

Pousette, Tomas

**Working Paper**

## Monopoly and Allocative Efficiency with Stochastic Demand

IUI Working Paper, No. 84

**Provided in Cooperation with:**

Research Institute of Industrial Economics (IFN), Stockholm

*Suggested Citation:* Pousette, Tomas (1983) : Monopoly and Allocative Efficiency with Stochastic Demand, IUI Working Paper, No. 84, The Research Institute of Industrial Economics (IUI), Stockholm

This Version is available at:

<https://hdl.handle.net/10419/94687>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

A list of Working Papers on  
the last pages

No. 84

**MONOPOLY AND ALLOCATIVE EFFI-  
CIENCY WITH STOCHASTIC DEMAND\***

by

Tomas Pousette

\* I am grateful to Fredrik Berg-  
holm for helpful comments.

This is a preliminary paper. It is  
intended for private circulation,  
and should not be quoted or referred  
to in publications without permis-  
sion of the authors. Comments are  
welcome.

**CONTENTS**

	Page
INTRODUCTION	3
I THE MODEL	5
II OPTIMAL PRICE AND CAPACITY	6
II.1 Public Utility	6
II.2 Monopoly	8
III COMPARISON	8
IV SUMMARY AND CONCLUSIONS	12
APPENDIX	14
NOTES	17
REFERENCES	18

## INTRODUCTION

The objections usually raised to monopoly are the negative distributional and allocational effects, of which we will focus on the latter. The allocational distortions brought about by monopoly are well-known. Since price is higher than marginal cost a monopolist will produce less than a competitive industry or a public utility. This is often referred to as a loss of the consumer surplus triangle or welfare triangle. The quantitative importance of the allocational inefficiency has been treated in a number of studies, beginning with Harberger (1954). However, the estimates of the welfare losses are still controversial, as exemplified by the debate between Cowling & Mueller (1978, 1981) and Littlechild (1981).

There is undoubtedly a gap between empirical studies of the welfare effects of monopoly and theoretical models of the conduct of firms. Empirical studies typically analyse firms with constant costs and linear demand in a deterministic environment. On the theoretical side the firm under uncertainty has received increased attention during the last ten fifteen years. This applies to the competitive firm as well as monopoly and public utility. In this paper we try to bridge the gap between application and theory in one important aspect, namely regarding uncertainty in demand. We take the often used model with constant costs and linear demand as a starting point, but add to it a stochastic component in demand. The price and capacity are assumed to be determined before the actual demand is known.

To evaluate the welfare loss from monopoly we use a welfare-maximizing public utility as benchmark instead of a competitive industry. This approach permits us to analyse the effects of different nonprice rationing schemes. It also has two further advantages. Firstly, we do not have to deal with questions of cost-efficiency, since there are no good reasons to believe that this should be different between monopoly and public utility. Secondly, the comparison is not affected by differences in size between firms which may cause differences in attitudes towards risk and in informational activities.

We concentrate on static efficiency and refrain from an analysis of the complicated question of dynamic efficiency. Furthermore, we limit the scope of the analysis to the loss of the welfare triangle. The only difference between monopoly and public utility in the model is that the former maximizes expected profits while the latter maximizes expected welfare. In this pure comparison we can isolate the effects of uncertainty in a model frequently used in empirical applications.

Several questions are treated. Is monopoly capacity relative to welfare-maximizing capacity in the stochastic case larger or smaller than in the deterministic case? Is it possible for monopoly capacity to exceed welfare-maximizing capacity in the stochastic model? Is the welfare loss from monopoly relative to monopoly profits in the stochastic case larger or smaller than in the deterministic case? These questions are clearly relevant if we believe that a model with stochastic demand can give better predictions about important economic variables than a model with deterministic

demand. It may then be crucial which model policy implications are based on, e.g. in antitrust cases.

In Section I and II the model and the first order conditions for optimum are presented. The comparison between monopoly and public utility is made in Section III. Section IV contains a summary and conclusions.

## **I THE MODEL**

We assume that the demand for a non-storable good  $Q$  takes on two different levels. A single price  $p$  and the capacity  $\bar{Q}$  has to be determined before actual demand is known. We assume that the demand functions are linear and have the same slope.

$$Q_i = A_i - Bp \quad \text{for } i = 1,2 \quad (1)$$

where subscript  $i=1,2$  denote high and low demand, respectively and  $A_i, B > 0$ .

The known probabilities of high and low demand are  $s$  and  $1-s$ , respectively. For  $s=1$  or  $s=0$  the model is reduced to the deterministic case with high or low demand.

