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Measuring Market Power When the Firm Has Power in the Input and Output Markets

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INTRODUCTION

We examine the problem of measuring market power when the firm has monopoly power in the output market and monopsony power in the input market—a case we refer to as 'dual-market' power. We show how the Lerner index, which measures the mark-up over marginal cost,[1] can be modified to reflect the firm's ability to set price above the competitive level.

The derivation of the Lerner index is straightforward—the sort of exercise an economics professor might give a first-year graduate student. However, the implications of the new index are broad. Moreover, the case of dual-market power seems as an empirical matter worthy of attention. Though the one-company mining town has been offered, traditionally, as the classic example of a monopsonized labor market (see Boal, 1995),[2] several empirical studies have suggested that monopsonies may exist in many labor markets (Katz and Krueger, 1992 (fast food); Sullivan, 1989 (nurses); Scully, 1974 (baseball players)). Further, if some workers skills are industry-specific, then the possibility arises that competition among employees within relevant labor markets will be imperfect. If this describes a broad range of industries, then the market power index derived here could provide some guidance to enforcement agencies.

The implications are as follows:

(1) If we define market power as *the power to set price above the competitive level*, then the standard Lerner index—and any assessment which fails to take input market power into account—may understate market power. Market power should be carefully assessed in cases in which competition is imperfect in both output and input markets.

(2) The sources of market power are diverse—all the factors giving rise to power in the output market (e.g. differentiation) have their analogues in the input market. Further, the nature of competition in an imperfectly competitive market influences the measure of market power. Since competition in both the output and input market matters, assessment of market power in imperfectly competitive markets can be quite complex.

(3) An aggregate market power index based on the new measure suggests that a simple comparison of pre- and post-merger Herfindahl–Hirschman Indexes overstates the increase in monopoly power that results from a merger of rival firms. An instantaneous power index based on the new measure suggests that the bias that results from using the standard Lerner index in a market in which price and output are determined intertemporally is smaller than suggested in the Pindyk (1985) analysis.

(4) The analysis suggests that, in the absence of an efficiency justification, extension of monopoly power through leverage is welfare-reducing. In other words, society should not be indifferent to the manner in which a monopolist exploits its monopoly power.

(5) Counterintuitive effects of price regulation, minimum wage laws, and unionization may be observed in the presence of dual-market power.

Putting a ceiling on output prices may lead to an increase in wages and expansion of employment. Putting a floor on wages may cause a reduction in output prices and expansion of output. Unionization of employees in an industry may lead to a reduction in output prices.

MEASURING MARKET POWER: THE 'DUAL-MARKET' CASE

Derivation of Market Power Index

In this section, we derive the Lerner index in the case in which the firm has monopoly power in the output market and monopsony power in the input market. Recall that when the firm has monopoly power in the output market (facing a competitive input market), the Lerner index is given by

$$L_1 = \frac{p - MC}{p} = \frac{1}{e_d} \tag{1}$$

where MC is the firm's marginal cost, p is the product price, and e_d is the elasticity of demand for the product produced by the firm.[3] It is generally understood that because marginal cost at the monopoly output level is smaller than if measured at the competitive output level, the Lerner index overstates the degree to which the monopolist's price exceeds the competitive level.

Assume the firm uses the production function $q = f(l)$, where q is output and l is the single input (labor). The demand curve is $p = p(q)$, and the labor supply curve is given by $w = w(l)$. Profit maximization implies the first-order condition:

$$\left[p + \left(\frac{dp}{dq}\right)q\right]\frac{df}{dl} = w + \left(\frac{dw}{dl}\right)l \tag{2}$$

or equivalently

$$p\left(1 - \frac{1}{e_d}\right)MP_l - w\left(1 + \frac{1}{e_1}\right) \tag{3}$$

where MP_l is the marginal product of labor evaluated at the firm's optimum output and e_d is the elasticity of labor supply. We can rewrite the first-order condition as

