Cyclicality of Markup and Markdown: Evidence from Korean Firm Data

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Abstract

A countercyclical markup of price over marginal cost is a key mechanism in the transmission of monetary and fiscal policy shocks in New Keynesian Models. This paper distinguishes price-cost markup with product-wage markdown under the assumption that firms have monopsony power in the labor market. This paper identifies markup and markdowns through production approach using Korean firm data. We find that whether or not the markdown is identified from the markup matters when examining the cyclicality of the markup. While the measure of markup that is not distinguished from the markdown is weakly countercyclical, measure of markup distinguished from the markdown is strongly countercyclical, because markdown is procyclical.

1. Introduction

Assessing whether the mark-up is pro- or counter-cyclical has important implications for different theories of the business cycle. For example, a counter-cyclical mark-up offers an appealing explanation for the observed pro-cyclicality of real wages (see Rotemberg and Woodford, 1991). In addition, to the extent to which the impact of macroeconomic policies on output and prices depends on the level and cyclicality of mark-ups, identifying mark-up behavior is important for the design of macroeconomic policies.

The markup of price over marginal cost plays a key role in New Keynesian macroeconomic models. In the sticky price models, a demand shock raises output and marginal cost, but since prices are sticky, the markup of price over marginal cost falls. The countercyclical movement in the price markup play a key role in the transmission of monetary and fiscal policy shocks. As Debortoli and Gali (2018) point out, the estimated dynamic stochastic general equilibrium model (e.q. Smets and Wouters (2007)) and heterogeneous-agent New Keynesian (HANK) model rely heavily on countercyclical price markups to amply shocks.

Previous studies measuring markup assume that the labor market is competitive. However, firms can have market power in both the product and the labor markets. Markup expresses market power in the product market, markdown expresses market power in the factor market such as the labor market. This paper distinguishes and identifies markup and markdown, and examines the cyclicality of markup.

In perfectly competitive labor market, marginal product of labor is equal to wage and markdown is one. Meanwhile, the markdown is greater than one in a situation where the employer has a monopsony power. This paper defines markup and markdown as market power (ψ). In a fully competitive labor market, markdown is one, so market power and markup are the same. However, in an incomplete labor market, the two do not match.

It is important to distinguish and measure the markdown when examining the cyclicality of the markup, because markdown is expected to be procyclical. The estimation on the cyclicality of markup could (downward) biased if the impact of

markdown is not taken into account.

This paper identify markup and markdowns through so-called production approach. This approach is valid regardless of a stand on the source of employer market power, the assumptions made on other inputs besides labor and materials. Also, the production approach only needs to impose a functional form on a firm's production function. This method is closely related with study on markup by De Loecker, Eeckhout, and Unger (2020), while their study do not analyze the cyclicality of markups. There are relatively many studies that measure markup, but few studies measure markup and markdown separately.

The estimation results show that it is important to distinguish markdown when trying to understand the cyclicality of the markup. If the demand shock increases by 1%, the markup decreases by 0.46%. The markup is strongly countercyclical. In line with expectations, markdown is procyclical. When supply shock (productivity) is controlled, when the demand shock increases by 1%, the markdown increases by about 0.36%. Estimation results also show that market power's cyclicality appears in a mixture of market power and market down's cyclicality.

2. Related Literature

2.1. Cyclicality of Markup

Previous studies are more interested in dominance in the product market than in the factor market, so many studies measure the markup, an indicator of monopoly power in the product market. See Basu (2019) for a study overview of measuring markup.

Studies that measure markup under the relationship with economic fluctuations are divided into studies using time series data and studies using micro firm level data. Studies using time series exploits the relationship between markup and labor share. The markup is proportional to the inverse of the labor share when output elasticities of inputs are constant, which is the case for Cobb-Douglas production function, and

there is no overhead labor. Some studies derive various measures of markup based on CES production functions or allowing for overhead labor (See Nekarda and Ramey, 2020).

