



Economic Growth Centre Working Paper Series

The Welfare Effects of Monopoly Innovation

by

YAO Shuntian and Lydia L. GAN

Economic Growth Centre
Division of Economics
School of Humanities and Social Sciences
Nanyang Technological University
Nanyang Avenue
SINGAPORE 639798

Website: <http://www.ntu.edu.sg/hss/egc/>

Working Paper No: 2006/09

Copies of the working papers are available from the World Wide Web at:

Website: <http://www.ntu.edu.sg/hss/egc/>

The author bears sole responsibility for this paper. Views expressed in this paper are those of the author(s) and not necessarily those of the Economic Growth Centre.

The Welfare Effects of Monopoly Innovation

Shuntian Yao
Associate Professor
Division of Economics
School of Humanities and Social Sciences
Nanyang Technological University
Nanyang Avenue, Singapore 639798
Tel.:+65-6790-5559, Fax: +65-6794-6303
E-mail address: astyao@ntu.edu.sg

Lydia L. Gan
*Assistant Professor
Division of Economics
School of Humanities and Social Sciences
Nanyang Technological University
Nanyang Avenue, Singapore 639798
Tel.:+65-6790-5676, Fax: +65-6794-6303
E-mail address: alggan@ntu.edu.sg

* Corresponding author, Division of Economics, School of Humanities and Social Sciences, Nanyang Technological University, Nanyang Avenue, Singapore 639798. Tel.:+65-6790-5676, Fax: +65-6794-6303, E-mail address: alggan@ntu.edu.sg

Monopoly Innovation and Welfare Effects

Abstract

In this paper we study the welfare effect of a monopoly innovation. Unlike many partial equilibrium models carried out in previous studies, general equilibrium models are constructed and analyzed in greater details. We discover that, technical innovation carried out by a monopolist could significantly increase the social welfare. We conclude that, in general, the criticism against monopoly innovation based on its increased dead weight loss is less accurate as previously postulated by many studies.

JEL Codes: D50, D60

1. Introduction

Economic literatures abound as far as studies related to the welfare losses as a result of monopolization are concerned. Most of them, however, are analyzed with partial equilibrium models. Many authors' attacks against monopoly are based on the dead weight loss. As for technical innovation, they argue that, while innovation reduces the monopolist's marginal cost and increases the consumer surplus and producer surplus in the monopoly market, it causes a much bigger dead weight loss than before; and because of the substantial misallocation of resources, the total welfare effect can be negative. In this paper, we attempt to discuss this issue with a general equilibrium model. As shall be seen from our general equilibrium analysis, and unlike the suggestion by some authors as mentioned above, we show that a technical innovation by a monopolist actually increases the social welfare.

2. Literature Review

Harberger (1954) was one of the pioneers in quantifying welfare losses due to monopoly. By adopting a partial equilibrium model that computes welfare losses in terms of the profit rate and the price elasticity of demand of an industry, he estimated welfare losses from monopoly in the United States in 1954 to be relatively insignificant (approximately 0.1% of GNP), and economists like Schwartzman¹ (1960), Leibenstein (1966), Bell (1968), Scherer (1970), Shepherd (1972), and Worcester (1973) had confirmed his results.

¹ Using similar estimates as Harberger, Schwartzman (1960) provided similar conclusions that the welfare loss from monopoly had been small, and that income transfers resulting from monopoly were small in the aggregate. Even when the elasticity of demand is assumed to be equal two, the welfare loss probably was still less than 0.1 percent of the national income in 1954.

Harberger's type of results had been met with several criticisms. Stigler (1956) and Kamerschen (1966) argued that welfare losses due to monopoly pricing might be greater than what Harberger and Schwartzman (1960) computed. Stigler used Harberger's welfare model and his own estimates of profits, and assumed a range of reasonable values for the elasticity of demand. He thought the limits within which the monopoly welfare losses lie were very broad, depending on the extent of actual monopoly power. Using data for the years 1956-1957 and 1960-1961, Kamerschen (1966) proposed that the welfare costs under monopoly power and mergers had been understated in the earlier studies. Much of the earlier work still followed essentially the Harberger methodology, except for Bergson (1973), who criticized Harburger's partial equilibrium framework, and put forward a general equilibrium model as an alternative. Bergson showed that the estimated welfare loss was heavily dependent on the value of other parameters, such as the elasticity of substitution and the distribution of price cost ratios, and his results showed that the welfare losses from monopoly were quite large. Bergson's estimates had drawn reaction, particularly from Carson (1975) and Worcester (1975).