$$p\left(1 - \frac{1}{e_d}\right) = MC'\left(1 + \frac{1}{e_l}\right) \tag{4}$$

where $MC' = w/MP_l$. If the firm did not have monopsony power (e_l approaches infinity), Eqn (4) would be the standard marginal-revenue-equals-marginal-cost condition, where MC' would be equal to the firm's marginal cost at the profit maximizing level of output (see e.g. Intriligator, 1971).[4] We will use MC' to approximate the firm's marginal cost at the profit-maximizing output level under the assumption the firm does not have monopsony power. This is an approximation, of course, because if the firm did not have monopsony power its output would be larger than the level suggested by Eqn (4). However, if the marginal cost curve is relatively flat between the monopoly-no-monopsony and monopoly-plus-monopsony output levels, this approximation will be close.[4]

Rearranging Eqn (4), it is easy to show that an alternative measure of market power can be expressed as follows:

$$L_2 = \frac{p - MC'}{p} = \frac{(e_d + e_l)}{e_d(e_l + 1)} \tag{5}$$

We focus on L_2 as the relevant measure of market power. Although the firm's marginal cost is given by the right-hand side of Eqn (4), that would be an inappropriate measure of the potential of a competitive market. For in a competitive market, the firm would have neither monopoly nor monopsony power. Thus, although L_2 is not a measure of percentage mark-up over marginal cost, it is appropriate to consider it a measure of percentage mark-up over the competitive price.

As e_l approaches infinity, L_2 approaches the standard measure $1/e_d$. As e_d approaches infinity, L_2 approaches $1/(e_1 + 1) > 0$; thus, because of the firm's power in the input market, the percentage mark-up over the competitive price remains positive even though e_d is infinite.

As long as e_d and e_l are positive, $1/e_d < (e_d + e_l)/[e_d(e_l + 1)] < 1$ and $1/(e_l + 1) < (e_d + e_l)/[e_d(e_1 + 1)]$. Thus, the percentage mark-up over the competitive price is greater for the firm with dual-market power than for the firm with power in only the output market or the firm with power in only the input market.

Suppose a firm has market power in both the output and input markets. When would an increase in input market power have the greatest impact on the firm's ability to set price above the competitive level? This is equivalent, of course, to asking when consideration of dual-market power is most likely to substantially alter a market power assessment based on the output market alone. Differentiating L_2 with respect to e_l, we have $\partial L_2/\partial e_1 = (1-e_d)/[e_d(e_l+1)^2]$, which is negative, given that the point-elasticity of demand is greater than one at the firm's optimum. Let e_d approach infinity, so that the firm becomes weaker in the output market. Then in the limit $\partial L_2/\partial e_l = -1(e_l+1)^2$, which is greater than $(1-e_d)/[e_d(e_l+1)^2]$ (given, again, that the point elasticity of demand is greater than one at the firm's optimum. This implies that the firm's ability to set price above the competitive level is enhanced most, by a slight increase in input market power, when the firm is weak in the output market. In other words, the 'power gradient' in the input market declines as the firm gains power in the output market. It is easy to show that the power gradient in the output market declines as the firm gains power in the input market. *Thus, consideration of dual-market power is most likely to substantially alter an assessment of market power based solely on the output market when the firm is relatively weak in the output market.*

Determinants of Power

Here, following Landes and Posner (1981) (and Encaoua and Jacquemin, 1980), we examine the determinants of market power in the dual-market power setting, and provide a simple numerical illustration of the importance of dual-market power. Table 1 shows the six variables that are used below to assess a firm's monopoly and monopsony power.

