

PASSING ON THE MONOPOLY OVERCHARGE: A FURTHER COMMENT ON ECONOMIC THEORY

ROBERT COOTER †

If the price of a factor of production increases, then intermediate producers will pass on part of the increase to consumers. The ability of an intermediate producer to pass on a monopoly overcharge was discussed by the Supreme Court in *Illinois Brick Co. v. Illinois*¹ and in *Hanover Shoe Co. v. United Shoe Machinery Corp.*² In *Illinois Brick*, the Supreme Court unequivocally stated its understanding of the relevant economic theory: If the usual assumptions of perfect competition are met, then "the ratio of the shares of the overcharge borne by passee and passer will equal the ratio of the elasticities of supply and demand in the market for the passer's product."³

This is not the correct economic theory to apply to monopoly overcharges. The Supreme Court arrived at this formula by applying tax incidence theory to the monopoly overcharge problem. This error apparently occurred because the Supreme Court used the theory of the incidence of an excise tax on a consumer good⁴ instead of the theory of the incidence of a tax on a factor of production.

If the price of one factor of production rises, then producers will attempt to substitute other factors whose prices have not risen for the overcharged factor. Technical features of the production process will determine whether substitution is easy or difficult. If substitution is easy, then the overcharge on a factor will not cause consumer prices to rise very much. If, however, substitution is difficult, and the overcharge represents a large proportion of production costs, then consumer prices will rise a great deal. Factor

† Acting Professor of Law, University of California, Berkeley. B.A. 1967, Swarthmore College; M.A. 1969, Oxford University; Ph.D. 1975, Harvard University.

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¹ 431 U.S. 720 (1977).

² 392 U.S. 481 (1968).

³ 431 U.S. at 741.

⁴ The Supreme Court's footnote to its incidence formula concerns the incidence of an excise tax. See *id.* 741.

substitution, therefore, is one determinant of the extent to which a price increase will be passed on to indirect purchasers.

The Supreme Court's formula is incorrect because it does not take account of factor substitution. The ease of factor substitution is not reflected in the elasticity of the supply curve for the final product. The elasticity of supply measures the effect of changes in scale on production costs, whereas the elasticity of substitution measures the effect of changes in factor proportions on production costs. If supply is elastic, then the supply curve does not *slope* up significantly. If factor substitution is easy, however, then the supply curve does not *shift* up significantly when a factor's price increases.

The correct incidence formula was not developed in two recent articles⁵ and a subsequent exchange⁶ concerning the cases. Professors William Landes and Richard Posner do not discuss factor substitution,⁷ and Professors Robert Harris and Lawrence Sullivan discuss factor substitution only in footnotes.⁸ This discussion piece derives the correct incidence formula and offers a few remarks on its policy implications.

INCIDENCE THEORY

If the factor market were perfectly competitive, then firms would price at cost. The "cost curve" is another name for the supply curve of a competitive industry. The long run supply curve is the long run average cost curve for a competitive industry and the short run supply curve is the marginal variable cost curve for a representative firm in the industry. The long run average cost includes a normal rate of return on capital. A monopolist

⁵ Harris & Sullivan, *Passing on the Monopoly Overcharge: A Comprehensive Policy Analysis*, 128 U. PA. L. REV. 260 (1979); Landes & Posner, *Should Indirect Purchasers Have Standing to Sue Under Antitrust Laws? An Economic Analysis of the Rule of Illinois Brick*, 46 U. CHI. L. REV. 602 (1979).

⁶ Harris & Sullivan, *Passing on the Monopoly Overcharge: A Response to Landes and Posner*, 128 U. PA. L. REV. 1280 (1980); Landes & Posner, *The Economics of Passing On: A Reply to Harris and Sullivan*, 128 U. PA. L. REV. 1274 (1980).