Carson (1975) introduced a three-sector economy and estimated a 3.2 percent maximum welfare loss due to monopoly, which was considerably bigger than Harberger's (1954) and Schwartzman's (1960) calculations, but considerably less than Bergson's maximum estimate. Based on Harburger's model and using disaggregated annual data for specific firms, Worcester (1973) presented a "maximum defensible" estimate of the welfare loss due to monopoly in the private sector of the U.S. economy during 1956-1969 and concluded that welfare loss as a result of monopolization was insignificant. Hefford and

Round (1978) later accounted for welfare cost of monopoly by applying Harberger-type estimates and Worcester's (1973) approach in the Australian manufacturing sector for the period 1968-69 to 1974. Their results too suggested that only a relatively small proportion of GDP at factor cost was accounted for by welfare losses due to monopoly power.

In contrast, using three independent methods and data sets, Parker and Connor (1979) estimated the consumer loss due to monopoly in the U.S. food-manufacturing industries in 1975. They found that consumer losses due to monopoly were around US\$15 billions or approximately a quarter of U.S. GNP. Virtually all of the consumer loss was attributed to income transfers, and 3% to 6% was due to allocative inefficiency. Supporting this, Jenny and Weber (1983) showed the sensitivity of the measure of welfare loss based on the French economy. They found considerable allocative welfare losses, between 0.85% and 7.39% of GDP, and the welfare loss due to X-inefficiencies was as high as 5% of GDP. However, their estimates were highly tentative due to a lack in data quality and methodological difficulties.

In addition, Cowling and Mueller (1978) obtained empirical estimates of the social cost of monopoly power for both the United States and United Kingdom. Their results showed a higher advertising expenses in the U.S., thus quadrupled the welfare loss estimate for the U.S. Evidence suggested that there was significant welfare loss due to monopoly power, with the presence of international distribution of these social costs in the U.K. Using a partial equilibrium framework, they proved that costs of monopoly power on an

individual firm basis were generally large. Attacking such model as yielding overestimates in terms of welfare losses, Littlechild (1981) introduced a model in an uncertain environment and argued that windfalls and innovation were more important than monopoly power. He suggested that works involving a long-run equilibrium framework in analyzing monopoly often failed to include any neutral or socially beneficial interpretation of monopoly.

Friedland (1978) estimated the welfare gains from economy-wide demonopolization in a general equilibrium setting and found that the true welfare loss was consistently lower than the partial deadweight loss. Specifically, the size of the welfare gains was dependent on the extent of the product substitutability between the monopoly and competitive firms. The greater the substitutability, the greater the welfare gains and the less the difference between partial and general equilibrium estimates. This result was supported by Hansen (1999), who examined the second-best antitrust issues related to the accuracy of estimating the true welfare loss. He too found that the estimate of deadweight loss under partial equilibrium was larger than the true loss and the difference between the two increased as the monopolist became larger. More recently, by adopting a two-good general-equilibrium monopoly production model, Kelton and Rebelein (2003) found that social welfare under monopoly was higher than social welfare under perfect competition. This was especially true if the productivity for the monopolistically produced good is relatively low and if the benefit of the good is relatively high. Their results showed that the monopoly leads to higher equilibrium price and lower equilibrium quantity,

generating a smaller welfare for non-monopolists, and a larger welfare for monopolists than under perfect competition.

As mentioned earlier, some economists proposed that the traditional analysis of monopoly pricing underestimated the social costs of monopoly. Under the perfectly discriminating model, Tullock (1967), Krueger (1974), and Posner (1975) argued that since the whole rent might be dissipated in competitive process, the full monopoly profit should be added to the social cost of monopoly. Tullock (1967) maintained that the social costs of monopoly should include resources used to obtain monopolies and their opportunity costs while Posner (1975) argued that they should include the high costs of public regulation. Koo (1970) too asserted that other than the loss of consumers' surplus net of the monopolist's gain in profits, the social opportunity loss of the monopolist as a result of inefficient use of resources should be included in calculating the social cost of monopoly. Even if economies of scale result in lower production costs, opportunity loss to society due to operations below optimum still exists. However, Shepherd (1972) claimed that the net social loss stemmed from the failure of the monopoly to price efficiently, and not the resulting loss from the monopolization of a competitive industry. Lee and Brown (2005) thought the conventional deadweight loss measure of the social cost of monopoly ignored the social cost of inducing competition. Using applied general equilibrium model, they proposed a social cost metric where the benchmark is the Pareto optimal state of the economy instead of simply competitive markets.