Table 1

e_{dm}	Market elasticity of demand for the product
e_{sl}	Elasticity of supply of competing or fringe firms
M	Dominant seller's market share
e_{sm}	Market elasticity of supply for the input market
e_f	Elasticity of demand of fringe buyers for inputs
S	Dominant buyer's market share
e_{dl}	Elasticity of demand for the product of the dominant seller

Landes and Posner (1981) show that

$$\frac{1}{e_{dl}} = \frac{M}{[e_{dm} + e_{sl}(1-M)]} \tag{6}$$

The relationship is important because it shows that market power is a function of market share, demand-side substitution, and supply-side substitution. Further, as Landes and Posner note, the relationship suggests that the particular market chosen should not greatly affect the assessment of the firm's power. The reason is as follows. Consider the choice between two markets, one narrow, the other broad. In the narrow market, the firm's market share will seem large. However, because the market is narrow, demand-side substitution will be greater, implying a larger elasticity of market demand. Similarly, there will be more opportunities for producers of substitutes to compete in the narrow market, so supply-side substitution will be greater implying a larger elasticity of fringe supply. Thus, if one chooses a narrow market, the large market share measure will be offset by large elasticity measures. Conversely, if one chooses a broad market, the narrow market share measure will be offset to some extent by small elasticity measures.

Blair and Harrison (1992) derive a formula, similar to that of Landes and Posner, that can be applied to the input market:

$$\frac{1}{e_{ll}} = \frac{S}{[e_{sm} - e_f(1-S)]} \tag{7}$$

Below, we present the results of a simple numerical simulation of the L_2 index. The simulation assumes the following: (1) $e_{sl} = 0$, (2) $e_f = 0$, (3) $[e_{dm} + e_{sl}(1-M)] > M$ (or, in this case, $e_{dm} > M$). Note that the third assumption follows from the fact that a monopolist will always produce where the elasticity of demand for his product exceeds one.

In Table 2, we consider three cases; low, medium, and high monopoly power. The L_2 index is calculated under these assumptions. The table shows that the level of monopsony power a firm possesses in each of these cases significantly alters a firm's dual market power measure. For example, in the 'low monopoly power, high buying power' case we see that the firm's mark-up over the competitive price is 68%. This suggests that a researcher could vastly understate a firm's effective market power by focusing solely on the output market.

Table 2. The Effect of Input Power on Overall Market Power

	No buying power	Low buying power $S = 0.1; e_{sm} = 2$	High buying power $S = 0.9; e_{sm} = 0.5$
Low monopoly $M = 0.2; e_{dm} = 2$	0.1	0.14	0.68
Medium monopoly $M = 0.5; e_{dm} = 1.5$	0.33	0.37	0.76
High monopoly $M = 0.9; e_{dm} = 1$	0.9	0.905	0.96

Note that as we move in the direction of greater power in one market, the greatest increases in effective market power are observed in those cases in which the firm starts with little power in its relevant markets. Consider the case in which the firm has low power in both the input and output markets. If we increase the firm's power in the input market slightly, Table 2 indicates that L_2 increases substantially. The move from 'low monopoly, no buying power' to 'low monopoly, low buying power' in Table 2 results in a 40% increase in the firm's mark-up over the competitive price. The increase from 'low monopoly, no buying power' to 'low monopoly, high buying power' is close to 600%. The market power gradient is substantially lower if we start with a firm with high monopoly power and no input market power, and consider the increase in effective power that is registered as we assume the firm gains additional market power in the input market.

Oligopolistic Interdependence

Following Ordover, Sykes, and Willig (1982), it is straightforward to extend the market power measure to the case in which firms anticipate the actions of rivals. Suppose there are two firms, so that price is now determined by $p = p(q_1, q_2)$. Wage is determined by $w = w(l_1, l_2)$. Let total quantity be $q = q_1 + q_2$, and let total labor be $l = l_1 + l_2$. Assume prices are affected by changes in total quantity only, so that $\partial p/\partial q_1 = \partial p \partial q_2 = \partial p/\partial q$, and $\partial w/\partial l_1 - \partial w/\partial l_2 = \partial w/\partial l$. The marginal revenue resulting from an expansion of output by firm 1 is

$$p\left[1 - \left(\frac{1}{e_{d1}}\right)(1 + k_1)\right] \tag{8}$$

where $1/e_{d1} = -(\partial p/\partial q_1)q_1$, and where k_1 is the familiar conjectural variation of the Cournot duopoly model. Alternatively Eqn (6) can be expressed as

