Monopsony, Price Squeezing, and Sub-optimality

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Monopsony has been a hot issue recently. A traditional view is that monopsony is harmless to consumers unless it results in higher prices downstream. In this study, I present a theoretical model in which the monopsonist may engage in price squeezing but cannot commit not to engage in advance. This lack of commitment (holdup problem) leads to two types of sub-optimality: (i) the monopsony reduces intermediate-good producers' incentive for relationship-specific investments, leading to sub-optimal investments and lowered wages, and (ii) the monopsonist may choose vertical over-integration.

Keywords: Monopsony, Price Squeezing, Sub-optimal Investments, Vertical Over-integration.

JEL Classification: D43; D23; L12.

I. Introduction

The monopsony and exclusive-dealing contracting are pervasive in the manufacturing sector of Korea. For example, in the automobile industry, Hyundai Motor acquired Kia Motor, whereas all the other three car makers went into bankruptcy and then sold to foreign producers between 1998 and 2004. These merging and reshuffling led to local

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monopolization in the automobile market,[1] establishing local monopsony and exclusive-dealing contracting in the industry of automobile parts and components. A survey by Korea Institute for Industrial Economics and Trade in 2014 indicates that the exclusive supply chains of automobile parts and components remained intact since then, reporting that approximately 74% of automobile parts and components had only one or two downstream firms in their supply chain. A study by the National Research Council for Economics, Humanities, and Social Sciences in 2020[2] confirms this monopsony structure of the automobile parts and components industry. The exclusive supply chain issue is not confined to the market for automobile parts and components. A survey of electronics industry subcontractors trading with chaebol firms, such as Samsung Electronics and LG Electronics, found that 97% of respondents were in exclusive relationships in 2016. Moreover, once a subcontractor enters an exclusive-dealing contract to supply parts to a chaebol firm, it is no longer able to trade with foreign businesses and cannot export its products.[3]

The exploitation by the monopsony is also recently an eye-popping issue in many other countries. In Latin America, across sectors and borders, firms owned and controlled by either large business groups or multinational companies have relations with suppliers either through direct vertical integration or general dependence of small suppliers on large or monopsony buyers (Schneider, 2013). Dominant retailers, such as Amazon and Walmart, wield monopsony power to depress wages up their entire supply chains, particularly in the rural areas in the U.S. An antitrust suit against the National Collegiate Athletic Association (NCAA) is ongoing since the NCAA, and its member colleges and universities cap the compensation, which players can receive.[4]

These examples indicate the ill protection of the workers in the monopsony of labor markets. However, monopsony has attracted less attention in industrial organizations as it has been taken for granted that the consumers may not be harmed if monopsony does not lead to

[1] To date, Hyundai-Kia Motors occupies approximately 80% of domestic automobile sales.

[2] National Research Council for Economics, Humanities and Social Sciences (2020).

[3] Korea Institute for Industrial Economics and Trade (2016).

[4] https://promarket.org/2020/02/03/antitrusts-monopsony-problem/

higher prices downstream,[5] although it is widely speculated that once the monopsonist establishes exclusive supply chains with suppliers of parts and components, she/he begins to engage in price squeezing in the bargaining with these suppliers.[6]

In this study, I highlight that monopsony may discourage relationship-specific investments (or innovations) of upstream firms, leading to the loss of consumer welfare downstream even if the price downstream is unchanged. The devastating consequences of monopsony on innovations and thus the loss of consumer welfare have been documented on several occasions. As illustrated in *Saving Capitalism from the Capitalists*, a book written by Rajan and Zingales, until the 1960s, the three U.S. automakers, GM, Ford, and Chrysler, colluded to dominate the U.S. automobile industry; hence, parts and components suppliers had exclusive-dealing contracts with them. This monopsony prevented any meaningful technological innovation or cost-cutting. Inevitably, Japanese car imports to the U.S. in the 1970s triggered a crisis of U.S. domestic automobile producers. Ironically, when Japanese carmakers started building factories in the U.S. and buying parts and components from American subcontractors, the monopsony and the exclusive-dealing contracts were broken. Moreover, the increased competition and productivity in local parts and components suppliers led to the revival of the U.S. automakers.