Oliver Williamson (1968a, 1968b, 1969a, 1969b) investigated the welfare tradeoffs related to horizontal mergers. Merger can result in higher efficiencies and lower costs, or greater market power and higher prices. Welfare gains associated with reductions in cost typically outweighed the welfare losses imposed on consumers by the greater market power, thus, leading to a net increase in social welfare. Innovation enables monopolists to lower their costs, to expand their outputs and to reduce their prices, thus it is conventional to conclude that social welfare unambiguously increases as a result. However, DePrano and Nugent (1969) pointed out that in Williamson's (1968a) model, a fixed value for elasticity was used, but if a merger result in a movement along the demand curve instead of a shift of the demand curve, the value of the elasticity would be different. They further showed that if elasticities were low, it would be unlikely for a small merger to actually experience positive welfare effects.

Geroski (1990) further listed three reasons to expect a negative direct effect of monopoly on innovation: (1) the absence of active competitive forces, (2) an increase in the number of firms searching for an innovation, and (3) incumbent monopolists enjoyed a lower net return from introducing a new innovation (Arrow 1962; Fellner 1951; Delbono and Denicolo 1991). In addition, Reksulak, Shughart, and Tollison (2005) argued that cost-saving innovation raised the opportunity cost of monopoly. As a monopolist with market power became more efficient, greater amounts of surplus were sacrificed by consumers since the former increasingly failed to produce the new and larger competitive output. Thus, innovation raised the social value of competition by raising the deadweight cost of monopoly. They further contained that even without a rise in market power, the consumer

welfare sacrificed under the monopolist would still be larger than under the competitive firms. In evaluating the monopoly welfare losses, Kay (1983) incorporated factors of production in a general equilibrium context and found that the summation of partial equilibrium estimates was likely to be inaccurate as an indicator of summed welfare costs. In the case where there were no constraints on the exercise of monopoly power, simple estimates for summing up the losses can be derived from the general equilibrium model, and these estimates suggested that welfare losses were potentially large.

Some literatures look at labor-managed behavior of a monopolist in a partial equilibrium setting. According to Hill and Waterson (1983), labor-managed industry equilibrium produced less output hence less welfare, than its profit-maximizing counterpart if firms were symmetric. Neary (1984, 1985) showed that small levels of output could lead to an increased number of firms in labor-managed equilibrium if firms were asymmetric in relation to technology and/or demand. Using a general equilibrium model, Neary (1992) showed that under certain circumstances, the equilibrium of the labor-managed economy could include more firms and result in higher welfare than the profit-maximizing one. If profits were positive, the labor-managed firms would not provide full employment. The entry of new firm can lower the unemployment and the wage rate, leading to lower total utility but a higher utility from consumption could lead to a higher total utility.

We now present our model with capital as the single input in the next section. Then, in section 4, we consider the model with labor as the single input. A brief concluding remark follows in section 5.

3. A Model with Capital as the Single Input

Consider an economy with a competitive industry that includes many firms and an industry with a single monopoly firm. The competitive industry consists of F identical small firms, of which each produces the same product good 1, using the same input of natural resources (for example, land, and it will be referred to as *capital*), having the same production function $q = k^{1/2}$, where k is the amount of capital input. The monopolist produces good 2 with the capital input, and its production function is $Q = tK$, where K is the capital input, and $t > 0$ is a parameter representing the level of technology².

There are M identical consumers, each having the same utility function $u = [x_1(x_2 + 1)]^{1/2}$, where x_j is the amount of good j consumed. The asymmetric feature of the utility function implies that good 1 is a subsistence good required to be consumed to survive (for example, basic food); on the other hand, while the consumption of good 2 increases the utility from each unit of good 1 consumed, good 2 itself is not a subsistence good³. Each consumer has an equal profit share from each and every firm, and all shares combined together equal to his total income. The total natural resource available in this economy is C , and each individual has an equal share.

Let 1 be the price of good 1, and let v be the rental rate of capital.