⁷ Professors Landes and Posner rely on a version of the Supreme Court's incidence formula, which omits the crucial role of factor substitution. The citation for their formula is to a public finance text in which a discussion of the incidence of a tax on a consumer good, and not a factor of production, appears. See Landes & Posner, *supra* note 5, at 617. See also C. SHOUR, PUBLIC FINANCE 273-74 (1979).

⁸ Professors Harris and Sullivan discuss factor substitution in two footnotes, but they do not stress that factor substitution determines the extent of the shift of the long run supply curve occasioned by the overcharge. See Harris & Sullivan, *supra* note 5, at 283 n.54, 292 n.59.

overcharges by pricing above cost and earning abnormally high profits.

The factor market is depicted in Figure 1. If the factor market were perfectly competitive, then firms would price at cost and equilibrium would be reached at the intersection of the cost curve S and demand curve D . If the supplier is a monopolist who imposes an overcharge, then equilibrium will occur at a point where the price is higher and the quantity is lower than the competitive equilibrium. To find the monopoly equilibrium for a given overcharge, move to the left from the competitive equilibrium until a point is reached where the vertical distance between the demand curve D and cost curve S equals the overcharge t .

In Figure 1, we see that the price of the factor rises from p_c to $p_o + t$. The price does not rise by the full extent of the overcharge. The lower level of production under monopoly results in a fall in costs and this fall in costs absorbs part of the overcharge. The flatter the cost curve (more elastic), the more the buyer's price will rise. This fact has been illustrated by drawing Figure 2 next to Figure 1. The only difference between these figures is that the cost curve is flatter in Figure 2, so the price of the factor rises more in Figure 2 than in Figure 1. It is easy to see that making the demand curve flatter (more elastic) has the opposite effect on price, but this relationship is not depicted.

The argument in the preceding paragraph can be stated more precisely: The ratio of the shares of the overcharge borne by direct purchasers and the monopolist will equal the ratio of the elasticities of the cost curve and demand curve in the factor market. Direct purchasers, however, will pass on part of their burden to indirect purchasers. The next step in the analysis is to derive a formula determining how much of the overcharge borne by direct purchasers in the factor market will be passed on to indirect purchasers in the product market. This discussion piece does not make the same mistake made by the Supreme Court and repeat the preceding formula.

It was already noted that the supply curve of a competitive industry is its cost curve. Consequently, the increase in the price of a factor of production will cause the supply curve to shift up as depicted in Figure 3. The shift will be relatively large if factor substitution is difficult and if the cost of the overcharged factor represents a large proportion of production costs. Factor substitution is difficult if rigidities in the production process require factors to be used in proportions that are almost constant.

