THREE SIMPLE MODELS OF OLIGOPSONISTIC LABOR MARKETS

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This paper newly introduces three simple geometrical models of oligopsonistic labor markets. The first model, which is called the kinked labor supply curve model, is concerned with the situation in which oligopsonists act independently without any collusive agreement. This model suggests that some oligopsonistic labor markets are likely to exhibit a high degree of wage and employment stability. The second model, which is called the joint profit maximization model, is concerned with the situation in which all oligopsonists organize a body of complete collusion, or a cartel. This model shows that the oligopsonists in the cartel will lower the wage rate by collusively reducing their employment and, by doing so, maximize the total of their profits. The third model is concerned with the situation somewhere between the two above and is called the wage leadership model. This model implies that the wage-leading dominant firm will lower the wage rate by substantially reducing its own employment by itself in order to maximize its profit. We believe that the three models in this paper help us understand the basic workings of oligopsonistic labor markets and, therefore, we strongly suggest that the models be put in ordinary textbooks of economics.

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            Leadership, Wage Exploitation
JEL classification: J40

1.   INTRODUCTION

Firms are suppliers in a product market. Structures of product markets are usually classified into three types, depending mainly upon the number of suppliers, or firms; competition (pure or monopolistic), monopoly and oligopoly. For each type of these market structures, we can easily find one or a few simple geometrical models in most textbooks of microeconomics.

In a labor market, however, firms are demanders rather than suppliers. Nevertheless, structures of labor markets are also analogously classified into three types, depending mainly upon the number of demanders, or firms; competition, monopsony and oligopsony. In most textbooks of microeconomics, we can also easily find a simple

geometrical model for each of the competitive and the monopsonistic labor markets. However, as for the oligopsonistic labor market, we can hardly find such a model not only in textbooks of microeconomics but also in those of labor economics.[1] In order to just provide an assortment to labor market models, therefore, we need to introduce some simple geometrical models for the oligopsonistic labor market.

More importantly, there are many labor markets of an oligopsonistic type in the real world. An oligopsonistic labor market is characterized typically by fewness of demanders. Accordingly, the labor market for professional baseball players in Korea is oligopsonistic, since there are only eight teams, or demanders, in the market. So is the labor market for professional soccer players. The labor markets for TV talents and singers respectively are also oligopsonistic in Korea, since there are only a few major TV companies, or demanders. If leading conglomerates, or *chaebuls*, in Korea organize a body of intimate cooperation in a certain domestic labor market, they will surely be able to exert dominant power in the market, thus bringing forth another type of oligopsonistic structure. As we can hardly find simple geometrical models for these oligopsonistic labor markets in ordinary textbooks, however, so can we hardly understand the basic workings of these markets.

The purpose of this paper is to introduce simple geometrical models for oligopsonistic labor markets. Because there are only a few firms in an oligopsonistic labor market, each firm, or oligopsonist, must consider not only "What should I do?" but also "How will the others react to what I do?" In other words, oligopsonists are highly interdependent among themselves. Because of such high interdependence, oligopsonists usually have strong incentives to get together and cooperate with each other in order to avoid costly competition among themselves. Depending upon the degree of cooperation, we can develop various kinds of oligopsonistic labor market models. In fact, we can build as many models as those we can find for oligopolistic product markets.

In this paper, however, we are going to build only three such models, all of which are exactly the counterparts of those for oligopolistic product markets. Specifically, the first model, which will be called the *kinked labor supply curve* model, is concerned with the situation in which there is no cooperative agreement at all and each oligopsonist acts independently. The second model, which will be called the *joint profit maximization* model, is concerned with the situation in which all oligopsonists in the labor market organize a body of complete cooperation, or a cartel. The third, and the last, model is concerned with the situation somewhere between the two above and will be called the

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[1] We cannot even find the word 'oligopsony' in Reynolds *et al.* (1991) nor in Ehrenberg and Smith(1997), both of which are well-known textbooks of labor economics. Ferguson(1969, p.40) and Pindyck and Rubinfeld(1998, p.358) introduce only the definition of oligopsony. Rarely, Henderson and Quandt(1971, pp.242-243) give some explanations about oligopsony: They mention that "most theories of duopoly and oligopoly···can be modified to cover duopsony and oligopsony" and introduce, though mathematically rather than geometrically, a modified version of the Cournot model.

wage leadership model. In order to set up the yardstick by which to evaluate the workings of these models, we are going to examine the workings of a competitive labor market in the first place.