² In our discussion, for simplicity, we do not consider the R&D costs of technical innovation. The R&D costs are paid for just one period, while the consumers' utility gains caused by innovation, if they do exist, will last for a lifetime. In this sense the R&D costs can be neglected if future utility is not too substantially discounted.

³ In reality, a subsistence good such as food is hardly provided by a single private firm. Otherwise for profit maximization the monopolist would charge an extremely high price and would produce a very tiny amount.

The decision of each small firm is:

$$\text{Max } \pi = k^{1/2} - vk \quad (1)$$

from which one solves $k = 1/(4v^2)$, $q = 1/(2v)$, and $\pi = 1/(4v)$.

The decision of the monopoly is:

$$\text{Max } \Pi = P(tK) - vK = P(K)(tK) - v(K)K \quad (2)$$

Note that the market clearing price $P(K)$ for good 2 and the market clearing price for capital $v(K)$ now are dependent on K . We have to first derive $P(K)$ and $v(K)$. According to the assumption on profit share, the income of each and every consumer is $M^I[F(4v)^{-1} + P(K)tK - vK]$. The income from renting of natural resources for each individual is Cv/M . It is easy to verify that the individual quantity demand for good 1 and that for good 2 are, respectively:

$$x_1 = 0.5M^I[Cv + F(4v)^{-1} + P(K)tK - vK] + 0.5P(K) \quad (3)$$

$$x_2 = 0.5M^I[Cv + F(4v)^{-1} + P(K)tK - vK] [P(K)]^{-1} - 0.5 \quad (4)$$

The total quantity demanded for good 2 is then:

$$Mx_2 = 0.5[Cv + F(4v)^{-1} + P(K)tK - vK][P(K)]^{-1} - 0.5M \quad (5)$$

For market clearing, it must hold that

$$0.5[Cv + F(4v)^{-1} + P(K)tK - vK][P(K)]^{-1} - 0.5M = tK \quad (6)$$

from which one can solve

$$P(K) = \frac{F + 4[v(K)]^2(C - K)}{4v(K)(M + tK)} \quad (7)$$

On the other hand, for capital market clearing:

$$K + \frac{F}{4v^2} = C \quad (8)$$

Thus

$$4[v(K)]^2 = \frac{F}{C - K}, \quad v(K) = \frac{\sqrt{F}}{2\sqrt{C - K}} \quad (9)$$

Combining these results, we get:

$$P(K) = \frac{\sqrt{F(C-K)}}{M+tK} \quad (10)$$

$$\Pi(K) = \frac{\sqrt{F(C-K)}}{M+tK} tK - \frac{\sqrt{F}}{2\sqrt{C-K}} K \quad (11)$$

The first order condition reads:

$$t^2 K^3 + 4t^2 (C-K)K^2 + 2MtK^2 + 6Mt(C-K)K - 4Mt(C-K)^2 + M^2 K + 2M^2 (C-K) = 0 \quad (12)$$

The solution is $K = K^*(M, C, t)$.

Note that

$$x_1 = M^{-1} \sqrt{F(C-K)}, \quad x_2 + 1 = M^{-1}(M+tK) \quad (13)$$

As a result,

$$u = \frac{(M+tK)^{1/2} [F(C-K)]^{1/4}}{M} \quad (14)$$

To get some numerical results, let us assume that $M = 10,000$, $C = 10,000$, and $F = 100$.

Then,

$$t^2 K^3 + 4t^2 (10000 - K)K^2 + 20000tK^2 + 60000(10000 - K)tK - 40000t(10000 - K)^2 + 100000000K + 200000000(10000 - K) = 0$$

(15)

when $t=1$, equation (12) becomes:

$$K^3 + 4(10000 - K)K^2 + 20000K^2 + 60000(10000 - K)K - 40000(10000 - K)^2 + 100000000K + 200000000(10000 - K) = 0$$

(16)

from which one solves $K=1630.234$ and $u = 0.1064$.

Assuming the values of t between the range of 1 to 2, and solving for the corresponding values of K and u using simulation techniques, the relationship between t and u can be derived as shown in Figure 1.

<Insert Figure 1 here>

From Figure 1 we observe that u increases together with t . Thus we have

Proposition 1. In our model with capital as the single input, as the technology of the monopolist advances, while more resources are used by the monopoly instead of by the competitive firms, the social welfare is actually increased.

4. A Model with Labor as the Single Input

We now consider a model with labor only as the production input. The main difference between this model and the one in the last section is, consumers' utilities depend not only on the consumption amounts of the firms' products, but also depend on the amounts of leisure they enjoy.