In this study, I build on the model for the political economy under elite control in Acemoglu (2009) to show that monopsony reduces subcontractors' incentive for relationship-specific investments (or innovations), leading to sub-optimal investments and lowered wages in these firms. I assume that (i) the local monopsonist competes in a competitive international product market, (ii) she/he simply assembles the subcontractors' intermediate goods without any assembly cost, (iii) she/he determines whether she/he hires intermediate-good manufacturers directly (vertical integration) or contracts with them independently (outsourcing), and (iv) she/he cannot commit not to engage in price squeezing upon the entry of subcontractors.

[5] The OECD (2008) pointed out that the exercise of monopsony power usually results in higher prices downstream, ultimately reducing consumer welfare.

[6] Although the Subcontracting Act was enacted in 1980 to regulate price squeezing in subcontracting, it has not been implemented effectively at all (Jung and Park, 2019).

Notably, I exclude the possibility of the loss of consumer welfare caused by the higher price of the final good resulting from monopsony in the markets for intermediate goods, considering that the price of the final good is fixed in the global competitive market. However, in the case of outsourcing, the monopsonist may engage in price squeezing but cannot commit not to engage in advance. This lack of commitment (holdup problem) is the key element of sub-optimal investments of subcontractors in my model. It is also interesting to note another source of inefficiency in choosing the organizational structure of production: the monopsonist may choose vertical over-integration owing to this holdup problem.

The rest of the paper is organized as follows. Section *II* describes the model and theoretically analyzes the investment behavior of the intermediate-good producers in the presence of price squeezing by the monopsonist. Based on the difference in the intermediate-good and final-good productions between the organizational structures of production, vertical over-integration owing to the holdup problem is discussed. Section *III* concludes the study.

II. Model

A. Setup

My model builds on the model for the political economy under elite control in Acemoglu (2009). An economy is populated by a continuum of workers, one final-good producer and intermediate-good manufacturers, with a discount factor equal to β. For simplicity, I assume that the final-good producer competes in a competitive international market but is a local monopsonist for intermediate-good manufacturers. For simplicity, the price of the final good is normalized to be "1". Hence, I exclude the possibility of the loss of consumer welfare caused by the higher price of final goods resulting from monopsony in the markets for intermediate goods. I also assume that the monopsonist assembles the manufacturers' intermediate outputs without any assembly cost.

The timing of events on each date is as follows. At date 0, the monopsonist determines whether she/he hires intermediate-good manufacturers directly (vertical integration) or contracts with them independently (outsourcing). In this simple setup, I assume that the vertical structure as the organization of production is fixed as vertical

integration or outsourcing by the decision of the monopsonist at date 0.

The model posits that outsourcing is a straightforward form of organization if price squeezing does not occur. Hence, I assume that in the case of outsourcing, the monopsonist suffers a loss of Δ^O because of transaction costs with subcontracted manufacturers, which is smaller than the loss Δ^I owing to monitoring costs in vertical integration.

Notably, my model differs from a typical model of residual rights and organization forms[7] as in Antràs (2003, 2005), who assumed a generalized Nash bargaining game in the allocation of surplus between final producers and intermediate-good producers, which is more appropriate for bilateral monopoly. However, mine is concerned with the monopsony (buyer monopoly) who has absolute bargaining power over intermediate-good producers and is able to engage in price squeezing.[8] If all the surplus is exploited by the monopsonist, then the typical incomplete contract model may fall short of explaining the change in relationship-specific investments under vertical integration and outsourcing (See Antràs, 2003, 2005). Hence, in the model, I use more traditional terms of transaction and monitoring costs as determinants of vertical integration and outsourcing.