The marginal operating cost is  $b$  per unit of output and the marginal capacity cost is  $\beta$  per unit of capacity. We assume that there are no problems of indivisibilities. This kind of model, which is in the tradition of Brown & Johnson (1969), was used by Andersen (1974) and Sherman & Visscher (1977, 1979). Although the model is simple, it captures the essential stochastic element in demand.

## II OPTIMAL PRICE AND CAPACITY

Following Andersen and Sherman & Visscher we derive the optimal price and capacity which are used in the comparison in Section III.

### II.1 Public Utility

We take the objective function of the public utility to be the expected value of total benefits minus total costs,  $E(W)$ <sup>1</sup>. When welfare is maximized we need some assumptions about the nonprice rationing scheme since demand may exceed capacity at the preset price. Two alternative rationing cases are considered. Consumers are served either in order of highest or lowest willingness to pay.<sup>2</sup> Thus we get the extremes of the rationing schemes.

Firstly, we consider the case when those who receive the largest consumer surplus are served first. The optimal price is either equal to the marginal operating cost  $b$  or equal to the market-clearing price with low demand  $(A_2 - \bar{Q})/B$ .<sup>3</sup> The objective function is:

$$E(W) = s \left[ (A_1/B - (A_1 - \bar{Q})/B) \bar{Q} / 2 + ((A_1 - \bar{Q})/B - b) \bar{Q} \right] \quad (2)$$

$$+ (1-s) \left[ (A_2/B - p)(A_2 - Bp) / 2 + (p - b)(A_2 - Bp) \right] - B\bar{Q}$$

We insert the price solutions in (2) and maximize with respect to  $\bar{Q}$ .

$$P_w^* = b \quad \bar{Q}_w^* = A_1 - B(b + \beta/s) \quad (3)$$

$$P_w^* = (A_2 - \bar{Q}_w^*)/B \quad \bar{Q}_w^* = sA_1 + (1-s)A_2 - B(b + \beta) \quad (4)$$

where asterisks denote optimal values and subscript w denote welfare-maximizing values. Solution (3) is optimal for  $\min(s_k, 1) \leq s \leq 1$ , while solution (4) is optimal for  $0 \leq s \leq \min(s_k, 1)$ , where  $s_k$  is a value of  $s$  for which the expected value of the two solutions are equal.

Secondly, we assume that consumers who gain the smallest consumer surplus are served first. In this case the optimal price is either equal to the market-clearing price with high demand  $(A_1 - \bar{Q})/B$  or equal to the market clearing price with low demand  $(A_2 - \bar{Q})/B$ .<sup>4</sup> The objective function is:

$$E(W) = s \left[ (A_1/B - (A_1 - \bar{Q})/B) \bar{Q} / 2 + (p-b) \bar{Q} \right] + (1-s) \left[ (A_2/B - p) (A_2 - Bp) / 2 + (p-b) (A_2 - Bp) \right] - B \bar{Q} \quad (5)$$

To get the optimal capacity we insert the price solutions in (5) and maximize with respect to  $\bar{Q}$ .

$$p_w^* = (A_1 - \bar{Q}_w^*)/B \quad \bar{Q}_w^* = A_1 - B(b+B) \quad (6)$$

$$p_w^* = (A_2 - \bar{Q}_w^*)/B \quad \bar{Q}_w^* = A_2 - B(b+B) \quad (7)$$

In this case the optimal price always equals  $b+B$ . Solution (6) is optimal for  $s_\ell \leq s \leq 1$ , while solution (7) is optimal for  $0 \leq s \leq s_\ell$ , where  $s_\ell$  is analogous to  $s_k$ .



## II.2 Monopoly

The function to be maximized is taken to be expected profits,  $E(\Pi)$ . Therefore we do not need any assumption about the nonprice rationing scheme. The optimal price is either equal to the market-clearing price with high demand or equal to the market-clearing price with low demand.<sup>5</sup> The objective function is:

$$E(\Pi) = s[(p-b)\bar{Q}] + (1-s)[(p-b)(A_2 - Bp)] - \beta\bar{Q} \quad (8)$$

The optimal price and capacity is:

$$p_m^* = (A_1 - \bar{Q}_m^*)/B \quad \bar{Q}_m^* = (A_1 + (1-s)(A_1 - A_2) - B(b+\beta))/2 \quad (9)$$

$$p_m^* = (A_2 - \bar{Q}_m^*)/B \quad \bar{Q}_m^* = (A_2 - B(b+\beta))/2 \quad (10)$$

where subscript m denote monopoly values. Solution (9) is optimal for  $s_m \leq s \leq 1$ , while solution (10) is optimal for  $0 \leq s \leq s_m$ , where  $s_m$  is analogous to  $s_k$ .