$$p\left[1 - \left(\frac{1}{e_d}\right)(1 + k_1)(m_1)\right] \tag{9}$$

where $m_1 = q_1/q$. The marginal factor cost of an additional unit of l is given by

$$w\left[1 + \left(\frac{1}{e_{l1}}\right)(1 + h_1)\right] \tag{10}$$

where h_1 is the conjectural variation in the input market

$$w\left[1 + \left(\frac{1}{e_l}\right)(1 + h_1)s_1\right] \tag{11}$$

where $s_1 = l_1/l$. It follows that the new Lerner index is

$$L_3 = \frac{[e_{l1}(1 + k_1) + e_{d1}(1 + h_1)]}{[e_{d1}(e_{l1} + 1 + h_1)]} \tag{12}$$

Alternatively, the index can be expressed as

$$L_3 = \frac{\left[\frac{e_i}{s_1}(1 + k_1) + \frac{e_d}{m_1}(1 + h_1)\right]}{\left[\frac{e_d}{m_1}\left(\frac{e_i}{s_1} + 1 + h_1\right)\right]} \tag{13}$$

We will focus on expression (10), since it is simpler. Note that if $k_1 = h_1 = 0$ (firm's act independently, or Cournot–Nash competition), this simplifies to L_2. If $h_1 = -1$ (and $-1 < k_1 < 1$) the firm anticipates that its reductions in hiring in the labor market will be offset by expansions by the competing firm (aggressive competition). In this case, L_3 simplifies to $(1 + k_1)/e_{d1}$, which is the Ordover, Sykes, and Willig formula. Thus, if the firm anticipates aggressive competition in the input market, then even

though the number of rivals in the input market is small, its power to raise price above the competitive level will be the same as that of a firm that has monopoly power in the output market and hires labor in a perfectly competitive labor market. Obviously, if $h_1 = k_1 = -1$, the mark-up over the competitive price is zero, which implies the firm has effectively no market power.

If $k_1 = -1$ and $-1 < h_1 < -1$, so that the firm anticipates aggressive competition only in the output market, the index becomes $(1 + h_1)/(e_{l1} + 1 + h_1)$. Thus, even though the firm anticipates aggressive competition in the output market, its mark-up over the competitive price remains positive. In the extreme case in which it anticipates aggressive competition in the output market and perfect parallelism in the input market ($h_1 = 1$), the mark up over the competitive price is $2/(e_{l1} + 2)$, so that as the point-elasticity of labor supply (to firm 1) approaches zero, the firm's mark up over competitive price approaches 100%.

If $h_1 = k_1 = 1$ (pure parallelism), the ratio of L_3 to L_2 is $2(e_{l1} + 1)/(e_{l1} + 2)$, so that as labor supply elasticity measured at the firm's output increases, the extent to which L_2 understates the firm's effective monopoly power approaches 100%.

Table 3, which shows the Lerner index under different assumptions on the competitive interaction, summarizes this discussion. As you move toward the right in any row, or toward the bottom of any column, the power to raise price above the competitive level increases.

Aggregation Issues

Previous analyses have noted that the standard Lerner index fails in some respects to capture the impact of monopoly pricing on consumers, and have suggested methods of aggregating the index across firms (Encaoua and Jacquemin, 1980) or across time periods (Pindyck, 1985). In this section, we consider the implications of the new index for the aggregation results of these studies.