However, this assumption of smaller losses owing to transaction costs than monitoring costs is consistent with the intuition of Antràs (2003, 2005). As studied by Antràs (2003, 2005), if production is very intense in intermediate goods, the relationship-specific investment made by the final-good producer will have a relatively low marginal product. Moreover, assigning the residual rights of control to the operators of manufacturing plants will thus be optimal. In my model, the final-good producer's contribution to the production is minimal as she/he simply assembles the intermediate goods without any assembly cost. Hence, consistent with the results of Antràs (2003, 2005), the final-good producer prefers outsourcing to vertical integration without the holdup problem. However, as will be discussed, the monopsonist may choose vertical over-integration owing to this holdup problem.

In my model, there are several identical manufacturers for each intermediate good ex ante, and thus upon their contracts with the

[7] See Grossman and Hart (1986).

[8] From another aspect, Kim and Nora (2022) examined how buyer power affects the incentives of upstream firms to share information with downstream firms.

monopsonist, each intermediate-good manufacturer makes a lump-sum transfer $T_i^I(0)$ as managers of factories or $T_i^O(0)$ as independent subcontractors to the monopsonist to make them break even. However, in the case of outsourcing, the monopsonist may engage in price squeezing from date 1, but she/he cannot commit not to engage in price squeezing at date 0. This lack of commitment (holdup problem) is the key element of my model.

At date t ($t \geq 1$), in the case of vertical integration, each manager with the (relationship-specific or R&D) capital stock $K_i(t)$ decides how much labor to hire $L_i(t)$ and how much to make investments. Without price squeezing, the prices of intermediate goods are also normalized to be "1" in the model. However, in the case of outsourcing, the monopsonist sets a sequence of price-squeezing rates $\tau_i^t = \{\tau_i(s)\}_{s=t}^{\infty}$ on each subcontractor. Then, with τ_i^t as well as the capital stock $K_i(t)$, each subcontractor decides how much labor to hire $L_i(t)$ and how much to make investments. When the intermediate goods are produced, the monopsonist simply assembles these intermediate goods without any assembly cost to produce final products.

As I assume that the monopsonist competes in a competitive international market, no profit is made from the market power in final products. Hence, in the case of outsourcing, monopsonist can make profits from lump-sum tax $T_i^O(0)$ at date 0, and the sum of profit squeezing from date 1 and on while she/he can collect only lump-sum tax $T_i^I(0)$ at date 0 in the case of vertical integration.

B. Intermediate-good manufacturer's investment decision

I solve the model backward. Let me begin with exclusive-dealing outsourced subcontractors. At date t, given any feasible policy sequence $\tau_i^t = \{\tau(s)\}_{s=t}^{\infty}$ and equilibrium wage $w_i^t = \{w(s)\}_{s=t}^{\infty}$, the utility of a subcontractor with capital stock $K_i(t)$ at time t as a function of these policies is as follows:

$$U_i(\{K_i(s), L_i(s)\}_{s=t}^{\infty} \mid \tau^t, w^t) = \sum_{s=t}^{\infty} \beta^{s-t}[(1-\tau(s))F(K_i(s), L_i(s)) - \{K_i(s+1) - (1-\delta)K_t(s)\} - w(s)L_i(s)], \quad (1)$$

where F satisfies continuity differentiability, positive and diminishing marginal products, and constant returns to scale, including the

Inada condition. Notably, the price-squeezing rate is equivalent to a distortionary tax, which is the source of inefficiency in the model.

I assume that workers supply labor inelastically and all subcontractors employ the same number of workers. I also assume full employment in the economy. Then, $L_i(t) = L$, where L is the number of workers employed by subcontractor i.

