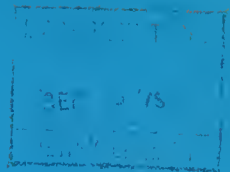


The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be supported by a valid receipt or invoice. This not only helps in tracking expenses but also ensures compliance with tax regulations. The document further outlines the steps for organizing these records, such as categorizing them by date and amount, and storing them in a secure and accessible location.

Next, the document addresses the process of reconciling bank statements. It explains how to compare the transactions recorded in the company's books with those shown on the bank's statement. Any discrepancies should be investigated immediately to identify errors or unauthorized transactions. Regular reconciliation is crucial for maintaining the integrity of the financial data and detecting potential fraud or mistakes.

The document also provides guidance on how to handle payroll and other recurring payments. It stresses the need for consistency and accuracy in these transactions, as they represent significant portions of the company's cash outflow. Proper documentation and timely processing are essential to avoid any issues with employees or vendors.

Finally, the document concludes by highlighting the overall benefits of a well-maintained accounting system. It notes that accurate records lead to better financial planning, improved decision-making, and a clear understanding of the company's financial health. By following the outlined procedures, businesses can ensure that their financial data is reliable and up-to-date.



**working paper
department
of economics**

**THE EFFECT OF A PROPORTIONAL SUBSIDY OR A TAX
ON THE QUALITY AND QUANTITY OF OUTPUT ***

Evsey D. Domar

Number 156

May, 1975

**massachusetts
institute of
technology**

**50 memorial drive
cambridge, mass. 02139**

THE EFFECT OF A PROPORTIONAL SUBSIDY OR A TAX
ON THE QUALITY AND QUANTITY OF OUTPUT *

Evsey D. Domar

Number 156

May, 1975

THE EFFECT OF A PROPORTIONAL SUBSIDY OR A TAX
ON THE QUALITY AND QUANTITY OF OUTPUT *

Evsey D. Domar

Massachusetts Institute of Technology

In an earlier paper I suggested that a bonus expressed as a linear function of profit and sales can induce a socialist (or any) manager to forgo his monopolistic powers.^{1/} Here I propose to investigate whether such a bonus might also prompt him to change, and particularly to lower, the quality of his product: the latter effect would be most unwelcome in socialist countries. But because, as was shown earlier, this bonus is equivalent to a subsidy proportional to price, this investigation can be broadened to include the effects of such a subsidy, not restricted to its optimal value, on the quality and also on the quantity of the product.^{2/} And finally, since the subsidy can be less than unity, it can be interpreted as a proportional tax as well. It will be shown that this subsidy (or tax) can indeed affect both quality and quantity (and of course the price) of output, and sometimes in a rather unexpected manner.

LIST OF SYMBOLS

(in order of appearance)

\underline{p} = price of output

\underline{x} = quantity of output

\underline{k} = index of quality of output

\underline{C} = total cost

H = profit (including the subsidy or the tax) = $\underline{zR} - \underline{C}$

\underline{R} = revenue (without the subsidy or the tax) = \underline{px}

\underline{z} = subsidy (if $\underline{z} > 1$), or tax (if $\underline{z} < 1$)

$$\frac{H}{\underline{x}} = \frac{\partial H}{\partial \underline{x}} ; \quad \frac{H}{\underline{xx}} = \frac{\partial^2 H}{\partial \underline{x}^2} ; \quad \frac{H}{\underline{xk}} = \frac{\partial^2 H}{\partial \underline{x} \partial k} .$$

Similar notation is used for other derivatives.

$$\frac{E}{\underline{R}}^k = \text{elasticity of } \underline{R} \text{ in respect to } \underline{k} .$$

Similar notation is used for other elasticities.

We assume that both the price and the cost of output are functions of quantity and of quality:

$$(1) \quad p = p(x, k), \quad C = C(x, k),$$

where \underline{k} is some quality index. It can stand for some easily quantifiable characteristic, such as the strength of a material or the longevity of a machine, or for something more elusive, like the variety of dresses or the taste of wine. Quality is of course multidimensional, but no attempt of dealing with the general complex case will be made here.