2.   COMPETITIVE LABOR MARKET

There are so many firms, or demanders, in a competitive labor market that no single firm can influence the wage rate. In other words, the wage rate is determined in the market and each of the individual firms can do nothing but take the market-determined wage rate as it is. The situation is illustrated in Figure 1.
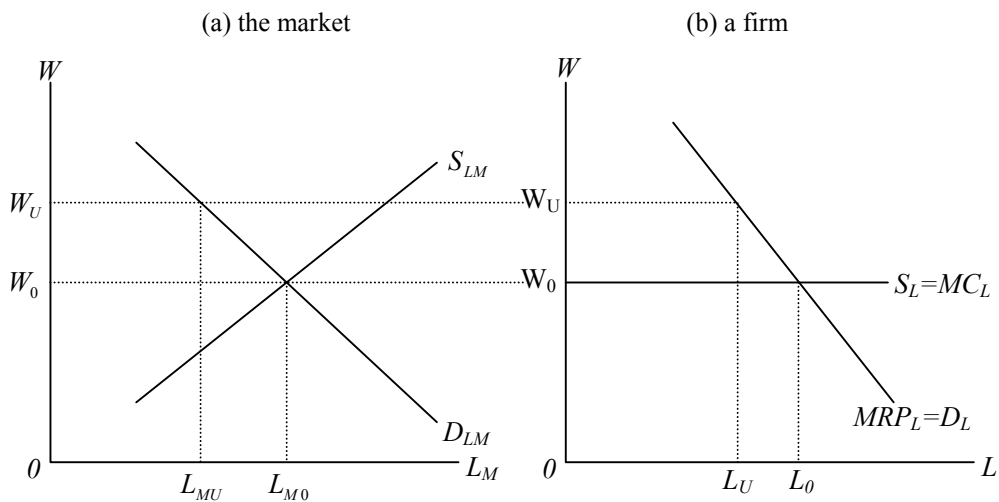
Figure 1.   Competitive Labor Market

The market is depicted in panel (a). The equilibrium wage rate and level of employment are determined respectively at W_0 and L_{M0} by the intersection of the market supply (S_{LM}) curve and the market demand (D_{LM}) curve. With the wage rate given at W_0, an individual firm just takes the wage rate as it is. But the firm can hire as many workers as it needs at this wage rate, which is shown by the horizontal labor supply (S_L) curve in panel (b). Since the S_L curve is horizontal, it also becomes the firm's marginal cost of labor (MC_L) curve. The firm's profit-maximizing employment is then determined at L_0 by the intersection of its marginal revenue product of labor (MRP_L) curve and the MC_L curve. Note, above all, that W_0 is equal to MRP_L at

the equilibrium level of employment L_0.

For a moment, we are going to make a little digression and introduce the definition of wage exploitation in order to help better understand our later discussions. According to Joan Robinson's definition,[2] a worker is exploited if he or she is employed at a wage rate which is less than the value of marginal product of labor (VMP_L). VMP_L is defined as the marginal product of labor (MP_L) multiplied by the price of the product (P), whereas MRP_L is equal to MP_L multiplied by the marginal revenue of the product (MR). If the product market is competitive, P is equal to MR and, hence, VMP_L is equal to MRP_L. On the other hand, if the product market is non-competitive, P is higher than MR and, hence, VMP_L is higher than MRP_L.

We have noted above that W_0 is equal to MRP_L in the competitive labor market. If the product market is also competitive, then W_0 must also be equal to VMP_L. There occurs no wage exploitation at all. This result brings forth the following proposition:

> If there occurs wage exploitation $(W < VMP_L)$ even though the product market is competitive $(VMP_L = MRP_L)$, then the exploitation stems from the labor market in which $W < MRP_L$. That is, $W < MRP_L = VMP_L$.