1. Oligopoly Under the assumption of Cournot–Nash competition, Encaoua and Jacquemin show that a weighted sum of the Lerner index for each firm, using market share as weights, can be expressed as

$$L_a = \sum_{i=1}^{N} m_i\left(\frac{1}{e_{di}}\right) = \sum_{i=1}^{N} m_i\left(\frac{m_i}{e_d}\right) \tag{14}$$

or equivalently

$$L_a = \left(\sum_{i=1}^{N} m_i^2\right)\left(\frac{1}{e_d}\right) \tag{15}$$

Note that $\sum m_i^2$ is the Herfindahl-Hirschman Index (HHI) of concentration. Thus L_a, which is an aggregate measure of monopoly power, is the product of the HHI and Lerner indexes. Using the new market power index, L_2, the across-firm aggregation index can be expressed as follows:

$$L_{a2} = \frac{1}{e_d}\sum_{i=1}^{N} m_i^2 \frac{\left(\frac{e_d}{m_i} + \frac{e_l}{s_i}\right)}{\left(\frac{e_l}{s_i} + 1\right)} \tag{16}$$

The relationship between L_{a2} and L_a can be summarized by the following two propositions.

Table 3

Input market \ Output market	$k_1 = -1$	$-1 < k_1 < 1$	$k_1 = 1$
$h_1 = -1$	0	$\frac{1 + k_1}{e_{d1}}$	$\frac{2}{e_{d1}}$
$-1 < h_1 < 1$	$\frac{(1 + h_1)}{(e_{l1} + 1 + h_1)}$	$\frac{e_{l1}(1 + k_1) + e_{d1}(1 + h_1)}{e_{d1}(e_{l1} + 1 + h_1)}$	$\frac{2e_{l1} + e_{d1}(1 + h_1)}{e_{d1}(e_{l1}(e_{l1} + 1 + h_1)}$
$h_1 = 1$	$\frac{2}{(2 + e_{l1})}$	$\frac{e_{l1}(1 + k_1) + 2e_{d1}}{e_{d1}(2 + e_{l1})}$	$\frac{2(e_{l1} + e_{d1})}{e_{d1}(2 + e_{l1})}$

Proposition 1: $L_{a2} > L_a$.

Proof: The difference between the two indices can be expressed as

$$L_a - L_{a2} = \frac{1}{e_d}\sum_{i=1}^{N}\left\{m_i^2\left[1 - \frac{\left(\frac{e_d}{m_i} + \frac{e_l}{s_i}\right)}{\left(\frac{e_l}{s_i} + 1\right)}\right]\right\} \quad (17)$$

Thus, it is sufficient to demonstrate that $e_d/m_i > 1$ for each i. This holds because $e_d/m_i = e_{di} > 1$ in the monopoly pricing equilibrium. □

Proposition 2: As the number of firms declines as a result of mergers, L_{a2} increases more slowly than does L_a.

Proof: To capture the effects of mergers on market shares, let each m_i be a nonincreasing function of N and strictly decreasing in N for at least one m_i. Differentiating L_{a2} and L_a with respect to N, it is straightforward to show that both indices decline as N increases. However, the effect of a change in m_i is smaller in the expression of L_{a2} because it is multiplied by the term $(e_d/m_i + e_l/s_i)/(e_l/s_i + 1)$, which is less than 1 in equilibrium. In addition, the term $(e_d/m_i + e_l/s_i)/(e_l/s_i + 1)$ increases as N increases, further dampening the effect of an increase in N on L_{a2}. □

Consider the special case in which market shares are equal, so that $m_1 = m_2 = \cdots = 1/N$, and $s_1 = s_2 = \cdots = 1/N$, the aggregation index is

$$\left(\frac{1}{N}\right)\left(\frac{e_d + e_l}{\left(e_l + \frac{1}{N}\right)e_d}\right) \quad (18)$$

which, like the index derived by Encaoua and Jacquemin, can be described as the product of the Herfindahl–Hirschman and Lerner indexes.

2. Variation over Time Periods Pindyck (1985) makes the important point that in a multiple period setting, the standard Lerner index is inappropriate as a measure of monopoly power. For example, in the case of a monopolist exploiting an exhaustible resource, the standard Lerner index incorrectly measures monopoly power because it relies on an inappropriate measure of marginal cost. Pindyck proposes a measure based on 'full marginal cost', which includes a measure of marginal 'user cost', which is 'the sum of discounted future costs or benefits that result from current production decisions' (Pindyck, 1985, p. 197). For example, in the case of an exhaustible resource, the user cost is the per-period marginal rental cost of the stock the monopolist exploits.