Studies using firm data estimate production functions and measure markups from cost minimization conditions. Domowitz, et al (1986) found that the markup was procyclical using four-digit corporate panel data. Anderson et al (2018) calculate the price of individual products and the cost of goods replacement (replacement of marginal cost) using retail data. They find that the markup is cyclical or weakly countercyclical. Haskel et al (1995), which applied the method of Hall (1986), use British manufacturing data and find that the markup is clearly procyclical. Marchetti (2002) uses Italian manufacturing data and finds that there is no clear pattern in the cyclicality of the markup. Morrison (1994), who measures the marginal cost in the stochastic Euler equation, uses Canadian manufacturing data and find the markup is weakly countercyclical. Chirinko and Fazari (1994) find the markup was procyclical.

2.2. Identification of markdown

Studies measuring monopsony power in the labor market include measuring market concentration measures such as the Herfindal Index and measuring markdown values from the firm's cost minimizing condition.

For example, Azar et al. (2017) defined a subclass occupational unit and one commuting area as a labor market, and measured the relationship between concentration and monopsony power. Study that measures concentration in the labor market by setting a divided labor market always has difficulty in market classification. There is also a disadvantage that the concentration measured in this method is limited to the market.

This study follows the method of utilizing the cost minimization conditions. This method is closely related with study on markup. De Loecker, Eeckhout, and Unger (2020) use Compustat's variable on the cost of goods sold as a measure of the variable input in order to infer markup, while their paper did not analyze the cyclicality of their measures of markups. There are relatively many studies that

measure markup, but few studies measure markup and markdown separately.
The method of identifying markdown and markup depends on whether some inputs are substitutable. Rubens (2021) exploits the situation in which Chinese tobacco manufacturers exercise monopsony power over local tobacco leaf producers, and suggested a method to identify markdown when some inputs are not substitutable.
When all inputs are substitutable, markdown and markup can be identified if there is an input that does not have a monopoly on demand. Yeh, Macaluso, and Hershbein (2019) assume that there is no monopsony power on demand for intermediate materials in a study using US firm data. Kim (2017) assumes that energy is an input without a monopsony power. Morlaco (2019) assumes that there is a monopsony on imported intermediate goods, but there is no monopsony on domestic intermediate goods with French firms data.
Which inputs do not have a monopsony on demand will vary from situation to situation. It is known that the main contractors have a great influence in subcontracting relations in Korea (Hong, 2021). Based on this, it is difficult to regard intermediate goods as input without monopsony power in Korea. This study assumes that there is no monopsony power for 'other manufacturing expenses' such as electricity costs, water and light and heat costs, and tax, because the government fully controls the price of other manufacturing expenses in Korea.

3. Identification and Estimation of Markup and Markdown

3.1. Markup and Markdown from Cost Minimization

This section derives the expressions for markup and markdown using the conditions for maximizing profits and minimizing costs of firms (Yeh et al. 2022). For convenience, subscripts that refer to firms and time are omitted for the time being. When the wage rate is W, the labor input is L, and firm's revenue function is $R(L)$, the problem of maximizing profits related to labor input is as follows.

$$\max R(L) - W(L)L$$

The first order condition for the maximizing profit is:

$$\frac{\partial R}{\partial L} = \left(\frac{\partial W}{\partial L}\frac{L}{W} + 1\right)W = \left(\epsilon_L^{-1} + 1\right)W$$

where ϵ_L is the wage elasticity of labor supply. Labor market markdown (v^L) is defined as a ratio of marginal product of labor over wage rate. From the profit maximization condition, there is a one-to-one relationship between markdown and wage elasticity of labor supply as follows.

$$(1) \qquad \frac{\partial R/\partial L}{W} \equiv v^L = \epsilon_L^{-1} + 1$$

In a fully competitive labor market, wages coincide with the marginal revenue of labor input, and the wage elasticity of the labor supply becomes infinite, resulting in a markdown value of one. If the labor market is incomplete, the elasticity of the labor supply is finite and the markdown is greater than one. A markdown value greater than 1 means that the marginal income of labor input is greater than the cost paid to labor. It is interpreted that the larger the markdown value, the greater the firm's monopsony power.