By the same token, the following proposition also holds:

> If there occurs wage exploitation $(W < VMP_L)$ even though the labor market is competitive $(W = MRP_L)$, then the exploitation stems from the product market in which $VMP_L > MRP_L$. That is, $W = MRP_L < VMP_L$.

Returning from the digression, suppose now that there is a market-level labor union and that the union demands a wage increase to the level of W_U so strongly that the firms cannot reject the demand. Employment will fall to L_{MU} in the market and to L_U at the firm. The union can increase the wage rate, but it can do so only by decreasing the level of employment.

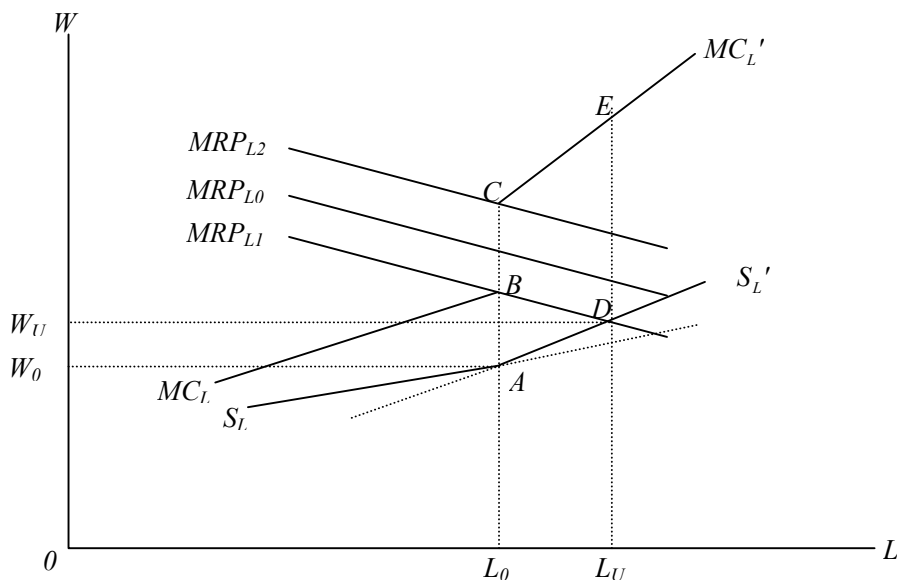## 3.   KINKED LABOR SUPPLY CURVE MODEL

Suppose there is an oligopsonistic labor market which consists of a few firms of more or less equal size. Suppose further that there is no cooperative agreement and each

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[2] Robinson(1934), chapter 26.

oligopsonist acts independently. When contemplating a change in the wage rate either up or down, therefore, it must consider how its rivals will react. The situation is shown in Figure 2, in which the oligopsonist is presently at A: The wage rate is W_0 and the level of employment is L_0. There are two labor supply curves passing through A; the relatively more elastic S_L curve and the less elastic S_L' curve. The MC_L and the MC_L' curves represent the marginal cost of labor curves corresponding respectively to the S_L and the S_L' curves.

Suppose specifically that each oligopsonist visualizes the labor supply curve to its firm by reasoning in the following way:

> If I raise my wage rate above W_0, my rivals will also raise their wage rates in order not to lose their workers. Therefore, the labor supply to my firm will rise relatively less following the less elastic S_L' curve. On the other hand, if I cut my wage rate below W_0, my rivals probably won't cut their wage rates and I'll lose my workers to them. Therefore, the labor supply to my firm will fall relatively more along the more elastic S_L curve.

Figure 2. Kinked Labor Supply Curve Model

That is to say, the labor supply curve the oligopsonist visualizes is $S_L - A - S_L'$, which has the kink at A. Corresponding to this kinked labor supply curve is the marginal cost of labor curve $MC_L - B - C - MC_L'$. Note this curve has the discontinuous part between B and C.

If the oligopsonist's marginal revenue product of labor (MRP_L) curve is presently located at MRP_{L0}, then its profit-maximizing employment is determined at L_0 by the intersection of the discontinuous $MC_L - B - C - MC_L'$ curve and the MRP_{L0} curve. At this level of employment, the oligopsonist's wage rate is determined by the kinked labor supply curve at W_0. That is, A is the equilibrium point.