In the case of an exhaustible resource, Pindyck shows user cost is positive, so that the standard Lerner index, by failing to take user cost into account, overstates monopoly power. However, in the case in which costs fall over time (learning curve effect), user cost is negative, which implies that the standard Lerner index overstates monopoly power.

Following Pindyck, let $\lambda_{c,m}(t)$ be the measure of user cost. The subscripts denote the fact that user cost is measured under the assumption that the firm is a price taker, and evaluated at the monopoly output level. $\lambda_{c,m}(t)$ is positive in the exhaustible resource case, and negative in the learning curve example. Pindyck's instantaneous Lerner index can be expressed as

$$L^*(t) = 1 - \left(\frac{e_d - 1}{e_d}\right)\left(\frac{1 + \lambda_{c,m}(t)}{MC}\right) \quad (19)$$

In this model, the instantaneous Lerner index is

$$L^*(t) = 1 - \left(\frac{e_l(e_d - 1)}{e_d(e_l + 1)}\right)\left(\frac{1 + \lambda_{c,m}(t)}{MC}\right) \quad (20)$$

As Eqn (18) demonstrates, consideration of dual-market power dampens the impact of user costs on the instantaneous measure of market power. The intuition for this should be clear in the case of an exhaustible resource. Inclusion of user cost implies a reduction in the firm's market power measure. Inclusion of dual-market power offsets this reduction to some extent. Hence, the bias that results from using the standard Lerner measure, L_1, rather than the instantaneous measure is not as severe in the dual-market power setting.

IMPLICATIONS

Antitrust Law

The results presented here have implications for antitrust law and the practices of enforcement agencies. We consider those implications here.

1. Sherman Act It has been clear for some time that collusive monopsonies violate section 1 of the Sherman Act.[5] This is true, regardless of the market shares possessed by the defendants.

The interesting question suggested by this analysis is whether section 2 doctrine gives appropriate consideration to the dual market power problem—i.e. of simultaneous monopolization and monopsonization. The case law is scant, but the little that is there suggests that it does not. In *Beef Industry v. Iowa Beef Processors*,[6] sellers of feed cattle brought monopsonization and monopolization claims against beef packers, alleging that the defendants conspired to depress cattle prices. Although the facts indicated that four major packers shared the meat packing market, the court dismissed the monopsonization claim on the ground that a cartel among packers would probably be too unstable for the packers to have monopsony power.[7]

The implication of this analysis is that dual-market power may allow the firm to earn monopoly projects even though it would not be deemed a monopolist on the basis of the traditional examination of market share and other factors (e.g. demand-side substitution). To require proof of monopoly power or monopsony power under traditional criteria, in these cases, would result in instances in which a defendant that had effectively attained monopoly power was immune from suit under section 2 because its market shares were too small in the relevant input and output markets. The analysis here suggests that some relaxation of the traditional criteria for determining monopoly power seems appropriate in this case.

2. Merger Guidelines The most obvious set of implications are for the market power measurement algorithm set forth in the 1992 Department of Justice and Federal Trade Commission Horizontal Merger Guidelines. The Guidelines do note that monopsony power is an important consideration, and that the agency's measurement algorithm should be applied in an analogous manner to measure monopsony power.[8] The Guidelines also note the importance of demand- and supply-side substitution possibilities in assessing a firm's market power. However, the Guidelines do not adequately consider the problem of modifying a market power assessment to take dual-market power into account.

One approach to taking power in both input and output markets into account would be to use the aggregation index proposed by Encaoua and Jacquemin, L_a. Suppose, for example, that one is examining the market power implications of a merger. If one examines both input and output markets using the L_a index, this would essentially involve comparing Herfindahl–Hirschman Indices (HHIs) for both markets. However, the new index, L_{a2}, indicates that a comparison of HHIs would be inappropriate. Because of the enhancement effect of simultaneous power in both markets, a comparison of HHIs would understate market power. A better approach would rely on calculating the pre- and post-merger levels of L_{a2}. Numerical thresholds would have to be developed for this new measure.