The economy under consideration consists of one competitive industry and one monopoly industry as before. Once again the competitive industry consists of F identical small firms, of which each produces the same product of good 1, using the same input of labor, having the same production function $q = n^{1/2}$, where n is the amount of capital input. The monopolist produces good 2 with the labor input, and its production function is $Q = tN$, where N is the labor input, and $t > 0$ is a parameter representing the level of technology.

Once again there are M identical consumers, each having the same utility function of $u = [Lx_1(x_2+1)]^{1/3}$, where L is the leisure consumed, and x_j is the amount of good j consumed. As before, the utility function implies that good 1 is a necessity, and while the consumption of good 2 increases the utility from each unit of good 1 consumed, good 2 itself is not a necessity. Each consumer has one unit of time per period used either for working or for leisure.

Let p be the price of good 1, and let w be the wage.

The decision of each small firm is:

$$\text{Max } \pi = n^{1/2} - wn \quad (17)$$

from which one solves $n = 1/(4w^2)$, $q = 1/(2w)$, and $\pi = 1/(4w)$.

The decision of the monopoly is:

$$\text{Max } \Pi = P(N)tN - wN \quad (18)$$

We have to first derive $P(N)$ for market-clearing. According to the assumption on profit share, the profit income of each and every consumer is $M^{-1}[F(4w)^{-1} + P(N)tN - wN]$.

Consider the decision problem of each consumer:

$$\begin{aligned} \text{Max } u &= [Lx_1(x_2+1)]^{1/3} \\ \text{s.t. } wL + x_1 + P(N)x_2 &= w + M^{-1}[F(4w)^{-1} + P(N)tN - wN] \end{aligned} \quad (19)$$

It is not difficult to derive

$$L = (1/3)\{w + M^{-1}[F(4w)^{-1} + P(N)tN - wN] + P(N)\}/w \quad (20)$$

$$x_1 = (1/3)\{w + M^{-1}[F(4w)^{-1} + P(N)tN - wN] + P(N)\} \quad (21)$$

$$x_2+1 = (1/3)\{w + M^{-1}[F(4w)^{-1} + P(N)tN - wN] + P(N)\}/P(N) \quad (22)$$

$$u = (1/3)\{w + M^{-1}[F(4w)^{-1} + P(N)tN - wN] + P(N)\}/[wP(N)]^{1/3} \quad (23)$$

Thus the total quantity demanded for good 2 is:

$$Mx_2 = (1/3)[Mw + F(4w)^{-1} + P(N)tN - wN]/P(N) - 2M/3 \quad (24)$$

For market clearing for good 2:

$$Nt = (1/3)[Mw + F(4w)^{-1} + P(N)tN - wN]/P(N) - 2M/3 \quad (25)$$

We solve

$$P(N) = \frac{Mw + \frac{F}{4w} - Nw}{2(M + Nt)} \quad (26)$$

On the other hand, we have the following for labor market clearing:

$$M(1 - L) = \frac{F}{4w^2} + N \quad (27)$$

From which one solves

$$w^2 = \frac{3F}{4(M - N)}, \quad w(N) = \frac{\sqrt{3F}}{2\sqrt{M - N}} \quad (28)$$

Now we have

$$P(N) = \frac{\sqrt{3F(M-N)}}{3(M+Nt)} \quad (29)$$

Thus the profit of the monopolist is:

$$\Pi(N) = \frac{\sqrt{3F(M-N)}}{3(M+Nt)} Nt - \frac{N\sqrt{3F}}{2\sqrt{M-N}} \quad (30)$$

The first order condition $\Pi'(N) = 0$ yields

$$3t^2 N^3 + 8t^2 (M-N)N^2 + 6tMN^2 + 14tM(M-N)N - 4tM(M-N)^2 + 3M^2 N + 6M^2 (M-N) = 0 \quad (31)$$

Now it is easy to verify

$$w + M^1[F(4w)^{-1} + P(N)tN - wN] + P(N) = \frac{4\sqrt{3F(M-N)}}{3M} \quad (32)$$

$$L = \frac{8(M-N)}{9M} \quad (33)$$

$$x_1 = \frac{4\sqrt{3F(M-n)}}{9M} \quad (34)$$

$$x_{2+1} = \frac{4(M+Nt)}{3M} \quad (35)$$

$$u = \frac{4(108F)^{1/6}(M - N)^{1/2}(M + Nt)^{1/3}}{9M} \quad (36)$$

Once again, we choose $M = 10,000$, $F = 100$, we can solve for N in terms of t from equation (31), and then determine the values of L , x_1 , x_2 , and u . Assuming the values of t in the range of 1 to 5, the relationship between t and u can be plotted from such simulation results as shown in Figure 2.