Suppose now that, for some reason or other, the MRP_L curve fluctuates between B and C as illustrated by the MRP_{L1} and the MRP_{L2} curves. The $MC_L - B - C - MC_L'$ curve intersects both the MRP_{L1} and the MRP_{L2} curves again at L_0. The oligopsonist's profit-maximizing employment and wage rate are determined again at L_0 and W_0 respectively. The equilibrium point does not change at all. The kinked labor supply curve model thus implies that some oligopsonistic labor markets are likely to exhibit a high degree of wage and employment stability.

Notice that, at the equilibrium level of employment L_0, the wage rate W_0 is lower than MRP_L. If the MRP_{L2} curve is presently the effective one, for example, the difference is as large as the distance between A and C. There occurs wage exploitation in this oligopsonistic labor market even if there is no cooperative agreement and each oligopsonist acts independently.

Finally, suppose that there is a strong labor union and that the union demands a wage increase to the level of W_U. Then, the effective labor supply curve is now $W_U - D - S_L'$ and its corresponding marginal cost of labor curve is $W_U - D - E - MC_L'$. If the MRP_{L0} curve is presently the effective one, for example, the profit-maximizing employment is determined at L_U by the intersection of the $W_U - D - E - MC_L'$ curve and the MRP_{L0} curve. Note that both W_U and L_U are higher than W_0 and L_0 respectively. In this type of oligopsonistic labor market, the labor union can increase not only the wage rate but also the level of employment if the union demands an appropriate amount of wage increase. Notice also that, even though the MRP_L curve fluctuates between D and E, the level of employment is still determined at L_U. The kinked labor supply curve model still implies that, even if there is a labor union, some oligopsonistic labor markets are likely to exhibit a high degree of employment stability.

4.   JOINT PROFIT MAXIMIZATION MODEL

Suppose again that there are a few firms of more or less equal size in an oligopsonistic labor market. But, contrary to the situation above, suppose these oligopsonists have agreed with each other that they organize a body of complete cooperation, or a cartel, so that they may maximize the total of their profits. If so, the situation is much the same as the one in which there is a monopsonist who has a few plants hiring the same kind of workers. Figure 3 shows the situation.

Each oligopsonist has its own marginal revenue product of labor (MRP_L) curve (not shown). To sum up all of the oligopsonists' MRP_L curves horizontally gives the ΣMRP_L curve. The S_L curve represents the total labor supply to the market and the MC_L curve represents the marginal cost of labor curve corresponding to the S_L curve. The total- profit-maximizing employment is determined at L_0 by the intersection of the MC_L curve and the ΣMRP_L curve. With this level of employment L_0, the wage rate is then determined by the S_L curve at W_0. That is, the equilibrium point is A.
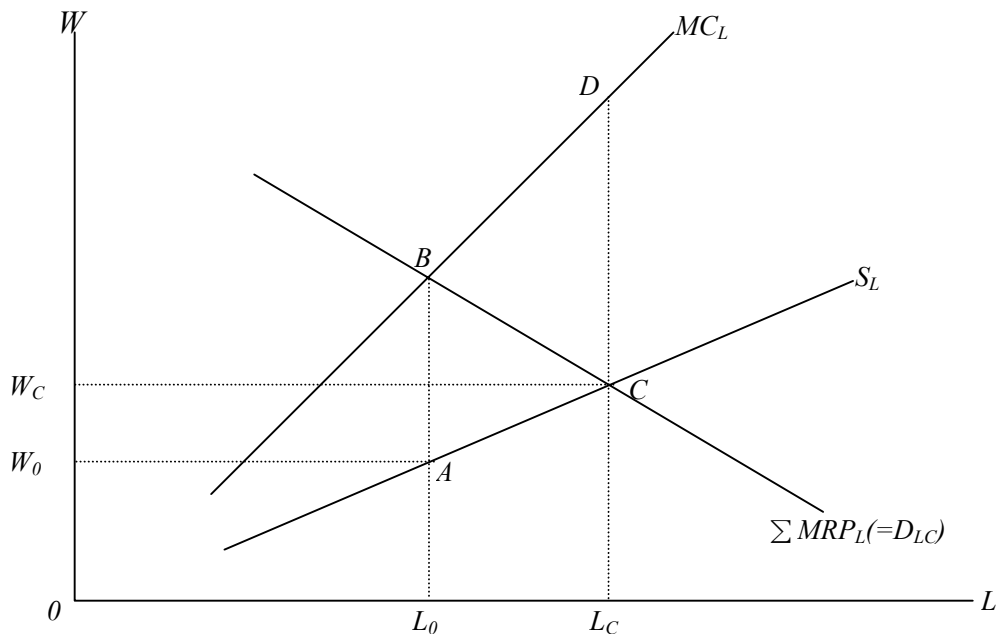