Consider an industry in which there are ten firms with equal shares. Suppose each firm merges with one another, producing an industry with five firms, again with equal shares. The Encaoua and Jacquemin index pre-merger is $L_a(10) = 1/10e_d$, where 1/10 is the HHI. Post-merger the Encaoua and Jacquemin index is $L_a = 1/5e_d$, where 1/5 is the HHI. The ratio of the pre- and post-merger measures is 2, which is the same as the ratio of the pre- and post-merger HHIs. However, pre-merger, $L_{a2}(10) = (e_d + e_l)/(10e_d + 1)e_d$ and post-merger $L_{a2}(5) = (e_d + e_l)/(5e_d + 1)e_d$. The ratio of pre- and post-merger power indices ranges between 1 and 2 in this case, reaching 2 only in the limiting case in which labor supply is infinitely elastic. This suggests that comparison of pre- and post-merger HHIs overstates the increase in monopoly power resulting from a merger when firms have simultaneous power in both input and output markets.

3. Standing Employees are generally denied standing except in the cases where the employee's job is a 'commercial enterprise'[9] or when the employee's firm and its rivals are colluding with respect to wages.[10] The analysis of this paper suggests that input market power should be taken into account in an analysis of standing.

The reason is as follows. Suppose a firm that already has monopsony power gains monopoly power in its output market. Then the acquisition of monopoly power will result in a downward shift in the monopolist's labor demand curve (compared to the demand curve under competition), which implies a reduction in employment and the equilibrium wage. Compare this to the case in which the firm faces a competitive labor market. In this case, acquisition of monopoly power in the output market will result, again, in a downward shift in the demand for labor, which will reduce total employment in the industry. However, the downward demand shift will not affect

the equilibrium wage, given the assumption that the employer is a price-taker in the labor market. This comparison suggests that the employees of a monopsonist, or a firm with monopsony power, have a substantially higher likelihood of suffering an injury (specifically, decline in wages) as the result of the firm's acquisition of monopoly power.[11] The argument applies generally to all input providers who claim to have been injured as the result of a purchaser's acquisition of monopoly or monopsony power.

4. Boycott Doctrine In *Northwest Wholesale Stationers v. Pacific Stationery & Printing Co.*, 472 US 283 (1985), the Supreme Court held that *per se* analysis applies to a boycotting consortium only when the consortium has market power or exclusive access to an essential facility. The market power threshold works as a filter that excludes *per se* claims when the likelihood of public harm, resulting from an increase in market price and reduction in total quantity, is small. However, consideration of dual-market power suggests that there may be instances in which the consortium has a relatively small share of the relevant output market, but the consortium as a whole has monopsony power in the input market. In this instance, public harm may indeed result from the consortium's exclusion of a rival. The harm may result if exclusion of the rival facilitates collusion in the input market.

5. Leveraging Monopoly Power The new Lerner index, L_2, has implications for the 'leverage' debate in the antitrust literature (Kaplow, 1985). A firm leverages its monopoly power when it uses its monopoly power in one market to gain a competitive advantage in a separate market. The Supreme Court held in *United States v. Griffith*, 334 US 100 (1948), that leveraging is a form of abuse of monopoly power that could result in a finding of a violation of the Sherman Act. Some antitrust commentators, however, have argued that society should be indifferent as to the various contractual arrangements a monopolist may choose in order to increase its power (Bowman, 1957).