## III COMPARISON

From the deterministic model with linear demand and constant costs we know that monopoly price is higher than the welfare-maximizing price and that monopoly capacity is 50 per cent of welfare-maximizing capacity. In the stochastic model it is obvious that the monopoly price is higher than the welfare-maximizing price. However, this does not prove that monopoly capacity is smaller than welfare-maximizing capacity, since the monopoly price-

capacity combination and the welfare-maximizing price-capacity combination do not necessarily correspond to the same demand function. In solution (3) the price-capacity combination do not even correspond to any demand function.

It is evident that if solution (10) is optimal, then monopoly capacity is smaller than welfare maximizing capacity, since  $\bar{Q}_w^* > A_2 - B(b+\beta)$ . In the Appendix we show that if solution (9) is optimal it is also true that monopoly capacity is below welfare-maximizing capacity. To prove this we compare solution (9) with each of the welfare-maximizing solutions and show that if monopoly capacity is larger than or equal to welfare-maximizing capacity, then some other assumptions in the comparison are contradicted. Thus, the standard result from the case with deterministic demand is still valid, i.e. the monopolist chooses a higher price and a smaller capacity than the welfare-maximizer.<sup>6</sup>

In the stochastic model we note that monopoly capacity is larger than or equal to 50 percent of welfare-maximizing capacity if solution (9) is optimal, while it is smaller than or equal to 50 percent if solution (10) is optimal. This observation is valid irrespective of the nonprice rationing scheme considered. Thus, monopoly capacity relative to welfare-maximizing capacity in the stochastic model may be larger as well as smaller than in the deterministic model. This is exemplified in Table 1 in which monopoly capacity relative to welfare-maximizing capacity ranges from 28 to 69 percent.

Although monopoly capacity is smaller than welfare-maximizing capacity, as shown in the Appendix, the percentage difference between the capacities can be small for suitable values on the parameters in the model. The 69 percent recorded in Table 1 is far from extreme. However, even if monopoly capacity relative to welfare-maximizing capacity in the stochastic model is larger than in the deterministic model, this does not imply that the welfare loss from monopoly relative to the optimal welfare or maximum profits is smaller (see Table 1).

Another conclusion from the numerical example is that monopoly does not necessarily perform worse when the nonprice rationing scheme is imperfect than when it is perfect. In Table 1 it is only for  $s = 0.4$  that the welfare loss from monopoly relative to optimal welfare or maximum profits is larger for the rationing case when those who receive the smallest consumer surplus are served first than for the case when those who receive the largest consumer surplus are served first.

In the deterministic model the welfare loss from monopoly can be calculated equivalently as 25 percent of the level of welfare in optimum or as 50 percent of monopoly maximum profits. In the stochastic model these percentages are no longer valid. In the numerical example in Table 1 we see that the welfare loss in percentage of the optimal level of welfare ranges from 25 to 50 percent. The welfare loss in percentage of maximum profits varies from 50 to 152 percent. The often used model with constant costs and linear demand is apparently sensitive to the introduction of a sto-

chastic component in demand. Thus, if there is uncertainty in demand the common practice of evaluating monopoly welfare losses as 25 percent of optimal welfare or 50 percent of maximum profits may lead to considerable miscalculations.

**Table 1. Monopoly welfare losses relative to optimal welfare and maximum profits for different nonprice rationing schemes**

Probability of high demand	Monopoly capacity/welfare-maximizing capacity (%)		Welfare loss/optimal welfare (%)		Welfare loss/maximum profit (%)	
	(a)	(b)	(a)	(b)	(a)	(b)
0.2	43	50	32	25	87	50
0.4	38	28	39	50	134	152
0.6	69	59	30	26	78	65
0.8	58	54	26	25	59	55

(a): Consumers who receive the largest consumer surplus are served first

(b): Consumers who receive the smallest consumer surplus are served first

Note:  $A_1=12$ ;  $A_2=8$ ;  $B=1$ ;  $b=1$ ;  $\beta=2$ ;  $s_k=0.5$ ;  $s_l \approx 0.22$ ;  $s_m \approx 0.41$ .