Figure 3.   Joint Profit Maximization Model

Notice again that, at the equilibrium level of employment L_0, the wage rate W_0 is lower than ΣMRP_L by the amount AB. There occurs this amount of wage exploitation in this oligopsonistic labor market.

If the labor market were competitive rather than oligopsonistic, each oligopsonist's MRP_L curve (not shown) would be its labor demand curve and, therefore, the ΣMRP_L curve, which is derived by horizontally summing up all of the oligopsonists' MRP_L curves, would be the total labor demand curve (D_{LC}) in the market. Therefore, the equilibrium point would be C at which the D_{LC} curve intersects the S_L curve. The level of employment and the wage rate would be determined at L_C and W_C respectively. Note that both the level of employment and the wage rate at the oligopsonistic equilibrium (W_0 and L_0) are lower than those at the competitive equilibrium (W_C and L_C). That is, the oligopsonists in the cartel lower the wage rate by collusively reducing their employment and, by so doing, maximize the total of their profits.

Suppose now that there is a strong market-level labor union and that the union demands a wage increase to the level of W_C. Then, the effective labor supply curve is $W_C - C - S_L$ and its corresponding marginal cost of labor curve is $W_C - C - D - MC_L$. The profit-maximizing employment is determined at L_C by the intersection of the $W_C - C - D - MC_L$ curve and the ΣMRP_L curve. The equilibrium point is C, which is also the competitive equilibrium point as noted above. In short, the union can push the cartelized oligopsonists to the point of competitive equilibrium if it demands an appropriate amount of wage increase.

5.   WAGE LEADERSHIP MODEL

Suppose this time that there are one dominant firm (or a cartel of a few leading firms) and many small firms in an oligopsonistic labor market. Suppose further these firms have agreed with each other, explicitly or implicitly, that the dominant firm first determines the wage rate and then the small firms just take the wage rate so determined. In other words, the dominant firm is the wage leader and the small firms are just wage takers, or followers. Under this agreement, the small firms are much the same as those in a competitive labor market in the sense that the labor supply curve to each of these firms is horizontal at the wage rate determined by the dominant firm and, hence, that the MRP_L curve of each of the small firms represents its labor demand curve. The situation is illustrated in Figure 4.
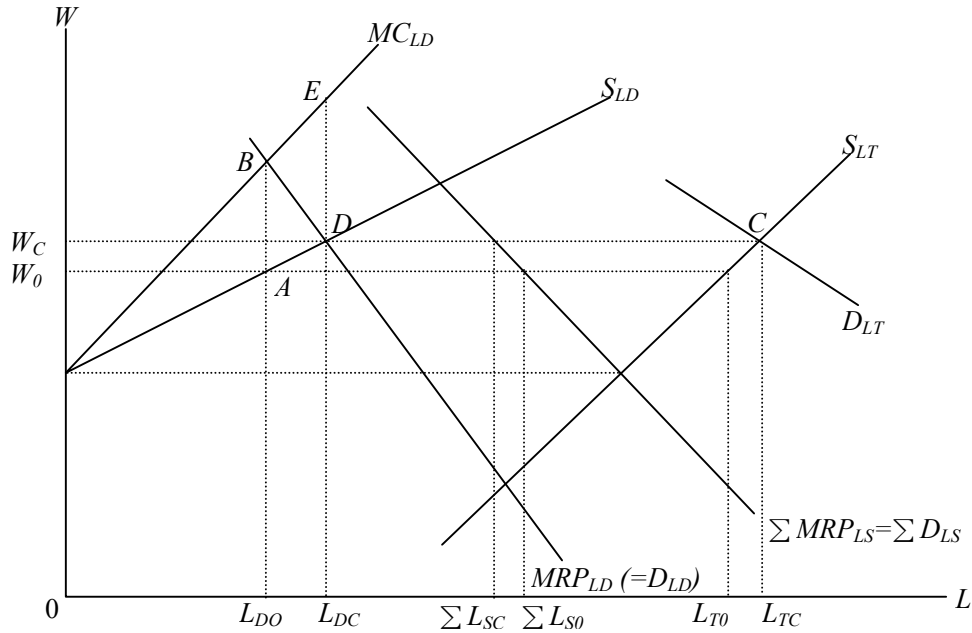
Figure 4.   Wage Leadership Model