FIGURE 2
FACTOR MARKET

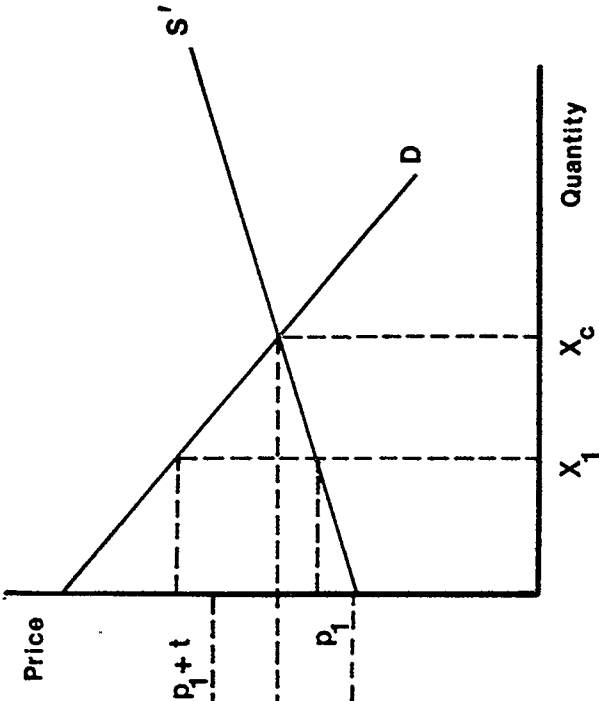


FIGURE 1
FACTOR MARKET

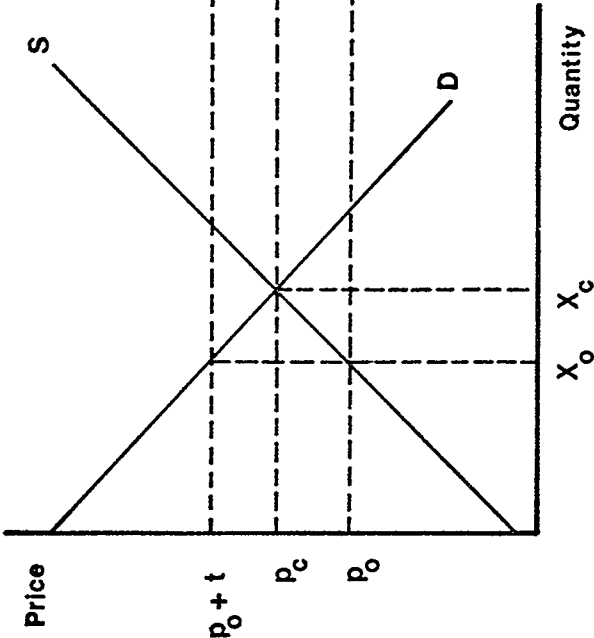
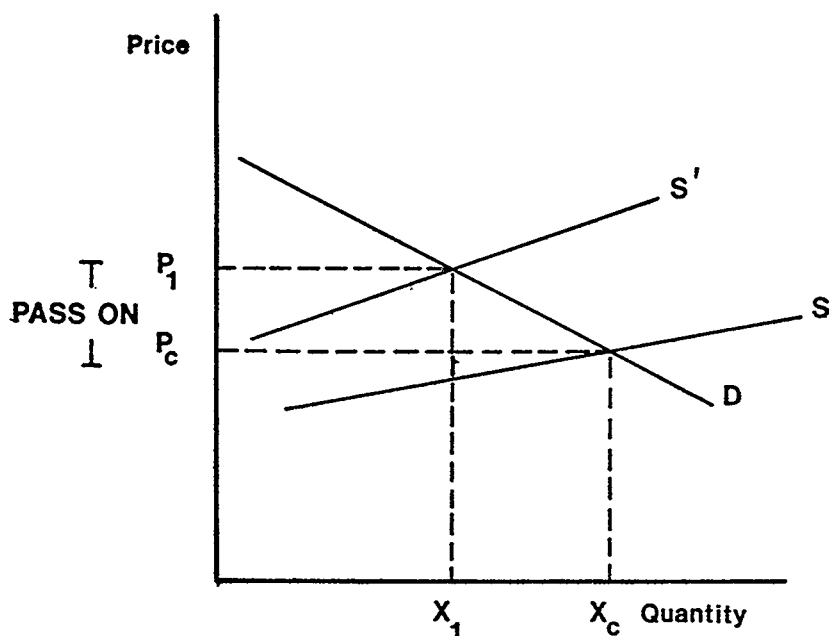