#### **IV SUMMARY AND CONCLUSIONS**

Welfare losses from monopoly are often evaluated using a model with constant costs and linear demand. We studied the robustness of this model when a basic assumption was changed, namely the deterministic property of demand. In the frequently used model we inserted an additive stochastic component. The price and capacity was assumed to be determined before actual demand was known. We compared a monopolist and a welfare-maximizer between which the only difference was that the former maximized expected profit while the latter maximized expected welfare.

In the deterministic model monopoly capacity is 50 percent of welfare-maximizing capacity. In the stochastic model we demonstrated that monopoly capacity relative to welfare-maximizing capacity may be larger as well as smaller than in the deterministic case. However, the standard result from the case with deterministic demand is still valid, i.e. the monopolist chooses a higher price and a smaller capacity than the welfare-maximizer.

In the deterministic model the conventional welfare loss due to monopoly is 50 percent of monopoly profits or equivalently 25 percent of the level of optimal welfare. We showed that this is no longer true when there is uncertainty in demand. In a numerical example the welfare losses varied from 50 to 150 percent of monopoly profits. The welfare losses relative to the optimal level of welfare ranged from 25 to 50 percent.

Thus, if observed profits are generated according to a model with stochastic demand while a determi-

nistic model is applied, this may lead to considerable miscalculations of monopoly welfare losses. Therefore the empirical results from the frequently applied deterministic model must be interpreted with great cautiousness.

**APPENDIX**

1. Proof of  $\bar{Q}_m^* < \bar{Q}_w^*$  when solution (3) and (9) are compared.

We study if  $\bar{Q}_m^* > \bar{Q}_w^*$  at the same time as  $E(\Pi)$  in solution (9)  $> E(\Pi)$  in solution (10). From the first-order conditions for maximum and the objective functions these two inequalities are solved for  $s$ . We then study if there is an  $s$  in  $[0;1]$  which satisfies these inequalities.<sup>7</sup>

$$0 < s < s_{\bar{Q}} = x/2 + (x^2/4+2y)^{1/2} \quad (1)$$

$$1 > s > s_m = x + (x^2 + 4y)^{1/2} \quad (2)$$

$$s_{\bar{Q}} > s_m \quad (3)$$

where  $x = (-A_2+Bb-B\beta)/(A_1-A_2)$  and  $y = B\beta/(A_1-A_2)$  are two variables introduced for ease of notation and  $s_{\bar{Q}}$  is the value of  $s$  for which  $\bar{Q}_m^* = \bar{Q}_w^*$  in solutions (3) and (9). We require that  $x < 0$  and  $y < 0$ . The restriction on  $x$  is reasonable since we are interested in cases in which  $A_2 - Bb > 0$ .

If  $x = 0$  then  $y = 0$ , which is an economically uninteresting case. If  $x < 0$  we rewrite (1) and (2) as:

$$s_{\bar{Q}} = x/2 + |x/2|(1+8y/x^2)^{1/2} \quad (1.b)$$

$$s_m = x + |x|(1+4y/x^2)^{1/2} \quad (2.b)$$

Let  $h = 2y/x^2$  and make a first order Taylor series expansion of the square roots at  $h = 0$ .

$$s_{\bar{Q}} = x/2 + |x/2|(1+2h+R_{\bar{Q}}) \quad (1.c)$$

$$s_m = x + |x|(1+h+R_m) \quad (2.c)$$

where  $R_{\bar{Q}}$  and  $R_m$  are the remainders which are nonpositive and increase more than proportionally to  $h$ . We have  $s_m - s_{\bar{Q}} = |x|(R_m - R_{\bar{Q}}/2) \geq 0$ . This means that  $s_{\bar{Q}} \geq s_m$  only when  $y=0$ . Thus, we have proved that  $\bar{Q}_m^* < \bar{Q}_w^*$  for  $y > 0$ .

2. Proof of  $\bar{Q}_m^* < \bar{Q}_w^*$  when solution (4) and (9) are compared.

In the preceding paragraph we proved that  $s_m > s_{\bar{Q}}$  for  $y > 0$ . Solution (3) is preferred to or indifferent to solution (4) if  $\min(s_k, 1) \leq s \leq 1$ . If  $0 \leq s < \min(s_k, 1)$  then  $\bar{Q}_w^*$  in solution (4)  $> \bar{Q}_w^*$  in solution (3). This means that  $s_{\bar{Q}}' \leq s_{\bar{Q}}$  where  $s_{\bar{Q}}'$  is the value of  $s$  for which  $\bar{Q}_m^* = \bar{Q}_w^*$  in solution (4) and (9). Thus,  $s_m > s_{\bar{Q}}'$  for  $y > 0$  also in solution (4) and  $\bar{Q}_m^* < \bar{Q}_w^*$ .