ΣMRP_{LS} is derived by summing up horizontally all of the small firms' MRP_L curves (not shown) and, therefore, represents the total labor demand curve of the small firms.[3] The S_{LT} curve represents the total labor supply to the market.

The S_{LD} curve, which is derived by horizontally subtracting the ΣMRP_{LS} curve from the S_{LT} curve, represents the labor supply to the wage-leading dominant firm. Then, the MC_{LD} curve represents the marginal cost of labor corresponding to the S_{LD} curve. The MRP_{LD} curve represents the dominant firm's marginal revenue product of labor. Under the setting like this, the dominant firm's profit-maximizing employment is determined at L_{D0} by the intersection of the MC_{LD} curve and the MRP_{LD} curve. At this level of employment, the wage rate is determined by the S_{LD} curve at W_0. With the wage rate so determined, the total employment of small firms, which are much

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[3] A change in wages, by changing employment and output, will also change the price of the product, which will then shift each firm's MRP_L curve. When deriving the total labor demand curve of the small firms, we must take this price effect into account. In this paper, however, we ignore such an effect for simplification.

the same as those in a competitive market, is determined by the ΣMRP_{LS} curve at ΣL_{S0}. Therefore, the total employment of both the dominant and the small firms is determined at L_{T0}, which is equal to L_{D0} plus ΣL_{S0}. In short, the equilibrium wage rate and level of employment are W_0 and L_{T0} respectively in this oligopsonistic labor market.

Note that, at the level of the dominant firm's employment L_{D0}, the wage rate W_0 is lower than MRP_{LD} by the amount AB. There occurs this amount of wage exploitation. Note also that, at the level of small firms' total employment ΣL_{S0}, the wage rate W_0 is equal to ΣMRP_{LS}. There occurs no wage exploitation. That is, in this particular type of labor market, there occurs some wage exploitation at the wage-leading dominant firm and no exploitation at the small firms.

If the labor market were competitive, the MRP_{LD} curve would also be the dominant firm's labor demand curve (D_{LD}). Therefore, the D_{LT} curve, which is derived by summing up horizontally the D_{LD} curve and ΣD_{LS} curve, would represent the total labor demand in the market. Therefore, the equilibrium point would be determined at C by the intersection of the D_{LT} curve and the S_{LT} curve. The wage rate and the level of total employment in the market would be W_C and L_{TC} respectively. As for individual firms, the level of the dominant firm's employment would be L_{DC} and that of small firms' employment would be ΣL_{SC}. As expected, both the wage rate and the level of total employment at the oligopsonistic equilibrium (W_0 and L_{T0}) are lower than those at the competitive equilibrium (W_C and L_{TC}). As for individual firms, also as expected, the level of the dominant firm's employment at the oligopsonistic equilibrium (L_{D0}) is lower than that at the competitive equilibrium (L_{DC}). Note, however, that the level of small firms' employment is higher at the oligopsonistic equilibrium (ΣL_{S0}) than at the competitive equilibrium (ΣL_{SC}). In sum, the wage-leading dominant firm lowers the wage rate by substantially reducing its own employment by itself in order to maximize its profit.