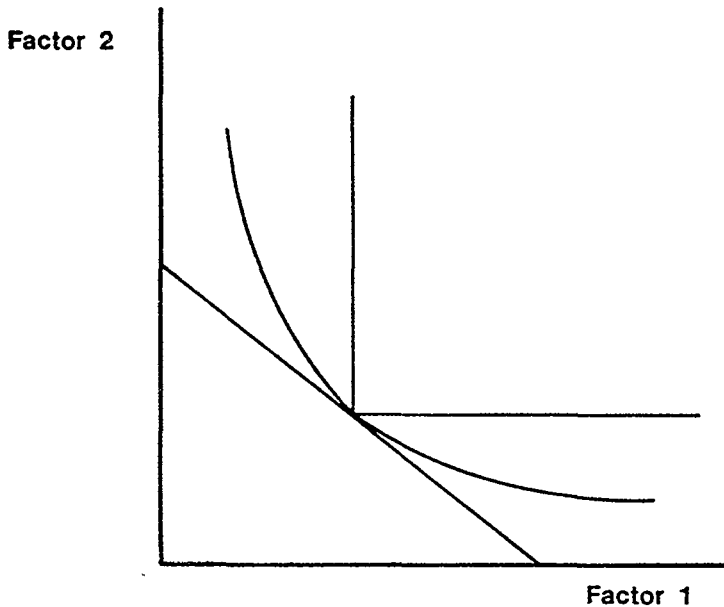
FIGURE 3
FINAL MARKET



By examining the production process that lies behind the cost curve, one can illustrate what is meant by the phrase "factor substitution is difficult." In Figure 4, an isoquant with the conventional convex shape, a straight line isoquant, and a right angle isoquant have been drawn. If the isoquants form right angles, then factors must be combined in fixed proportions and no scope for substitution exists. If the isoquants form straight lines, then factors can be substituted for each other at a constant rate. If the isoquants have the conventional convex shape, then factors can be substituted for each other, but the rate of substitution diminishes as one of the factors is used more intensively. Thus, factor substitution is relatively easy when the isoquants approach a straight line and more difficult when the isoquants approach a right angle.

Technologies with isoquants such as those depicted in Figure 4 are frequently encountered. For example, the operation of a bus requires one driver. Additional buses are unproductive without additional drivers and vice versa. Consequently, buses and drivers are represented by the right angle isoquant. Weed killers can be substituted for labor in farming, but substitution becomes more difficult as the ratio of chemicals to labor increases. Consequently, chemicals and labor are represented by the conventional convex

FIGURE 4
FACTOR SUBSTITUTION



isoquant. Some heating systems are designed to burn either gas or oil. The rate of substitution between gas and oil is the same regardless of the intensity at which either factor is being used, so the isoquant in this case is linear.

These examples demonstrate that substitution depends, in part, on technical characteristics of the industry. Another determinant is time. Substitution is easier when more time is allowed to overcome technical or practical obstacles. For example, it is difficult to change the gasoline consumption per mile for a particular truck, so the cost of trucking services will increase by almost the full rise in fuel prices in the short run. In the long run, however, the company can buy new trucks that are more fuel efficient but less powerful. In terms of the diagram, the isoquants will become flatter over time.

If the isoquants are not straight lines, then an increase in the price of a factor will cause the supply curve to shift up, as in Figure 3. The upward shift of the supply curve will cause the price of the product to rise. The magnitude of the price increase associated with a given shift in the supply curve depends on the slopes of the supply and demand curves. If the supply curve slopes up gently (that is, if it is elastic), then the price of the product will rise by almost the full extent of the shift in the supply curve. If the

demand curve slopes down gently (that is, if it is elastic), then the price of the product will increase insignificantly despite the significant shift in the supply curve.

In sum, the extent to which an increase in the price of a factor will be passed on to indirect purchasers depends on (i) factor substitution, (ii) elasticity of supply, and (iii) elasticity of demand.

A mathematical formula is necessary to express the precise relationship. The following formula is derived in the mathematical appendix:⁹

$$\underbrace{x \Delta p}_{\text{burden on indirect purchasers}} = \left[\frac{K - \frac{1}{2} \Delta K}{1 + E_d/E_s} \right] \Delta i$$

where:

- Δi = price increase in factor market due to overcharge;
- Δp = price increase in product market due to overcharge;
- x = consumption of the product at higher price;
- K = quantity of overcharged factor used in production at higher price;
- ΔK = change in K ;
- E_d = elasticity of demand;
- E_s = elasticity of supply.