Maximizing (1) w.r.t. the sequences of capital stock and labor choices, I obtain the following simple first-order condition:[9]

$$\beta[(1-\tau(t+1))f'(k_i(t+1))+(1-\delta)]=1, \tag{2}$$

where $k_i(t+1)$ denotes the capital-labor ratio $K_i(t)/L$ chosen by subcontractor i for time $t+1$ given the tax rate $\tau(t+1)$, and $f(k_i(t)) = \mathrm{F}(K_i(t)/L,1)$. Thanks to the Inada condition, this first-order condition holds equality for any $\tau \in [0,1)$. Owing to linear preferences, the choice of the capital-labor ratio by each subcontractor at time t+1 only depends on the tax rate $\tau(t+1)$ and not on all the future taxes. I can therefore write the equilibrium capital-labor ratio at time t for all subcontractors as follows.

$$\hat{k}(\tau(t)) = (f')^{-1}\left(\frac{\beta^{-1}+\delta-1}{1-\tau(t)}\right), \tag{3}$$

If all taxes were equal to zero, then the unique solution to (3) would be identical to the first-best capital-labor ratio k*. Naturally, when there are positive taxes, the level of capital-labor ratio is less than k* as f(·) is strictly concave. Furthermore, the level of the capital-labor ratio is lower if the tax rate is higher. Notably, F and thus f are twice differentiable. Hence, we have from Eqs. (2) and (3) the following:

$$\hat{k}'(\tau) = \frac{f'(\hat{k}(\tau))}{(1-\tau)f''(\hat{k}(\tau))} < 0, \tag{4}$$

considering that $f'(\cdot) > 0$ and $f''(\cdot) < 0$.

Given the expression in Eq. (3) and full employment, the equilibrium wage at time t is given by the usual expression:

[9] This is straightforward from the Euler equation (6.27) in Acemoglu (2009).

$$\hat{w}(\tau) = (1 - \tau)[f(\hat{k}(\tau)) - k(\tau)f'(k(\tau))], \tag{5}$$

which is similar to the first-best wage w* except for the presence of the tax rate in front of the square bracket.[10]

Notably, the final-good producer will not engage in price squeezing in the case of vertical integration. Hence, in the case of vertical integration, the equilibrium capital-labor ratio and the equilibrium wage are the first-best k* and w*, respectively.

C. Price squeezing

I proceed to see if the unintegrated monopsonist actually engages in price squeezing, setting $\tau > 0$. For simplicity, without loss of generality, I assume that the total number of workers is equal to 1. Then, the final goods, y_t, are produced by assembling the intermediate goods without assembly costs, such as:

$$y_t = \int F(K_i(t), L_i(t))di = f(\hat{k}(\tau))$$

As the monopsonist competes in the competitive global market, her/his profit will be zero at date t if she/he does not engage in price squeezing on the subcontractors.[11] Otherwise, the monopsonist's profit at date t is as follows:

$$T^e(t) = \tau(t)\int F(K_i(t), L_i(t))di = \tau(t)f(\hat{k}(\tau)), \tag{6}$$

The maximization problem of the monopsonist can then be written recursively as follows:

$$V^e(\tau(t), [K_i(t)]_i) = \max_{\tau(t+1)}\{T^e(t) + \beta V^e(\tau(t+1), [K_i(t+1)]_i)\}, \tag{7}$$

Notably, $T^e(t)$ depends only on the tax rate at time t. Hence, the utility-maximizing tax rate for the monopsonist is the same at all dates and is given by the solution to the following first-order condition from Eq. (6):

[10] The equilibrium wage rate in the competitive equilibrium without taxes is: $w(t) = w^* = f(k^*) - k^*f'(k^*)$ for all t, where $f'(k^*)$ is the marginal product of capital.

[11] Recall that the prices of final and intermediate goods are normalized to be 1 in the model.

$$f\left(\hat{k}(\hat{\tau})\right) + \hat{\tau} f'\left(\hat{k}(\hat{\tau})\right) \hat{k}'(\hat{\tau}) = 0, \tag{8}$$

Substituting Eq. (4) into Eq. (8), we have

$$f(\hat{k}(\hat{\tau})) + \frac{\hat{\tau}(f'(\hat{k}(\hat{\tau})))^2}{(1-\hat{\tau})f''(\hat{k}(\hat{\tau}))} = 0, \tag{9}$$

This equilibrium tax rate $\hat{\tau}$ is always between 0 and 1.[12] This analysis so far establishes the following results.