<Insert Figure 2 here>

Once again from Figure 2, we observe that u increases with t . Thus we have

Proposition 2. In our model with labor as the single input, as the technology of the monopolist advances, while more resources are used by the monopoly instead by the competitive firms, the social welfare is actually increased.

5. Conclusion

Most of the criticism against monopoly is based on its dead weight loss. With partial equilibrium models, some authors argue that innovation introduced by a monopolist could generate substantial dead weight loss and hence could lead to negative welfare effects. Our modeling and analysis have proved otherwise. Although our analysis is based on two simple models, we believe that our conclusion that monopoly technical

innovation increases welfare is generally correct. In practice, the development of the information technology industry, to some extent does justify all our arguments!

Acknowledgements

The authors would like to thank School of Humanities and Social Sciences of Nanyang Technological University for the research grant (RCC2/2005/SHSS-M52109004) to conduct this study.

References

Arrow, K. 1962. Economic welfare and the allocation of resources for inventions. In *The rate and direction of inventive activity*. Edited by Nelson, R. Princeton: Princeton University Press.

Bell, Frederic W. 1968. The effect of monopoly profits and wages on prices and consumers' surplus in American manufacturing. *Western Economic Journal* 6: 233-241.

Bergson, Abram. 1973. On monopoly welfare losses, *American Economic Review* 63: 853-870.

Carson, R. 1975. On monopoly welfare losses: comment. *American Economic Review* 65: 1008-1014.

Cowling, Keith, and Dennis Mueller. 1978. The social costs of monopoly power. *Economic Journal* 88: 727-748.

Delbono, F., and V. Denicolo. 1991. Incentives to innovate in a Cournot oligopoly. *Quarterly Journal of Economics* 106: 951-961.

DePrano, Michael E., and Jeffery B. Nugent. 1969. Economies as an antitrust defense: comment. *American Economic Review* 59: 947-953.

Fellner, W. 1951. The influence of market structure on technological progress. *Quarterly Journal of Economics* 65: 556-577.

Friedland, Thomas S. 1978. The estimation of welfare gains from demonopolization. *Southern Economic Journal* 45: 116-123.

Geroski, P.A. 1990. Innovation, technological opportunity, and market structure. *Oxford Economic Papers* 42: 586-602.

Hansen, Claus Thustrup. 1999. Second-best antitrust in general equilibrium: a special case. *Economics Letters* 63: 193-199.

Harberger, A.C. 1954. Monopoly and resource allocation. *American Economic Review* 44: 77-87.

Hefford, C.B., and David K. Round. 1978. The welfare cost of monopoly in Australia. *Southern Economic Journal* 44: 846-860.

Hill, Martyn, and Michael Waterson. 1983. Labor-managed Cournot oligopoly and industry output. *Journal of Comparative Economics* 7: 43-51.

Jenny, Frederic, and Andre-Paul Weber. 1983. Aggregate welfare loss due to monopoly power in the French economy: some tentative estimates. *Journal of Industrial Economics* 32: 113-130.

Kamerschen, David R. 1966. An Estimation of the welfare losses from monopoly in the American economy. *Western Economic Journal* 4: 221-236.

Kay, J. A. 1983. A general equilibrium approach to the measurement of monopoly welfare loss. *International Journal of Industrial Organization* 1: 317-331.

Kelton, Christina M.L., and Robert P. Rebelein. 2003. A static general-equilibrium model in which monopoly is superior to competition. <http://irving.vassar.edu/faculty/rr/Research/monopoverCE.pdf> (accessed March 16, 2006).

Koo, S.E. 1970. A note on the social welfare loss due to monopoly. *Southern Economic Journal* 37: 212-214.

Krueger, Anne. 1974. The political economy of the rent-seeking society. *American Economic Review* 64: 291-303.