Factor substitution results in a change in factor utilization denoted ΔK . The burden of the overcharge is the increase in factor costs $K\Delta i$. If demand is inelastic ($E_d = 0$) and factor substitution is difficult ($\Delta K = 0$), then the indirect purchasers bear the full burden of the overcharge: $x\Delta p = K\Delta i$. If factor substitution is easy, then the change in utilization of the overcharged factor ΔK will be large and the burden on indirect purchasers will be small. Notice that if supply is perfectly elastic ($E_s \rightarrow \infty$) or if demand is totally inelastic ($E_d = 0$), then the burden on indirect purchasers will depend on the extent of factor substitution alone.

Professors Harris and Sullivan correctly observed that the cost curve is more elastic in the long run than in the short run.¹⁰ From the formula above, one can see that the burden of the overcharge borne by consumers is greater when the supply is more elastic. It would be incorrect, however, to conclude that the burden on consumers will be greater the longer the overcharge persists. This

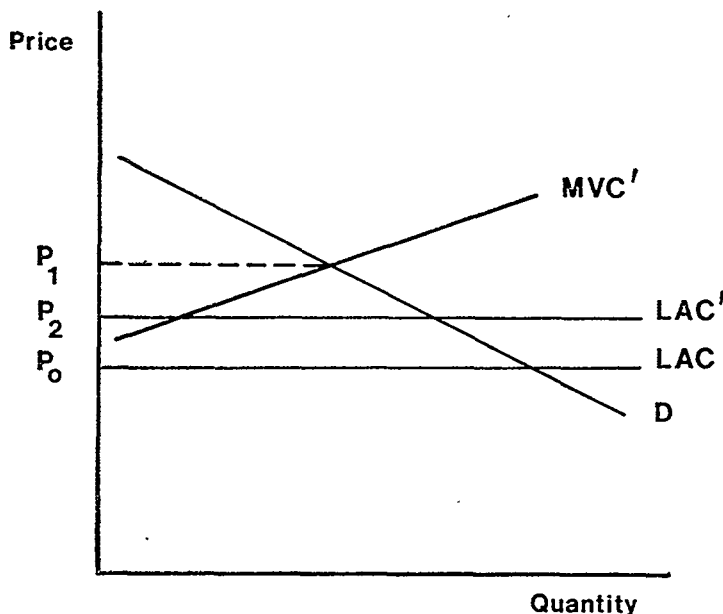
⁹ This formula describes the incidence of an overcharge in the long run. It is accurate to a second order approximation. See Mathematical Appendix.

¹⁰ Harris & Sullivan, *supra* note 5, at 291.

conclusion is not necessarily true because factor substitution works in the opposite direction. The longer the overcharge persists, the easier it will be for producers to substitute against the overcharged factor. As time passes, the burden of the overcharge becomes smaller because less of the factor is used in production, but a larger proportion of the remaining burden is born by ultimate consumers.

Figure 5 illustrates the effects of time on prices. The initial competitive equilibrium price p_0 is found at the intersection of the demand curve D and the long run average cost curve LAC . The overcharge causes costs to increase. The industry responds immediately by moving to the new equilibrium price p_1 found at the intersection of the demand curve and the new marginal variable cost curve MVC' (short run supply curve). If factor substitution were impossible, then the long run equilibrium would occur at a price higher than the short run equilibrium price p_1 . If factor substitution is easy in the long run, then the new long run average cost curve LAC' will be close to the original LAC curve. Thus, the new long run equilibrium price p_2 will be close to the original price p_0 as depicted. Notice that the long run average cost curves are horizontal (that is, they are perfectly elastic).¹¹ Consequently,

FIGURE 5
EFFECT OF TIME ON PRICE



¹¹ It is customary among economists to assume that the cost curve of a competitive industry is perfectly elastic, in the long run. Professors Harris and Sullivan

the increase in consumer prices depends entirely on the shift in the average cost curve in the long run, which, in turn, depends entirely on the ability to substitute against the overcharged factor.

