The Harberger Triangle Re-Visited Re-Visited

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Study	Subject	Welfare Loss
Harberger (1954)	Monopoly	0.07% US GNP
Schwartzman (1960)	Monopoly	0.01% US GNP
Scitovsky (1958)	E.C. Tariffs	0.05% EC GNP

"Unless there is a thorough theoretical re-examination of the validity of the tools upon which these studies are founded ... someone will inevitably conclude that economics has ceased to be important" (Mundell 1962).

Introduction

Ryan and O'Sullivan considered the welfare costs of monopoly in the 1991 edition of the *Review*. The purpose of this note is to extend their analysis of the Harberger study by consistently applying profit maximising behaviour on the part of the monopolist, and by this means it will be suggested that Harberger's results, when recalculated, are more appealing than at first sight. It will be argued that Mundell can rest easily.

How Harberger upset Mundell

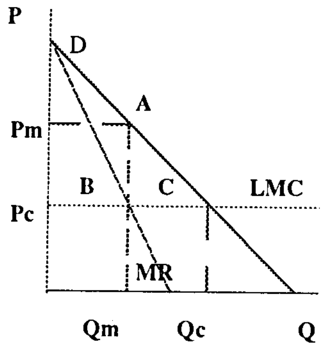

Figure 1

As in the 1991 article, the situation in which a monopolist and a perfect competitor face identical and constant costs in the long run is depicted.

The authors then allow a perfect competitor, with no market power, to maximise profits setting AR = LMC, producing Qc at a price Pc. Thus no supernormal profits exist, and net surplus (producer surplus plus consumer surplus, NS) = consumer surplus (CS) = DPcC, the social optimum.

The monopolist, however, does have market power, and by setting LMC = MR he produces Qm at a price Pm, restricting output, raising price, and generating PS (producer surplus), supernormal profit, π = PmABPc. CS is reduced to PmAD.

In summary, NSm (net surplus under monopoly) + ABC = NSc, (net surplus under competition) where ABC is the famous Harberger Triangle, the deadweight loss (DWL).

Given assumptions of demand curve linearity and constant long run marginal cost, Harberger argued that:

$DWL \sim ABC$
$= 1/2.dP.dQ$
$= 1/2.dP.dQ/dP.dP$
$= 1/2[(dP)^2/P].[dQ/dP.P/Q].Q$
due to linearity
$= 1/2[(dP)^2/P].\varepsilon.P.Q/P$,
in the limit
$\Rightarrow$ $ABC = 1/2(dP/P)^2.\varepsilon.P.Q$

where $\varepsilon = (\delta Q/\delta P.P/Q)$ is the point home price elasticity of demand. This is where the 1991 article left off.

One of Harberger's assumptions was to let P=Pm, Q=Qm, thus:

$dP/P = r = (Pm-Pc)/Pm$, and multiplying above and below by Qm yields:

$$r = (Pm.Qm-TC)/Pm.Qm$$
$$= \pi/TR$$

thus $ABC = 1/2.r^2.\varepsilon.TR$
$= 1/2.\pi^2.\varepsilon/TR$

It was from this equation, setting $\varepsilon = 1$ (its minimum possible value, and a serious underestimate), that Harberger calculated the cost of monopoly to be 0.07% of US GNP thereby puzzling overcharged consumers, annoying Mundell, and upsetting the career plans of potential Monopolies Commission employees.

Some Solace for Mundell

What should be argued is that in order for the ABC to be identified as a deadweight loss in the first place, we assumed, controversially, that the monopolist was a profit maximiser who set LMC = MR. If we consistently apply this assumption, then his objective function is given by (arbitrarily choosing quantity as the choice parameter):

$\pi(Q) = P(Q).Q - C(Q).Q$
$\Rightarrow \pi(Q) = TR(Q) - TC(Q)$
Maximising,
$\delta\pi(Q)/\delta Q$
$= \delta TR(Q)/\delta Q - \delta TC(Q)/\delta Q = 0$
$\Rightarrow P(Q) + Q.P'(Q) - C'(Q) = 0$
i.e. $MR = P + Q.\delta P/\delta Q$,
and $\delta P/\delta Q < 0$, thus $MR < AR = P$.
{NB: under competition,
$\delta P/\delta Q = 0$, giving MR = AR = P}
at π max MC = MR
$\Rightarrow MC = P + Q.\delta P/\delta Q$
$= P(1 + Q/P.\delta P/\delta Q)$
$= P(1 + 1/\varepsilon)$
or $MC = P(1 - 1/|\varepsilon|)$, the inverse elasticity rule,
$\Rightarrow (P-MC)/P = 1/|\varepsilon|$, the Lerner index of monopoly power.

Note that we can easily see that in the limit, (P-MC)/P -> 0; i.e. the more elastic is demand, the less is monopoly power. Now, (P-MC)/P = dP/P = r, => $|\varepsilon| = 1/r$, so referring back to Harberger,

$$ABC = 1/2.r^2.\varepsilon.P.Q$$

and by substitution for ε,

$$\begin{aligned} ABC &= -1/2.r^2.1/r.P.Q \\ &= -1/2.P.Q.r \\ &= -1/2.P.Q.\pi/TR \\ \Rightarrow \quad ABC &= -1/2.\pi. \end{aligned}$$

Thus by consistent application of the original assumption of profit maximising behaviour on the part of the monopolist, an assumption that was originally necessary to identify ABC as the deadweight loss, we have arrived at an estimation for DWL = $1/2.\pi$, and using Harberger's original data, this would have yielded DWL ~ 4% US GNP.

It should be noted that having dispensed with the necessity to make an assumption about the magnitude of ε, we have overcome any argument as to exactly how much an underestimate was Harberger's original estimate of $|\varepsilon|=1$.

Conclusion

Underlying Harberger's famous 1954 study are a number of dodgy assumptions. These are discussed in Ryan and Sullivan's 1991 *Review* essay. What has been shown in this short note is that by applying the assumption of profit maximising behaviour on the part of the monopolist consistently, Harberger's original estimate of welfare loss due to the presence of monopolies in a society is greatly modified.