Next, we consider the cost minimization problem. Let $Q(L; \bullet)$ be the production fun. The problem of cost minimizing related to labor input is as follows:

$$\min W(L)L \quad s.t.\ Q(L; \bullet) = \overline{Q}$$

When demand monopoly power exists in the labor market, the first-order conditions for cost minimization are as follows.

$$W\left(\frac{\partial W}{\partial L}\frac{L}{W} + 1\right) = \lambda\frac{\partial Q}{\partial L}$$

where λ is the Lagrange multiplier. Since the Lagrange multiplier means marginal cost, the markup, μ, in the product market can be defined as follows.

$$\mu \equiv \frac{P}{\lambda}$$

where P is the price of a product.
Let θ^L be the labor elasticity of output be θ^L, that is, $\theta^L \equiv \partial lnQ/\partial lnL$.
From the cost minimization condition and the definitions of markup and markdown, the following equation cab be obtained.

$$(2) \qquad \mu \cdot v^L = \theta^L \frac{PQ}{WL}$$

The first term on the right side of equation (2) is the labor elasticity of production, and the second term is the reciprocal of the proportion of labor costs in sales.
This paper defines market power as the multiplication of markup and markdown. That is,

$$\psi \equiv \mu \cdot v^L$$

Most previous studies have assumed that the labor market is completely competitive. Markup is the same as market power in a fully competitive labor market (in which $v^L = 1$), However, these two are different in an incomplete labor market.

3.2. Identification of markdown

The left side of equation (2) is the product of markup and markdown. Calculating the right side can measure the value multiplied by the markup and markdown, but the markup and markdown are not identified separately. In this study, we intend to identify markdown and markup under the assumption that there are production factors that do not have a monopsony power.

Let C be the production factor has a monopsony power, that is, $v^C = 1$. We can get following equation from a cost minimization problem of input C:

$$\mu = \theta^C \frac{PQ}{P^C C} \quad (3)$$

where P^C is the price of input C, θ^C is the output elasticity of input C. From the equations (2) and (3), we can get

$$v^L = \frac{\theta^L}{\theta^C} \frac{P^C C}{WL} \quad (4)$$

The above equation can be used to measure the markdown, an indicator of monopoly power in demand in the labor market. For a given v^L, we can measure markup μ from the equation (2) or (3).

Previous studies assumed that intermediate input materials (Yeh et al, 2022; Morlacco, 2019) or energy (Kim, 2017) are production factors without monopsony on demand. In Korea, it is difficult to assume that intermediate materials are a factor that does not have a monopsony on demand because the main contractor has a large market dominance in subcontracting transactions. This study assumes that there is no monopsony power on demand for 'other manufacturing expenses' such as electricity cost, water heating cost, and tax. The government exclusively regulates supply and prices of electricity, water, and taxes, so firms do not have the power to determine prices.

If there is a monopoly on demand for other manufacturing costs, $v^C > 1$, equation (4) becomes:

$$v^L = \frac{\theta^L}{\theta^C} \frac{P^C C}{WL} v^C$$

In this case ($v^C > 1$), equation (4) underestimates the markdown value in the labor

market. In other words, the markdown value measured by equation (4) can be interpreted as the lower bound of labor market markdown.

3.3. Estimation of output elasticity

The second term on the right side of Equation (4) that measures the labor market markdown is the ratio of the cost of inputs to the cost of labor. Cost items can be calculated from the firm's accounting data. In order to calculate the first term of equation (4), one needs to estimate the input elasticities of output.