A familiar example illustrates how time can undo the influence of monopoly. It is commonplace to observe that the value of a patent diminishes with time because ways are discovered to innovate around it. The burden of the overcharge diminishes because substitutes are found for the patented product. The same phenomenon will occur as a response to antitrust violations. If courts restrict themselves to a long run perspective, then damages will be seriously underestimated.¹²

CONCLUSION

A monopolist in a factor market can enjoy excess profits by pricing above cost, provided that the derived demand curve or the cost curve for the factor is less than perfectly elastic. In the short run, the overcharge will be borne by consumers paying higher prices for final goods and by intermediate producers making lower profits. In the long run, competitive intermediate producers will earn normal profits and all of the burden will fall on consumers paying higher prices. The extent of the consumer's long run burden will depend entirely on the ability of producers to substitute against the overcharged factor.

In order for a court to assess the extent to which a rise in consumer prices was caused by an overcharge in a factor market, the court would have to examine the opportunities for factor substitution in producing the consumer good. It is relatively easy to allocate the long run burden of the overcharge between direct and indirect purchasers, but considerably more difficult to allocate the short run burden. The short run perspective is important because monopoly practices are most profitable during the time interval before producers and consumers can find substitutes.

correctly observed that, if the cost curve is perfectly elastic, then the full increase in production costs will be passed on to consumers. See Harris & Sullivan, *supra* note 5, at 292. If the supply curve is perfectly elastic, then unit costs are constant and prices are independent of the level of demand.

In reality, the expansion of an industry will cause unit costs to change if the industry is large enough to influence the price of the raw materials that it uses. For example, the expansion of the brick industry may cause costs to rise because inferior clay must be quarried. Economists use the phrase "pecuniary externalities" to refer to changes in unit costs caused by changes in the size of an industry. If pecuniary externalities are present, then the long run supply curve is not perfectly elastic. See generally *id.* 291 n.57.

¹² Professors Harris and Sullivan write: "For purposes of antitrust enforcement, it is the longer run that matters most." *Id.* 294. An analysis of factor substitution suggests limits to this claim.

MATHEMATICAL APPENDIX

Consider a model with one consumer good and two factors of production, capital K and labor L . The long run supply price of a competitive market equals the average cost of production:

$$p = c(y, i, w) \quad (1)$$

where
 p = price
 y = output
 i = cost of capital
 w = cost of labor
 c = average cost of production.

Demand depends on price:

$$x = x(p). \quad (2)$$

In equilibrium, supply equals demand:

$$x = y. \quad (3)$$

We differentiate equations (1), (2), and (3) and combine them:

$$dp = c_y x' dp + c_i di. \quad (4)$$

We use the facts that $c_y = \left(\frac{dy}{dp}\right)^{-1}$ and $c_i = K/y$ to obtain

$$x dp = \frac{K}{1 - \frac{dx}{dp} / \frac{dy}{dp}} di.$$

This equation is accurate for infinitesimally small overcharges, which would not give rise to lawsuits.

For large changes we integrate equation (4):

$$\begin{aligned} \Delta p &= \int_{p_0}^{p_1} c_y x' dp + \int_{i_0}^{i_1} c_i di \\ &= \int_{p_0}^{p_1} \frac{-E_d}{E_s} dp + \frac{1}{x} \int_{i_0}^{i_1} K di. \end{aligned}$$

Assume that E_d/E_s is constant and K is a linear function of i :

$$\begin{aligned} \Delta p &= \frac{-E_d}{E_s} \Delta p + \frac{1}{x} (a \Delta i - \frac{1}{2} b (i_1^2 - i_0^2)) \\ &= \frac{-E_d}{E_s} \Delta p + \frac{1}{x} (K_1 \Delta i - \frac{1}{2} \Delta K \Delta i). \end{aligned}$$

This is the formula given in the text.