Suppose now that there is a strong labor union at the dominant firm (or in the market) and that the union demands a wage increase to the level of W_C. Then, the effective labor supply curve to the dominant firm is $W_C - D - S_{LD}$ and the marginal cost of labor curve corresponding to this supply curve is $WC - D - E - MC_{LD}$. The firm's profit-maximizing employment is now determined at L_{DC} by the intersection of the $W_C - D - E - MC_{LD}$ curve and the MRP_{LD} curve. As for the small firms, with the wage rate at W_C, their total employment is determined by the ΣMRP_{LS} curve at ΣL_{SC}. Therefore, the total employment of both the dominant and the small firms is determined at L_{TC}, which is equal to the sum of L_{DC} and ΣL_{SC}. The equilibrium point is C,

which is also the competitive equilibrium point as noted above. Once again, the union can push not only the wage-leading dominant firm but the whole labor market to the point of competitive equilibrium if it demands an appropriate amount of wage increase.

6.   SOME REAL WORLD CASES

We believe the three simple geometrical models of this paper help us understand the basic workings of some oligopsonistic labor markets. In order to make the models theoretically complete, however, we need to do some empirical studies for each of them. This must obviously be a very difficult job and, therefore, we are going to refrain from doing such a job in this paper. But we can think over many real-world cases to which the models can possibly apply. We are going to conclude this paper by presenting two of such cases in Korea.

Labor Market for Baseball Players

The first case is the labor market for professional baseball players. There are only eight teams, or demanders, in the market and these teams have an organization of strong cooperation, namely the Korea Baseball Organization (KBO). Above all, the KBO rules severely restrict mobility of players between teams. Specifically, there are two typical systems by which the KBO and its member teams restrict the mobility. One is the system of reservation and the other is the system of nomination.

Under the reservation system, each team reserves the right to keep on holding its existing players up to the maximum number of sixty. That is, every year, each team submits to the KBO president the list of its players whom it wants to keep on holding and the president collects and publicly announces all of the lists submitted by its member teams. A player, once so reserved by a team, cannot virtually make a contract with any other team. Similarly, under the nomination system, each team is authorized to preferentially nominate certain rookie players according to a predetermined procedure. A rookie player, once so nominated by a team, cannot make a contract with any other team without the consent of the nominating team. In addition, each team can not only transfer a player to other teams but also waive its contract with a player.

There is virtually no counterbalancing system on the part of players, or suppliers, however. The situation is therefore very close to the setting of the joint profit maximization model without a labor union. The labor market for professional baseball players in Korea is thus very likely to be characterized by point A in Figure 3.

From the early 2000 on, there has been a movement among active baseball players to organize a labor union. The KBO and its member teams responded immediately with strong opposition. In the spring of 2001, however, the players succeeded in formally organizing a body, namely the Conference of Baseball Players. This Conference, even though it is not a labor union officially, has been playing a union-like role to improve

employment conditions of the players. Activities of the Conference may therefore be considered as efforts to move, in Figure 3, from point A to point C.

Attempt of Conglomerates to Form a Wage Cartel

In the later half of the 1970s, there was severe competition among conglomerates, or *chaebuls*, in Korea to attract new college graduates. As a result, while the general wage level rose rapidly, the wage level of college graduates rose even more rapidly. During the three-year period from 1976 to 1979, the general wage level doubled and, in 1978 for instance, the average wage rate of college graduates was 2.3 times as high as that of high school graduates. In the spring of 1980, therefore, executive officers of the leading general trading corporations, which respectively were representative companies of the *chaebuls* they belonged to, had a meeting and made an agreement that the wage increase of new college graduates should be restricted within 10%.

Severe criticism immediately followed from mass communication and the public opinion, saying that the *chaebuls*, which had already been exercising dominant powers in major product markets, were then trying to command labor markets as well by forming a wage cartel. In a few days, the executive officers of the general trading corporations had a meeting again and officially announced that they would withdraw the previous agreement to restrict the wage increase of new college graduates. The event calmed down officially as a result.

Although the *chaebuls* officially withdrew the agreement to form an explicit wage cartel in 1980, there always exists the possibility that they make some kind of tacit agreement in the labor market. If they do, they are very likely to exercise dominant powers in some labor markets. In fact, the 1980 event indicates that the *chaebuls* themselves have manifested the truth of this likelihood.

The situation is then very close to the setting of the wage leadership model: There are one dominant firm (or a cartel of *chaebuls*) and many small firms in the labor market. The wage rate and the level of total employment thus are very likely to be determined respectively at W_0 and L_{T0} in Figure 4.

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