This study estimates the input elasticity of production using the following production function.

$$(5) \quad y_{it} = \theta_0 + \theta_{it}^L l_{it} + \theta_{it}^k k_{it} + \theta_{it}^M m_{it} + \theta_{it}^C c_{it} + w_i + \epsilon_{it}$$

Here i and refers to firm, t refers to year. The lower-case variable is the logarithm of the output and input of the production factor. That is, $y_{it} = \ln(Y_{it})$, $l_{it} = \ln(L_{it})$, $k_{it} = \ln(K_{it})$, $m_{it} = \ln(M_{it})$, $c_{it} = \ln(C_{it})$. w_i is an unobserved firm characteristics. ϵ_{it} is a residual.

When estimating the production function, the inputs can be endogenous. Considering this, the production function is estimated here by the method of Ackerberg, Caves, and Frazer (2015; hereinafter ACF). In estimation, intermediate materials and other manufacturing costs are considered as variable inputs and capital is considered as fixed inputs. It is assumed that there is an adjustment cost in labor. The ACF method sets w_i as a nonparametric function of the variable input and estimates the coefficient value using the moments that the lagged value of the variable inputs are not correlated with w_i and ϵ_{it}.

There are concerns that using revenue as a dependent variable when estimating production functions using the ACF method may lead to poor identification of coefficient values (Gandhi, Navarro, and Rivers, 2013). However, the estimation procedure goes well with the regression of firm saels in practice. The reason is not clear.

4. Data and Sample

This study uses Korean firm accounting data. This data covers firms obliged to submit financial information, such as listed companies and companies subject to external audits.

The analysis period is from 2000 to 2019. The analysis sample shall be limited to the manufacturing industry. For reference, even if the service industry is included in the analysis sample, the cyclicality results of markup and markdown do not change significantly. The analysis sample was limited to the manufacturing industry because the concept and definition of the productivity measure of the service industry were not clear compared to the manufacturing industry and the proportion of service firms included in the accounting obligation was not large.

Labor costs, material costs, other manufacturing costs, and capital required for analysis are extracted from financial information data. Labor costs are the sum of direct production and indirect labor costs. Direct production labor costs are calculated from manufacturing costs (including welfare, training costs), and indirect production labor costs are calculated as labor costs included in sales and management costs.

The material cost (purchase amount) of the manufacturing cost is used as for the intermediate material cost, Other manufacturing costs, such as electricity, water heating, fuel, and tax, are calculated as the cost of sales in the manufacturing cost statement minus material costs, labor costs, and depreciation costs. The end-of-term tangible assets are used as the amount of capital.

Accounting data do not report the items required for analysis or measurement errors are expected to be significant in may cases. Labor costs, other manufacturing costs, and material costs were calculated as the proportion of sales and excluded from the sample when these ratios were extreme (less than 3% or more than 50 times). The total number of firms included in the sample is 3,324,819 over 20 years. The companies included in the sample account for about 54.4% of the number of companies in the whole firm data and about 42.9% of total sales amount.

5. Estimation results for markup and markdown

5.1. Aggregate markup and markdown

According to the above estimation method, the markdown and markup values are measured on a firm level. There are various methods of calculating the aggregate economic markdown from the estimated firm level markup and markdown. For example, De Loecker et al. (2018) used sales as weights, while Rossi-Hansberg et al. (2018) used employment as weights. According to Yeh, Macaluso, and Hershbein (2022, p.50), if the production function is in the form of Cobb-Douglas and the output elasticity is constant over time, the aggregate economic markup is equal to the sales weighted average of markup. This study uses sales as weights for the aggregate values.

According to equation (1), markdown and labor supply elasticity are in a one-to-one relationship. This expression is rearranged as follows.

$$\epsilon_L = (v^L - 1)^{-1}$$

The elasticity of labor supply can be obtained from the above equation. From the markdown value measured above, From 2000 to 2019, the average markdown value was 2.26, and the corresponding labor supply elasticity was 0.79. The US labor market markdown value measured by Hershbein, Macaluso, and Yeh (2019) is 1.79 on average, and the labor supply elasticity derived from this is 1.27. According to Webber (2015), Sokolova, and Sorensen (2018), which summarized the existing studies, the average value of labor supply elasticity is 1.08. The labor supply elasticity measured in this study is lower than that measured in other studies. The monopsony power in labor market in the Korean is higher than that of other countries.