3. Proof of  $\bar{Q}_m^* < \bar{Q}_w^*$  when solution (6) and (9) are compared.

This is obvious since  $p_m^* > b+\beta$  and both solutions correspond to the same demand function.



4. Proof of  $\bar{Q}_m^* < \bar{Q}_w^*$  when solution (7) and (9) are compared.

We use three inequalities:

$$0 < s < s_\lambda = 2y/(1-2x-2y) \quad (4)$$

$$1 > s > s_m = x + (x^2+4y)^{1/2} \quad (5)$$

$$s_m < s_\lambda \quad (6)$$

For  $s_\lambda = 1$  we have  $A_1 - B(b+\theta) + A_2 - B(b+\theta) = 0$ , which is economically uninteresting. For  $s_\lambda < 1$ , we have  $y < (1-2x)/4$ . Solving (6) for  $y$  we get  $(1-2x)/4 < y < 1-x$ . Thus,  $s_m > s_\lambda$  if  $s_\lambda < 1$  and therefore  $\bar{Q}_m^* < \bar{Q}_w^*$ .

**NOTES**

<sup>1</sup> The usual assumptions for the applicability of partial welfare analysis are made.

<sup>2</sup> Alternative rationing methods are discussed by Holt & Sherman (1982).

<sup>3</sup> See Andersen (1974) and Sherman & Visscher (1977). Optimal prices below  $b$  are disregarded.

<sup>4</sup> See Sherman & Vischer (1977).

<sup>5</sup> See Sherman & Vischer (1979).

<sup>6</sup> This result seems to contrast with Appelbaum & Lim (1982) who finds that monopoly capacity may exceed the capacity of a competitive industry when demand is stochastic. In comparing monopoly and competition they assume that price is set ex post. However, we observe that their result is due to differences in size between the monopolist and the competitive firms which are not present in the comparison of monopoly and public utility.

<sup>7</sup> It is only the positive roots that are relevant for  $s_Q^-$  and  $s_m$ .

## REFERENCES

- Andersen, P. (1974): "Public Utility Pricing in the Case of Oscillating Demand." Swedish Journal of Economics, Vol. 76 (December), pp. 402-14.
- Appelbaum, E. and Lim, C. (1982): "Monopoly Versus Competition Under Uncertainty." Canadian Journal of Economics, Vol. XV (May), pp. 355-63.
- Brown, G., Jr. and Johnson, M.B. (1969): "Public Utility Output and Pricing Under Risk." American Economic Review, Vol. 59 (March), pp. 119-28.
- Cowling, K., and Mueller, D.C. (1978): "The Social Costs of Monopoly Power." Economic Journal, Vol. 88 (December), pp. 727-48.
- \_\_\_\_ (1981): "The Costs of Social Monopoly Power Revisited." Economic Journal, Vol. 91 (September), pp. 721-25.
- Harberger, A.C. (1954): "Monopoly and Resource Allocation." American Economic Review, Papers and Proceedings, Vol. 44 (May), pp. 77-87.
- Holt, C.A. and Sherman, R. (1982): "Waiting-Line Auctions." Journal of Political Economy, Vol. 90 (April), pp. 280-94.
- Littlechild, S. (1981). "Misleading Calculations of the Social Costs of Monopoly Power." Economic Journal, Vol. 91 (June), pp. 348-63.
- Sherman, R. and Visscher, M. (1979): "Public Price and Capacity in the Case of Oscillating Demand." Scandinavian Journal of Economics, Vol. 79, No. 1, pp. 41-53.
- \_\_\_\_ (1979): "Persistent Multiple Prices for Oscillating Demand." Scandinavian Journal of Economics, Vol. 81, No.4, pp. 494-504.