Lee, Yoon-Ho Alex, and Donald J. Brown. 2005. Competition, consumer welfare, and the social cost of monopoly. Cowles Foundation Discussion Paper No. 1528. <http://cowles.econ.yale.edu/P/cd/d15a/d1528.pdf> (accessed February 4, 2006).

Leibenstein, Harvey. 1966. Allocative efficiency vs. "x-efficiency", *American Economic Review* 56: 392-415.

Littlechild, S.C. 1981. Misleading calculations of the social costs of monopoly power. *Economic Journal* 91: 348-363.

Neary, Hugh M. 1984. Labor-managed Cournot oligopoly and industry output: a comment. *Journal of Comparative Economics* 8: 322-327.

Neary, Hugh M. 1985. The labor-managed firm in monopolistic competition. *Economica* 52: 435-447.

Neary, Hugh M. 1992. Some general equilibrium aspects of a labor-managed economy with monopoly elements. *Journal of Comparative Economics* 16: 633-654.

Parker, R.C., and J.M. Connor. 1979. Estimates of consumer losses due to monopoly in the U.S. food-manufacturing industries. *American Journal of Agricultural Economics* 61: 626-639.

Posner, R.A. 1975. The social costs of monopoly and regulation. *Journal of Political Economy* 83: 807-828.

Reksulak, Michael, William F. Shughart II, and Robert D. Tollison. 2005. Innovation and the opportunity cost of monopoly. <http://home.olemiss.edu/~shughart/Innovation%20and%20the%20Opportunity%20Cost%20of%20Monopoly.pdf> (accessed October 20, 2005).

Scherer, Frederic M. 1970. *Industrial market structure and economic performance*, Chicago: Rand McNally.

Schwartzman, David. 1960. The burden of monopoly. *Journal of Political Economy* 68: 627-630.

Shepherd, R.A. 1972. The social welfare loss due to monopoly: comment. *Southern Economic Journal* 38: 421-424.

Stigler, George J. 1956. The statistics of monopoly and merger. *Journal of Political Economy* 64: 33-40.

Tullock, Gordon. 1967. The welfare costs of tariffs, monopolies, and theft. *Western Economic Journal* 5: 224-232.

Waterson, M. 1982. The incentive to invent when a new input is involved. *Economica* 49: 435-445.

Williamson, Oliver E. 1968a. Economies as an antitrust defense: the welfare tradeoffs. *American Economic Review* 58: 18-36.

Williamson, Oliver. 1968b. Economies as an antitrust defense: correction and reply. *American Economic Review* 58: 1372–1376.

Williamson, Oliver. 1969a. Allocative efficiency and the limits of antitrust. *American Economic Review* 59: 105-118.

Williamson, Oliver. 1969b. Economies as an antitrust defense: reply. *American Economic Review* 59: 954-959.

Worcester, Jr., D.A. 1973. New estimates of the welfare loss to monopoly, United States: 1956-1969. *Southern Economic Journal* 40: 234-245.

Worcester, Jr., D.A. 1975. On monopoly welfare losses: comment. *American Economic Review* 65: 1015-1023.