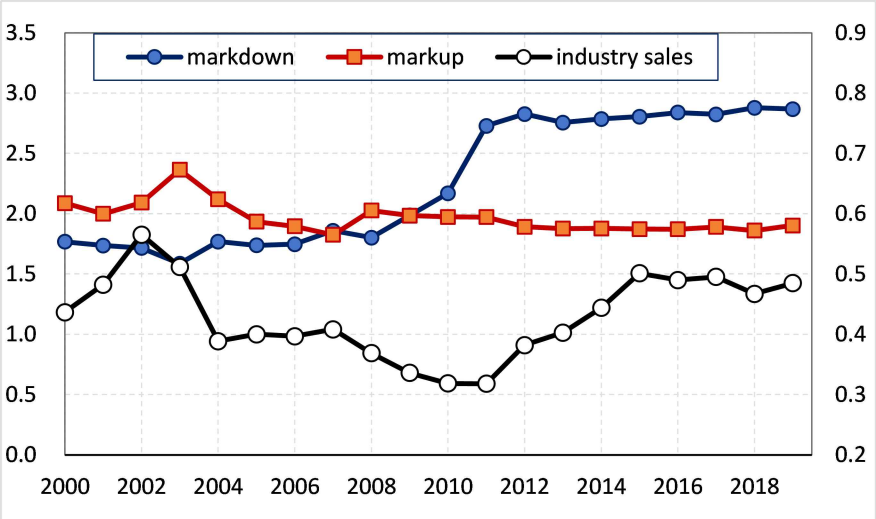
5.2. Aggregate elasticity

The empirical literature has used different proxies for capturing the cyclical variation of product demand at either the aggregate or the sectoral level. Most time-series literature use detrended real GDP as a business cycle indicatior (for example, Nekarda and Ramy, 2020). Domowits, Hubbard, and Peterson (1986) use current and lagged real GDP as instrumental variables for firm level production. Haskel, Matin, and Small (1995) used aggregate unemployment and capacity utilisation, while Bils (1987) used sectoral employment. Martins and Scarpetta (2002) use deviations of industry output from its long-term trend. some studies use financial market value or firm revenue. Chirinko and Fazzari (1994) use deviations of financial market value from its long run equilibrium value.

The aggregate time-series GDP includes production sectors other than manufacturing. The cyclicality of firms may not necessarily be consistent with aggregate cyclicality. The structure of the industry plays an important role in a firm's market dominance. Taking this into account, we use the sectoral cycles as the main variable representing business cycle. The results of using GDP and firm sales are also presented in the robustness verification.

[Figure 1] shows aggregate markup and markdown along with cyclical component of industry sales. As shown in <Table 1>, elasticities of markup and markdown with respect to industry sales are 0.04 and 0.11 respectively. This means the markup is close to acyclical and the markdown is wealky procyclical. The elasticities with respect to other indicators of business cycle such as GDP and firm sales show that the cyclicalility of the markup and the markdown is inconclusive from the macro level. we examine the cyclicality of markup and markdown from the firm level in the next chapter.

[Figure 1] Aggregate Markup, Markdown(left axis), and Deviation of Industry Sales (right axis)



<Table 1> Elasticity of Aggregate Markup and Markdown

	Industry Sales	GDP	Firm Sales
Markup	0.040	0.133	-0.033
Markdown	0.110	-0.021	0.159

(note) 'GDP' is the cyclical component of log real GDP using Christiano-Fitzerald fiter.