Proposition: Suppose full employment. Then, for any initial distribution of capital stocks among subcontractors, $[K_i(0)]_i$, there exists a unique Markov Perfect Equilibrium, where at each $t = 1, \ldots$, the monopsonist set the tax $\hat{\tau} \in (0,1)$ as given in Eq. (9), all subcontractors choose the capital-labor ratio $\hat{k}(\hat{\tau})$ as given by Eq. (3) and the equilibrium wage rate is $\hat{w}(\tau)$ as given by Eq. (5). We have: $\hat{k}(\hat{\tau}) < k^*$, where k^* is the first-best capital-labor ratio, and $\hat{w}(\tau) < w^*$, where w* is the first-best wage.

The proposition indicates that the subcontractor's investment is sub-optimal, and thus, the wage of the subcontractor's worker is lowered. The source of this inefficiency is the combination of revenue extraction by the monopsonist with distortionary taxes.

D. Conditions for subcontracting and price squeezing

At date 0, the final-good producer decides whether she/he hires intermediate-good manufacturers or contracts them out. The integrated final-good producer expects her/his profits made by lump-sum taxes $T^I = \sum_i T_i^I(0)$ at date 0 net of a loss, Δ^I, owing to monitoring costs. For notational simplicity, lump-sum taxes at date 0 are the value evaluated at date 1. From another aspect, the outsourcing final-good producer receives her/his lump-sum taxes $T^0 = \sum_i T_i^0(0)$ at date 0 and distortionary taxes $T^e (= \sum_t \beta^t T^e(t) = \sum_t \beta^t \hat{\tau} f(\hat{k}))$ net of a loss, Δ^O, owing to transaction costs. Hence, the final-good producer contracts out to manufacturers if

[12] $0 < \hat{\tau} = \dfrac{f''(\hat{k}(\hat{\tau}))f(\hat{k}(\hat{\tau}))}{f''(\hat{k}(\hat{\tau}))f(\hat{k}(\hat{\tau})) - (f'(\hat{k}(\hat{\tau})))^2} < 1$ since $f'' < 0$ and $f > 0$.

$$T^0 + T^e - \Delta^O > T^I - \Delta^I \tag{10}$$

Notably, $(T^0 + T^e)$ and T^I are total sales of intermediate-good producers net of capital and labor costs that are proportional to their sales. Considering that ex post outputs of intermediate-good producers are greater under vertical integration,[13] we have: $(T^0 + T^e) < T^I$, which indicates the reduction of final-good productions by under-investment owing to price squeezing. Recall that the set-up of my model assumes the situation in which the monopsonist suffers a loss of Δ^O in outsourcing smaller than the loss Δ^I in vertical integration (*i.e.*, $\Delta^O < \Delta^I$). The condition in Eq. (10) can be rewritten as follows.

$$\Delta^I - \Delta^O > T^i - (T^0 + T^e). \tag{11}$$

Hence, for a given relative loss from monitoring and transaction costs, the monopsonist will contract out and engage in price squeezing if under-investment owing to price squeezing is less severe. Equation (11) implies that the monopsonist may choose vertical over-integration because of the holdup problem of price squeezing in the area, as in Eq. (12):

$$T^I - (T^0 + T^e) > \Delta^I - \Delta^O > 0. \tag{12}$$

Notably, the final good producer will choose to contract out to intermediate-good producers if $\Delta^O < \Delta^I$. However, as indicated in Eq. (12), owing to the reduction of final goods by price squeezing under monopsony, the monopsonist may prefer vertical integration to outsourcing even if $\Delta^O < \Delta^I$.