The firm (or the manager) will maximize

$$(2) \quad H = zR - C$$

in respect to \underline{x} and to \underline{k} :

$$(3) \quad H_{\underline{x}} = zR_{\underline{x}} - C_{\underline{x}} = 0,$$

$$(4) \quad H_{\underline{k}} = zR_{\underline{k}} - C_{\underline{k}} = 0.$$

The second order conditions are:

$$(5) \quad H_{\underline{xx}} = zR_{\underline{xx}} - C_{\underline{xx}} < 0,$$

$$(6) \quad H_{\underline{kk}} = zR_{\underline{kk}} - C_{\underline{kk}} < 0,$$

and

$$(7) \quad H_{xk}^2 = (zR_{xk} - C_{xk})^2 < (zR_{xx} - C_{xx})(zR_{kk} - C_{kk}).$$

We now want to find the signs of $\frac{dx}{dz}$ and $\frac{dk}{dz}$. The differentiation of

(3) and (4) results in the following system of equations:

$$(8) \quad H_{xx} \frac{dx}{dz} + H_{xk} \frac{dk}{dz} = -R_x$$

$$(9) \quad H_{xk} \frac{dx}{dz} + H_{kk} \frac{dk}{dz} = -R_k,$$

with the determinant

$$(10) \quad D = \begin{vmatrix} H_{xx} & H_{xk} \\ H_{xk} & H_{kk} \end{vmatrix} = H_{xx}H_{kk} - H_{xk}^2 > 0$$

by second order conditions (7).

$$(11) \quad \frac{dx}{dz} = \frac{-R_x H_{kk} + R_k H_{xk}}{D},$$

$$(12) \quad \frac{dk}{dz} = \frac{-R_k H_{xx} + R_x H_{xk}}{D}.$$

Since we can readily assume that the firm operates in the region where $R_x > 0$, $R_k > 0$, while $H_{xx} < 0$, $H_{kk} < 0$ by (5) and (6), $\frac{dx}{dz} > 0$, $\frac{dk}{dz} > 0$ if $H_{xk} \geq 0$. Thus it only remains to explore the case when $H_{xk} < 0$. A change in the signs in (8) and (9) gives us two equations with all positive coefficients. We can immediately conclude that:

$$(12) \quad \text{if } \frac{dx}{dz} > 0, \quad \frac{dk}{dz} \begin{matrix} > \\ < \end{matrix} 0;$$

$$(13) \quad \text{if } \frac{dx}{dz} = 0, \quad \frac{dk}{dz} > 0;$$

$$(14) \quad \text{if } \frac{dx}{dz} < 0, \quad \frac{dk}{dz} > 0,$$

and by symmetry the same relations hold for $\frac{dx}{dz}$ as a function of $\frac{dk}{dz}$.

We should note that for either $\frac{dx}{dz} < 0$ or $\frac{dk}{dz} < 0$ the other derivative must be positive and large.

Propositions (12) - (14) can also be established by examining the second order conditions. This method would give us more restricted results, but on the whole it would hardly justify the effort and the space. It may be worth while to examine in detail just two cases, say when $\frac{dx}{dz} < 0$, or when $\frac{dk}{dz} < 0$ though the results will be expressed in such unfamiliar elasticities that, I suspect, they will add little to our understanding of the problem.

If $\frac{dx}{dz} < 0$, then from (11)

$$(15) \quad \frac{H_{xk}}{R_x} < \frac{H_{kk}}{R_k} .$$

From (15), (6) and (7)

$$(16) \quad \frac{zR_{xk}}{R_x} - \frac{C_{xk}}{R_x} < \frac{zR_{kk}}{R_k} - \frac{C_{kk}}{R_k} .$$

From (16), (3) and (4)

$$(17) \quad \frac{R_{xk}}{R_x} - \frac{C_{xk}}{C_x} < \frac{R_{kk}}{R_k} - \frac{C_{kk}}{C_k} .$$

Introducing the elasticity of $\underline{R_x}$ in respect to \underline{k}

$$(18) \quad E_{R_x}^k = \frac{\partial(R_x)}{\partial k} \cdot \frac{k}{R_x} = \frac{kR_{xk}}{R_x} ,$$

and using similar definitions for the other elasticities, we can express

(17) as

$$(19) \quad E_{R_x}^k - E_{C_x}^k < E_{R_k}^k - E_{C_k}^k$$

or as

$$(20) \quad E_{R_x}^k - E_{R_k}^k < E_{C_x}^k - E_{C_k}^k,$$

if $\frac{dx}{dz} < 0$.

Following the same procedure we can find that

$$(21) \quad E_{R_k}^x - E_{R_x}^x < E_{C_k}^x - E_{C_x}^x,$$

if $\frac{dx}{dz} < 0$.

While it is probable that $\frac{E_{C_x}^k}{x} > 0$ (because an improvement in quality should raise the marginal cost), $\frac{E_{C_k}^k}{k} > 0$ (because further quality improvements should be more expensive, and $\frac{E_{R_x}^x}{x} < 0$ (if demand elasticity declines to the right), I would not venture to predict on a priori grounds the signs of the other elasticities and particularly of the differences between them.