6. Cyclicality of Markups and Markdowns

6.1. Main results

<Table 2> shows the estimation results using the estimated firm level markup, make down, market power, and label share as dependent variables. We use panel fixed effect model to control for unobserved firm heterogeneity. All estimates are significant at 1% level. As an indicator of economic cyclicality, this paper uses the difference between the average of total industrial sales and industrial sales for each year.

<Table 2> Main estimations results

	Markup		Markdown		Market Power		Labor Share	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Industry Sales	-0.119 (0.002)	-0.458 (0.002)	0.483 (0.003)	0.358 (0.004)	0.364 (0.002)	-0.099 (0.002)	-0.063 (0.002)	0.239 (0.002)
Productivity		0.638 (0.002)		0.431 (0.003)		1.070 (0.001)		-0.465 (0.002)
Sample	2502662	1949299	2502662	1949299	2502662	1949299	2427633	1891107

Notes: All variables are in log forms. Regression results with firm fixed effects. Weighted by firm's average revenue over time. Clustered standard errors in parentheses. All estimates are significant at 1% level.

Column (1) and (3) of Table 2 shows unconditional cyclicality of markup and markdown. The results indicates markup is weakly countercyclical and markdown is strongly procyclical.

Fluctuations in revenues are expected to be driven by shocks to both demand and supply. While both prices and marginal costs are expected to increase with a positive demand shock, both are expected to decrease with a positive productivity shock (Santos et, al. 2021, p. 1628).

In order to identify and control the impact of supply shocks, productivity variables were included in the estimation. As a result of estimation, productivity has a positive effect on markup. An 1% increase in productivity increases the markup by 0.64%.

With the supply shock controlled, fluctuations in sales represent demand shocks. If the demand shock increases by 1%, the markup decreases by 0.46%. Controlling supply shocks increases the impact of demand shocks. The markup is strongly countercyclical.

Markdown is inversely related to labor supply elasticity. Suppose that the labor supply curve facing a firm is upward. Increasing working hours makes it difficult to

make people work more even at high wage levels. If so, the elasticity of the labor supply decreases as the firm's employment and working hours increase. Labor supply elasticity is expected to be countercyclical, so markdown is expected to be countercyclical.

Markdown can be expressed as a ratio of marginal wage to average wage. When the overtime labor wage rate is higher than the normal labor wage rate, the marginal wage is greater than the average wage. Since working hours are very procyclical, the marginal wage to average wage ratio will be procyclical.

<Table 2> column (3)-(4) shows the results of estimating the effect on markdown. In line with expectations, Markdown is procyclical. When supply shock (productivity) is controlled, when the demand shock increases by 1%, the markdown increases by about 0.36%.

Previous studies do not distinguish between markup and markdown, but considered the market power (product of the two values) as a markup variable. This paper defines market power as the product of markup and markdown. As estimated in this study, market power's cyclicality will appear in a mixture of market power and market down's cyclicality, as markup is countercyclical and markdown is procyclical. <Table 2> column (5)-(6) shows the estimation results using market power as the dependent variable. When productivity is controlled, if the demand shock increases by 1%, the market power decreases by 0.01%. Market power is very weakly countercyclical. The estimation results show that it is important to distinguish markdown when trying to understand the cyclicality of the markup.

Many previous studies use laber share as a proxy variable for markup. <Table 2> column (7)-(8) shows the results using laber share as the dependent variable. As in market power, the cyclicality laber share varies greatly depending on the control variable. In the absence of a control variable, the label share is weakly countercyclical. On the other hand, when the supply shock is controlled, the label share appears to be procyclical. These results are very different from the case of using markup. It can be questioned whether laber share is a proper proxy variable for markup.