III. Conclusion

Monopsony has been a hot issue recently. A traditional view is that monopsony is harmless to consumers unless it results in higher prices downstream. In this study, I exclude the possibility of the loss

[13] That is, $y^* > y^e$ where $y^*(= \sum_t \beta^t f(k^*))$ is the present value of the optimal output levels at date 1 and $y^e(= \sum_t \beta^t f(\tilde{k}))$ is the present value of the equilibrium output levels with no integration at date 1. Notably, under-investment leads to less equilibrium output and poorer profit made by taxations on subcontractors.

of consumer welfare caused by the higher price of final goods resulting from upstream monopsony, providing a theoretical model in which monopsony reduces subcontractors' incentive for relationship-specific (or R&D) investments, leading to sub-optimal investments and lowered wages. In my model, the monopsonist cannot commit not to engage in price squeezing upon the entry of subcontractors, and this lack of commitment (holdup problem) is the source of inefficiency.

Korea has experienced a growing gap in profitability and wage between final-good firms (typically large chaebol firms) and intermediate-good firms (typically small and medium-sized enterprises (SMEs)). As shown by the Korean Metal Workers Union, in 2014, Hyundai Motor, the monopsonist, enjoyed an 8.5% operating profit margin. By contrast, operating profit margins were 5.8% at large primary subcontractors, 3.8% at primary medium-sized subcontractors, and 2.8% at small subcontractors in the secondary tier. This gap in profitability is directly reflected in the wage gap between SMEs and large firms, which has become a key element of widening income inequality in Korea[14]. The results of the study may provide explanations for these gaps in profitability and wage between large chaebol firms and SMEs in Korea.

My theoretical model may also be able to explain the continuing vertical integration in the manufacturing sector of Korea despite the global trend of vertical disintegration, the building of global supply networks, and new systems of cooperation between intermediate goods SMEs and end goods producers. Owing to price squeezing and holdup problems, the monopsonist has more incentive to choose vertical over-integration.

My model abstracts from the monopsonist's R&D investments and the interactions between her/his investments and price-squeezing behavior. A related observation is as follows. Hyundai Motor's ratio of consolidated sales to R&D spending is just 2.4%, whereas that of Volkswagen stands at over 5% in 2014. As long as price squeezing provides an easy way for a monopsony firm to guarantee its own price competitiveness, it may have less incentive to push for innovation as well. A more elaborate model is needed to fully address this intuition in

[14] National Research Council for Economics, Humanities and Social Sciences, 2017.

the future.

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References

Acemoglu, D. *Introduction to Modern Economic Growth*. Princeton and Oxford: Princeton University Press, 2009.

Antrás, P. "Firms, Contracts, and Trade Structure." *Quarterly Journal of Economics* 118(No. 4 2003): 1375-1418.

Antrás, P. "Property Rights and the International Organization of Production." *American Economic Review*(No. 2 2005): 25-32.

Grossman, Sanford J. and Oliver D. Hart. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration." *Journal of Political Economy* 94(No. 4 1986): 691-719.

Jung, J. and Park S. "Regulations of Unfair Pricing and Corrective Measures in Sub-contracting." *HUFS Global Law Review* 43(No. 1. 2019): 165-184. (in Korean)

Kim, I. K. and Nora V. "Buyer Power and Information Sharing." *Seoul Journal of Economics* 35(No. 3 2022): 261-290.

Korea Fair Trade Committee. *Survey on Sub-contracting Transactions in 2019*, 2019. (in Korean)

Korea Institute for Industrial Economics and Trade. *A Study of Export Promotions of Subcontractors of Large Firms*. 2016. (in Korean)

National Research Council for Economics, Humanities and Social Sciences. *Income Distribution and Economic Growth*, 2017. (in Korean)

_____. *Fair Trade and Innovation for Small and Medium-sized Enterprises*. 2020. (in Korean)

Rajan, Raghuram G. and Zingales, L. *Saving Capitalism from the Capitalists: Unleashing the Power of Financial Markets to Create Wealth and Spread Opportunity*. Princeton: Princeton University Press, 2005.

OECD. *Monopsony and Buyer Power*, OECD Policy Roundtables, 2008.

Schneider, Ben R. *Hierarchical Capitalism in Latin America: Business, Labor, and the Challenges of Equitable Development*. New York: Cambridge University Press, 2013.