The new Lerner index suggests that a firm with market power may have an incentive to leverage its market power in order to increase its ability to set price above the competitive level. This would be profitable to the firm if it could structure an arrangement in which it forgoes full exploitation of its monopoly power in one market in order to gain monopoly power in a separate market. Consider the case in which the firm forgoes full exploitation in the input market in exchange for additional market power in the output market. Since this is equivalent to accepting an increase in the elasticity of supply in the input market in exchange for a reduction in the elasticity of demand in the output market, one could use L_2 to see when such an exchange would be profitable to the firm. It is straightforward to show that the firm would exchange a small increase in the elasticity of supply of labor for a small reduction in the elasticity of demand for its output when:[12]

$$-e_d(1-e_d) < (1+e_l)e_l \tag{21}$$

The question whether society should be indifferent to this type of exchange is also answered by this analysis. If leveraging market power really does permit the firm to increase the mark-up over the competitive price, then it necessarily follows that society's welfare is reduced.

Price Regulation

The foregoing analysis has implications for the effects of price regulation. First, consider minimum wage laws. Suppose the firm has monopsony power in the labor market and monopsony power in the labor market. It is well known that in the case of monopsony, a minimum wage, set at the appropriate level, could enhance efficiency. Taking output market power into account suggests an additional way in which a minimum wage statute could enhance efficiency; by reducing the marginal factor cost of labor (at the firm's optimum output level), the statute would lead to a reduction in the monopolist's price, enhancing the welfare of the monopolist's consumers.

Second, consider direct regulation of the monopolist/monopsonist's output price. If the regulated output price exceeds $p(1-1/e_d)$ (evaluated at the firm's optimum), the marginal revenue of the monopolist *increases*, leading the firm to expand hiring in its monopsonized labor market.

Of course, it would be difficult for a government to find the right wage floor or price ceiling to bring about the results just described. If the costs of error and of encouraging rent-seeking legislation were brought into this analysis, these suggestions of the possible benefits of price regulation would have to be weighed against substantial costs.

CONCLUSION

We have provided a measure of market power when the firm has monopoly power in the output market and monopsony power in the input market. The derivation of the measure is quite simple. The main contribution of the new measure is its implication that the measure of market power is enhanced substantially by considering power in both input and output markets. The enhancement effect is greatest when the firm's market power is relatively low in either the input market alone or the output market alone.

NOTES

1. See Lerner (1934) for the original presentation.
2. We should note that Boal (1995) examines the one-company mining town case and rejects the monopsony power hypothesis.
3. Since the firm is a monopolist, it makes no difference whether we refer to this as the elasticity of demand for the firm's product or the market elasticity of demand. It is well known that the index actually overstates the extent to which price exceeds the competitive level, because the firm's marginal cost, evaluated at the monopoly output level, will be below marginal cost evaluated at the competitive output level (see e.g. Landes and Posner, 1981, p. 941).
4. And even if the marginal cost curve is not relatively flat in this range, the use of MC' would only slightly exaggerate the overstatement of monopoly power already associated with the Lerner index.
5. *Mandeville Island Farms v. American Crystal Sugar Co.*, 334 US 219 (1948).
6. *In re Beef Industry Litigation*, 907 F.2d 510, 516 (5th Cir. 1990).
7. *Beef Processors*, at 515.
8. Horizontal Merger Guidelines, Issued by the US Department of Justice and the Federal Trade Commission, 2 April 1992, Section 0.1.
9. See e.g. *Reibert v. Atlantic Richfield Co.*, 471 F.2d 727, 728 (10th Cir. 1973).
10. *Radovich v. NFL*, 352 US 445, 446 (1957); *Wilson v. Ringsby Truck Lines*, 320 F. Supp. 699 (D. Colo. 1970).
11. In theory, the employees who lose their jobs as the result of the demand shift should also have standing. Their injury is a direct result of their previous employer's monopolization. However, courts generally deny standing to these plaintiffs, on the theory that their injury is too remote or indirect to merit standing under the Sherman Act, see e.g. *Sharp v. United Airlines*, 967 F. 2d 404, 405–6 (10th Cir. 1992).
12. Differentiating L_2 with respect to e_l yields Eqn (8). Differentiating L_2 with respect to e_d yields $-e_e(e_l+1)/[e_d^2(e_l+1)^2]$. $|\partial L_2/\partial e_l| < |\partial L_2/\partial e_d|$ when the condition in Eqn (20) holds.

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