. The results show that the distortion of IGM does reduce the capital intensity, which is not conducive to innovative behavior.

Finally, the increase in the input of intermediate products and the distortion of capital factors greatly limit the improvement of the production efficiency of enterprises, thereby inhibiting the demand for subsequent technological innovation. Therefore, we take total factor productivity at the firm level as the explained variable. The regression results of columns (5)-(6) in Table 6 show that the distortion significantly reduces firm productivity, thus leading to insufficient innovation motivation.

5. Conclusion

Scientific and technological innovation is the strategic support for improving social productivity and comprehensive national strength and must be placed at the core of the overall national development. This paper innovatively examines how to promote firm innovation from the perspective of distortion in intermediate goods market. The results show that: First, during 1998-2007, the distortion in intermediate goods market presents a trend of "relatively stable—rapid decline—rising" and exhibits great heterogeneity across firm ownership, region and industry. Second, the distortion of IGM significantly reduces firms' innovation activities. We then examine the heterogeneous effects of distortion and find that this negative effect is stronger for SOEs, those in the higher financing constraints sectors and those located in the western region. The mechanism research shows that the distortion in IGM discourages the firms' innovation mainly by increasing the rent-seeking cost, reducing capital intensity and total factor productivity.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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