If we recollect that a $\frac{H_{xk}}{xk} \geq 0$ always yields $\frac{dx}{dz} > 0$, $\frac{dk}{dz} > 0$, and that only a large negative $\frac{H_{xk}}{xk}$ (subject to the second order restrictions) can give us $\frac{dx}{dz} < 0$ or $\frac{dk}{dz} < 0$, a negative effect of the subsidy either on quantity or on quality seems unlikely. But since we do not know the probabilities of each configuration it is best to leave the question open. It is possible that a subsidy can improve the quality to such an extent as to reduce the quantity, and vice versa (while exactly the opposite would be true of a tax). All this can happen, but I wonder if it has ever happened in reality?^{3/}

It is also possible that a subsidy may have an unexpected effect on price. For

$$(22) \quad \frac{dp}{dz} = p_x \frac{dx}{dz} + p_k \frac{dk}{dz} .$$

Assuming, as usual, that $p_x < 0$ and that $p_k > 0$, we find that only if $\frac{dx}{dz} > 0$, $\frac{dk}{dz} \leq 0$ (one of the "less probable" cases) will $\frac{dp}{dz}$ be definitely negative. If $\frac{dx}{dz} < 0$, $\frac{dk}{dz} > 0$, then $\frac{dp}{dz} > 0$, while in the supposedly most "common" case when $\frac{dx}{dz} > 0$, $\frac{dk}{dz} > 0$ the result is uncertain.

* * *

The introduction of quality as a decision variable may also cast some doubts on the welfare effects of our bonus scheme. No longer can we assert (abstracting from the complex general equilibrium considerations) that the bonus, even if set correctly, will increase social welfare by inducing the manager to move from the usual monopolistic position, point D on the diagrams of the earlier paper, to point A (of the same demand curve) where marginal cost equals price. All we can now claim is that, if quality changes, the manager will move from point D on the demand curve for products of one quality to point A on the demand curve for products of another quality. It is plausible that social welfare will increase, but it is not certain.^{4/}

NOTES

* This paper was prompted by a question raised by one of my graduate students in the Seminar on Economic Development at La Trobe University in Melbourne (June-August, 1974) whether my bonus scheme (see note 1) might not lower the quality of output. Unfortunately, I do not remember who of the several students should be thanked for that.

I am very grateful to my colleague Professor Peter A. Diamond for his gentle guidance through some labyrinths of welfare economics. He is not to be held responsible, however, for any of my remaining mistakes.

I am also grateful to the National Science Foundation (Grant NSF-GS-2627) for its financial support.

1. "On the Optimal Compensation of a Socialist Manager", The Quarterly Journal of Economics, LXXXVIII (February 1974), 1-18.

2. That optimal value of z was the one which induced the manager to move to the point where marginal cost equaled price. Ibid., pp. 10, 16-17.

3. In the last few years there have appeared a number of articles on the effects of monopolization on the quality of output, most of them dealing with the durability of capital goods. For a bibliography see Richard W. Parks, "The Demand and Supply of Durable Goods and Durability", The American Economic Review, LXIV (March 1974), 37-55. It seems that the results of that discussion have been rather inconclusive. See also an unpublished paper by Michael Spence, "Product Selection, Fixed Costs and Monopolistic Competition" (1974).

4. I have not proved yet that changes in quality will not affect the convergence of the iterative process (the "Simple Rule") described in the Mathematical Appendix of the earlier paper.

BASEMENT

Date Due

OCT 14 '76	JUN 6 '76	
OCT 14 '76	DEC 4 '78	
JAN 04 '77	DEC 07 '78	
MAR 17 '77	JAN 04 '80	
	JAN 15 1980	
	JUN 11 1980	
MAY 20 '77	1861 9 0 1774	
JUN 1 '77	JUL 9 '84	
JUL 6 '77	DEC 13 1986	
MAY 29 '77	AG 10 '89	
DEC 29 '77		Lib-26-67



3 9080 003 960 082

HB31.M415 no.153

Fisher, Frankl/The stability of genera
724529 D*BKS 00174197

3 9080 002 568 712

T-J5 E19 w no.154

Kindleberger, /Commercial expansion an
724542 D*BKS 00009761

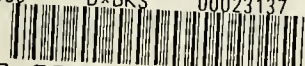
3 9080 000 523 669

HB31.M415 no.155

Joskow, Paul L/The future of the U.S.
725160 D*BKS 00023133

3 9080 000 689 379

HB31.M415 no.156

Domar, Evsey D/The effect of a proport
725159 D*BKS 00023137

3 9080 000 689 460

HB31.M415 no.157

Bhagwati, Jagd/Devaluation in a small
724537 D*BKS 00023134

3 9080 000 689 395

HB31.M415 no.158

Bhagwati, Jagd/Welfare-theoretical ana
724545 D*BKS 00023135

3 9080 000 689 411

HB31.M415 no.159

Bhagwati, Jagd/Education in a "job lad
725449 D*BKS 00019893

3 9080 000 646 437

HB31.M415 no.160

Bradbury, Kath/Simultaneous estimation
725446 D*BKS 00023132

3 9080 000 689 338