WORKING PAPERS (Missing numbers indicate publication elsewhere)

1976

1. Corporate and Personal Taxation and the Growing Firm  
by Ulf Jakobsson
7. A Micro Macro Interactive Simulation Model of the Swedish  
Economy.  
Preliminary model specification  
by Gunnar Eliasson in collaboration with Gösta Olavi
8. Estimation and Analysis with a WDI Production Function  
by Göran Eriksson, Ulf Jakobsson and Leif Jansson

1977

12. The Linear Expenditure System and Demand for Housing  
under Rent Control  
by Per Högberg and N Anders Klevmarken
14. Rates of Depreciation of Human Capital Due to Nonuse  
by Siv Gustafsson
15. Pay Differentials between Government and Private Sector  
Employees in Sweden  
by Siv Gustafsson

1979

20. A Putty-Clay Model of Demand Uncertainty and Investment  
by James W. Albrecht and Albert G. Hart

1980

25. On Unexplained Price Differences  
by Bo Axell
26. The West European Steel Industry - Structure and  
Competitiveness in Historical Perspective  
by Bo Carlsson
33. The Demand for Energy in Swedish Manufacturing  
by Joyce M. Dargay
34. Imperfect Information Equilibrium, Existence, Configuration  
and Stability  
by Bo Axell

1981

35. Value Added Tax: Experience in Sweden  
by Göran Normann
36. Energi, stabilitet och tillväxt i svensk ekonomi (Energy,  
Stability and Growth in the Swedish Economy)  
by Bengt-Christer Ysander
37. Picking Winners or Bailing out Losers? A study of the  
Swedish state holding company and its role in the new  
Swedish industrial policy  
by Gunnar Eliasson and Bengt-Christer Ysander
40. Wage Earners Funds and Rational Expectations  
by Bo Axell
41. A Vintage Model for the Swedish Iron and Steel Industry  
by Leif Jansson
43. An Econometric Model of Local Government and Budgeting  
by Bengt-Christer Ysander
44. Local Authorities, Economic Stability and the Efficiency of  
Fiscal Policy  
by Tomas Nordström and Bengt-Christer Ysander
45. Growth, Exit and Entry of Firms  
by Göran Eriksson
52. Swedish Export Performance 1963-1979. A Constant Market  
Shares Analysis  
by Eva Christina Horwitz
56. Central Control of the Local Government Sector in Sweden  
by Richard Murray
58. Industrial Subsidies in Sweden: Macro-economic Effects and  
an International Comparison  
by Bo Carlsson
59. Longitudinal Lessons from the Panel Study of Income  
Dynamics  
by Greg J. Duncan and James N. Morgan

1982

61. Var står den nationalekonomiska centralteorin idag?  
av Bo Axell
63. General Search Market Equilibrium  
by James W. Albrecht and Bo Axell
64. The Structure and Working of the Isac Model  
by Leif Jansson, Thomas Nordström and Bengt-Christer  
Ysander
65. Comparative Advantage and Development Policy Twenty  
Years Later  
by Anne O. Krueger
67. Computable Multi-Country Models of Production  
and Trade  
by James M. Henderson
68. Payroll Taxes and Wage Inflation: The Swedish Experiences  
by Bertil Holmlund (Revised, September 1982).
69. Relative Competitiveness of Foreign Subsidiary Operations  
of a Multinational Company 1962-77  
by Anders Grufman
70. Optimization under nonlinear constraints  
by Leif Jansson and Erik Mellander
71. Technology, Pricing and Investment in Telecommunications  
by Tomas Pousette
72. The Micro Initialization of MOSES  
by James W Albrecht and Thomas Lindberg
73. Measuring the Duration of Unemployment: A Note  
by Anders Björklund
74. On the Optimal Rate of Structural Adjustment  
by Gunnar Eliasson
75. The MOSES Manual  
by Fredrik Bergholm
76. Differential patterns of Unemployment in Sweden  
by Linda Leighton and Siv Gustafsson

77. Household Market and a Nonmarket Activities (HUS)  
- A Pilot Study  
by Anders Klevmarken
78. Arbetslöshetsersättningen i Sverige  
- motiv, regler och effekter  
av Anders Björklund och Bertil Holmlund

1983

79. Energy Prices, Industrial Structure and Choice of  
Technology; An International Comparison with Special  
Emphasis on the Cement Industry  
by Bo Carlsson
80. Energy Usage and Energy Prices in Swedish Manufacturing  
by Joyce Dargay
81. ELIAS - A Model of Multisectoral Economic Growth  
in a Small Open Economy  
by Lars Bergman
82. Oil Prices and Economic Stability - Simulation  
Experiments with a Macroeconomic Model  
by Tomas Nordström and Bengt-Christer Ysander
83. Statlig kontroll av kommunerna  
En översikt av svenska erfarenheter under efterkrigstiden  
av Richard Murray och Bengt-Christer Ysander
84. Monopoly and Allocative Efficiency with Stochastic Demand  
by Tomas Pousette