<Table 3> Estimations results : Including direct labor cost ratio

	Markup	Markdown	Market Power	Labor Share
	(1)	(2)	(3)	(4)
Industry Sales	-0.460 (0.002)	0.364 (0.003)	-0.096 (0.001)	0.228 (0.002)
Productivity	0.825 (0.002)	-0.081 (0.002)	0.744 (0.001)	-0.367 (0.002)
Direct Labor Cost Ratio	0.618 (0.002)	-1.697 (0.002)	-1.079 (0.001)	0.265 (0.002)
Observations	1949299	1949299	1949299	1891107

Notes: All variables are in log forms. Regression results with firm fixed effects. Weighted by firm's average revenue in sample period. Clustered standard errors in parentheses. All estimates are significant at 1% level.

6.2. Estimation results accounting the overhead labor

Considering the existence of an overhead label or fixed cost, the effect of economic fluctuations on the markup may increase. (Rotemberg and Woodford, 1999). Let H be the total working hours and $\overline{H}$ be indirect working hours. The market power equation considering indirect labor is as follows.

$$\mu \cdot v^L = \theta^L \frac{PQ}{WL}\left(\frac{H}{H-\overline{H}}\right)$$

If output increases, the direct labor is expected to increase and $H/(H-\overline{H})$ will decrease. In other words, the proportion of direct working hours in the total working hours is expected to be procyclical. In this paper, the ratio of direct labor costs to total labor costs is used as a proxy for the proportion variable of direct labor hours.

Table 3 The results estimated by additionally controlling the direct labor cost ratio. As predicted by the theory, considering the overhead cost, the economic volatility of the markup increases. Including the overhead cost, the effect of the demand shock

on the markup has little change, while the effect of the supply shock on the markup increases.

The effect of productivity on markdown varies greatly depending on whether or not the direct labor ratio is included. This is because the direct production labor ratio is highly correlated with productivity. However, Markdown's cyclicality does not changed qualitatively. As shown in column (3) and (4) of <Table 3>, when indirect labor costs are included in the control variable, the estimation results of cyclicality of market power or labor share also do not change significantly.

7. Robustness Check

Here, we examine the cyclicality of markup and markdown using other indicators for business cycle.

<Table 4> columns (1)-(3) show the estimation results when real GDP is used as an indicator of business cycle. Compared to the previous estimation results, markup, markdown, and market power appear to be very sensitive to business cycle. However, the results remain unchanged, with markup being countercyclical and markdown being procyclical.

As shown in <Table 4> columns (4)-(6), when corporate sales are used as an indicator of economic fluctuation, the economic volatility of markup and markdown is weak. However, the qualitative results remain unchanged.

<Table 4> Estimation Results with alternative indicators for business cycle

	Markup	Markdown	Market Power	Markup	Markdown	Market Power
	(1)	(2)	(3)	(4)	(5)	(6)
GDP	-3.871 (0.036)	4.977 (0.051)	1.106 (0.025)			
Firm Sales				-0.153 (0.001)	0.388 (0.001)	0.235 (0.0004)
Productivity	0.740 (0.002)	-0.023 (0.002)	0.717 (0.001)	0.877 (0.002)	-0.394 (0.002)	0.483 (0.001)
Direct Labor Ratio	0.612 (0.002)	-1.69 (0.002)	-1.078 (0.001)	0.649 (0.002)	-1.776 (0.002)	-1.128 (0.001)
N	1949299	1949299	1949299	1949299	1949299	1949299

Notes: All variables are in log forms. Regression results with firm fixed effects. Weighted by firm's average revenue in sample period. Clustered standard errors in parentheses. All estimates are significant at 1% level.

8. Conclusion

This paper distinguishes and identifies markup and markdown, and examines the cyclicality of markup. This paper defines markup and markdown as market power. It is important to distinguish and measure the markdown when examining the cyclicality of the markup, because markdown is expected to be procyclical. The estimation on the cyclicality of markup could (downward) biased if the impact of markdown is not taken into account. This paper identifies markup and markdowns through production approach.

The estimation results show that it is important to distinguish markdown when trying to understand the cyclicality of the markup. The markup is strongly countercyclical and markdown is procyclical. Market power's cyclicality appears in a mixture of market power and market down's cyclicality.

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