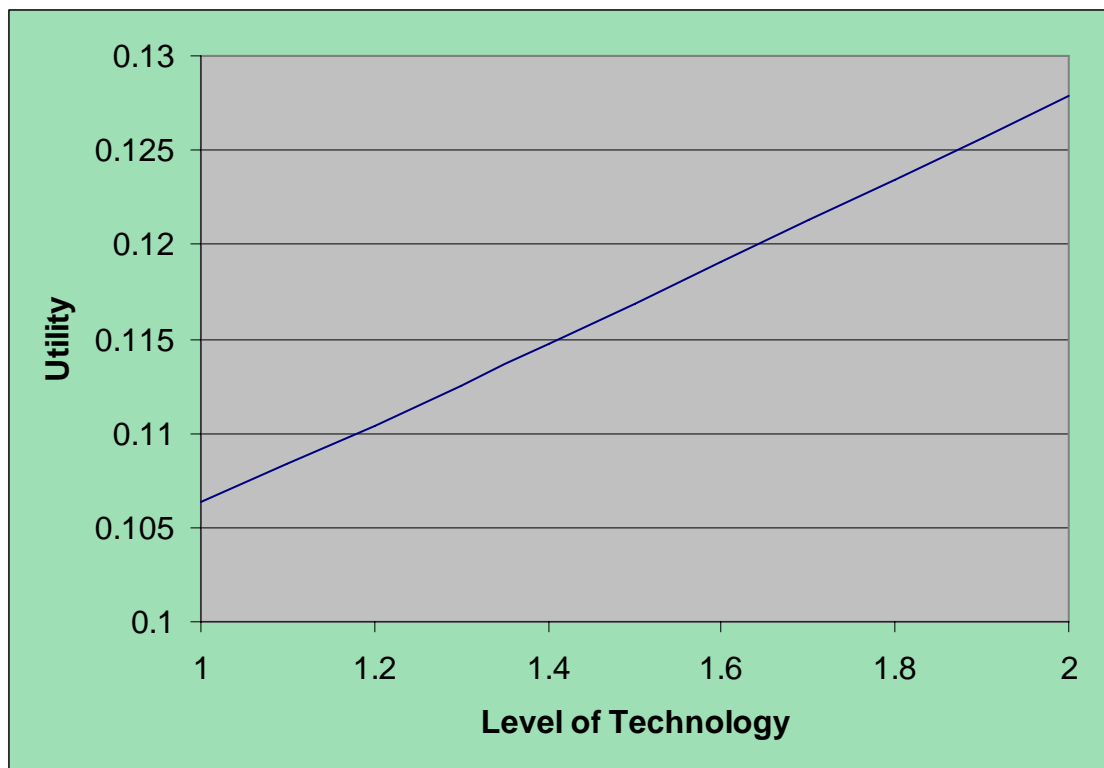


Figure 1. Model with Capital as the Single Input: Relationship between the Level of Technology and Utility

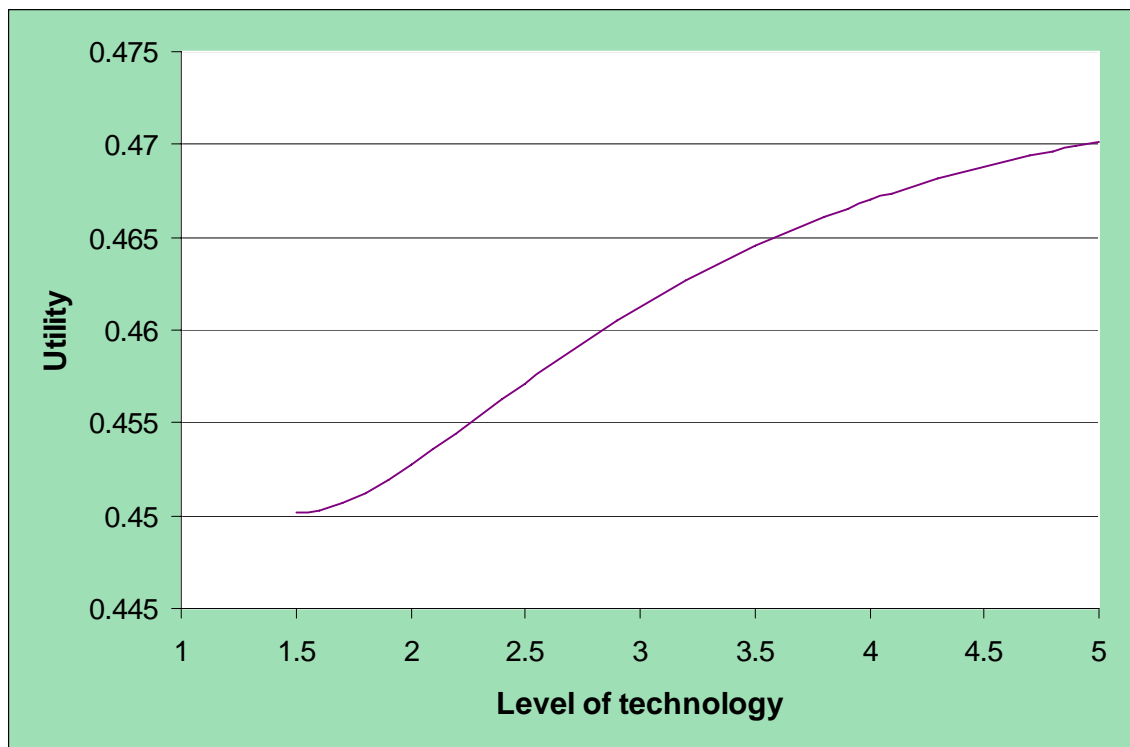


Figure 2. Model with Labor as the Single Input: Relationship between the Level of Technology and Utility