Economics Discussion Papers
The Open-Access, Open-Assessment E-Journal

Discussion Paper 2008-28
September 24, 2008

Perfecting Imperfect Competition

Goetz Seißer

Maastricht University

Abstract:

This paper addresses the reduction of market failure under imperfect competition. It proposes a tax-scheme that provides firms with an incentive to forgo their market power: Firms optimize after-tax profits. Now simply consider a firm's gross profit margin the unique tax-rate it is charged on absolute profits. In theory the firm's tax-rate would be the mark-up over marginal costs, the firm's Lerner index. As a result every firm determines its own tax-rate by setting its price and incurring costs. This creates a new trade off for firms between a low tax-burden and the exercising of market power. Welfare for society increases since firms with market power choose a lower price and produce a quantity closer or equal to social optimum; at the original monopolistic price-level they can increase their profits by lowering their tax-burden. Essentially the tax-condition does not seem to distort profit incentives or markets; under perfect competition the tax-rate would be zero. Thus, it is clear that the tax only takes effect when markets work inefficiently and its countervailing nature subsequently helps to remedy inefficiencies of imperfectly competitive markets.

JEL: D00, D21, D40, H21, H25, H26, P11.
Keywords: Imperfect competition; market power; tax-condition; monopoly; welfare; efficiency

Correspondence: gseisser@googlemail.com

The author is indebted to Drs. Christian Kerckhoffs for his help with the partial equillibrium analysis.

Introduction

The main motivation for this paper is the problem of market power and the inefficiencies associated with it. If the real-world economy would resemble the theory of perfectly competitive markets nobody would have confused the pursuit of profits with exploitation. However, in reality competition is imperfect. Market power is the ability of a firm to affect the price in its market. Maximizing profits, firms with market power choose a higher price and produce a lower quantity than socially desirable. Government regulation or even central planning distort markets; they cripple the incentive that pushes people to employ resources efficiently and spurs innovation in the first place: the pursuit of profits. Moreover, due to economies of scale or patents, for example, monopolistic structures are often economically sensible. Hence, neither government intervention nor competition alone provide for a satisfactory answer to the problem of using resources in the most economic manner possible. If anything, this paper hopes to encourage thinking that doesn't take this kind of market failure as an irrevocable fact and trusts in our capabilities to do better. Everyone would gain from more rational behaviour, including monopolies. Just consider pharmaceutical industries which spend twice as much on marketing than on research and development (Gagnon & Lexchin, 2008). The pharmaceutical industry saves millions of lives and is of particularly important service to society. Monopolies certainly don't behave in a wasteful and inefficient manner by malicious intent but act within the framework shaped by policy makers and not least the work of economists.

The paper aims to introduce a tax-scheme which provides agents in markets with imperfect competition with an incentive to behave more economically. I will carefully explain the intended mechanism to achieve this and illustrate its theoretical application in a partial equilibrium analysis. Afterwards I will discuss the relevance of further research and implementation of the scheme by policy makers.

The Tax-Condition

First of all, I intend to develop a common understanding of the new taxing principle used in this paper. The tax-rate τ is determined by the following condition:

$$\tau = \frac{Price - Marginal\ Costs}{Price} \qquad (1)$$

The following table visualizes how the tax-rate is given by each firm's individual price-cost-ratio:

Table 1: Tax-condition example

	Price	**Cost**	**Pre-Tax Profit**	**Tax-Rate**	**After-Tax Profit**
Firm A	**3 €**	**2 €**	**1 €**	**33%**	**0,67 €**
Firm B	**4 €**	**2 €**	**2 €**	**50%**	**1 €**

Or in reality, the gross profit margin widely used in income statements seems appropriate to consider and may be more straightforward than above ratio. Evidently, a firm's individual tax-rate is directly derived from its books. This allows the firm to control its own tax-rate if it is a price-setter. Otherwise it would operate in a perfectly competitive environment where price equals marginal costs and the tax-rate is consequently zero. The condition is known to the firm in advance. Cost's are calculable, unexpectedly higher costs would lead to a corresponding tax relief. I assume that agents understand the dynamics and are able to maximize after-tax profits subject to it. The tax burden caused by my scheme is firm-specific and may vary greatly. This is, however, very welcome since the tax-rate varies with inefficient pricing due to market power. Note how τ is equal to a measure of market power established by Abba Lerner (1934). The result is a reduction of market power and convergence of conditional tax-rates towards some low value (in an ideal world zero).

The aim of above tax-condition is to provide an incentive not to exercise market power. Firms maximize after-tax profits. Note that the condition leaves the determination of pre-tax profits and the break-even point untouched. The normal demand relation between price and quantity remains obviously valid. A lower price leads to a higher quantity demanded and different absolute profit. In addition, the firm's tax-rate is now given by its price and marginal costs. Thus, choosing a lower price lowers the firm's tax burden, which contributes to an increase in after-tax profits and vice versa. This will induce a firm to choose a lower price compared to unmitigated price-setting.

Consider a monopoly firm facing the linear inverse demand curve (2) and a total costs (3), where a, b and α are constants and F represents fixed costs:

$$D(Q) = a - b * Q \quad (2)$$
$$TC(Q) = \alpha * Q^2 + F \quad (3)$$

Marginal costs and average costs are accordingly:

$$MC = C'(Q) = 2\alpha Q \quad (4)$$

$$AC = \frac{C(Q)}{Q} = \alpha Q + \frac{F}{Q} \quad (5)$$

The model is plotted in Figure 1. A monopoly maximizes profit at Q_m where marginal revenue equals marginal cost. Welfare is measured in producer, consumer and government surplus. At the quantity Q_m the price consumers would be willing to pay exceeds the cost to produce it; the loss is the vertical distance between the demand curve D and the marginal cost curve MC. The gains in producer surplus from the higher monopoly price cannot compensate the losses due to lower productivity in consumer and producer surplus. This results in a dead weight loss to society as indicated by the grey triangle DWL. Welfare is maximized at Q_c where price equals marginal cost.

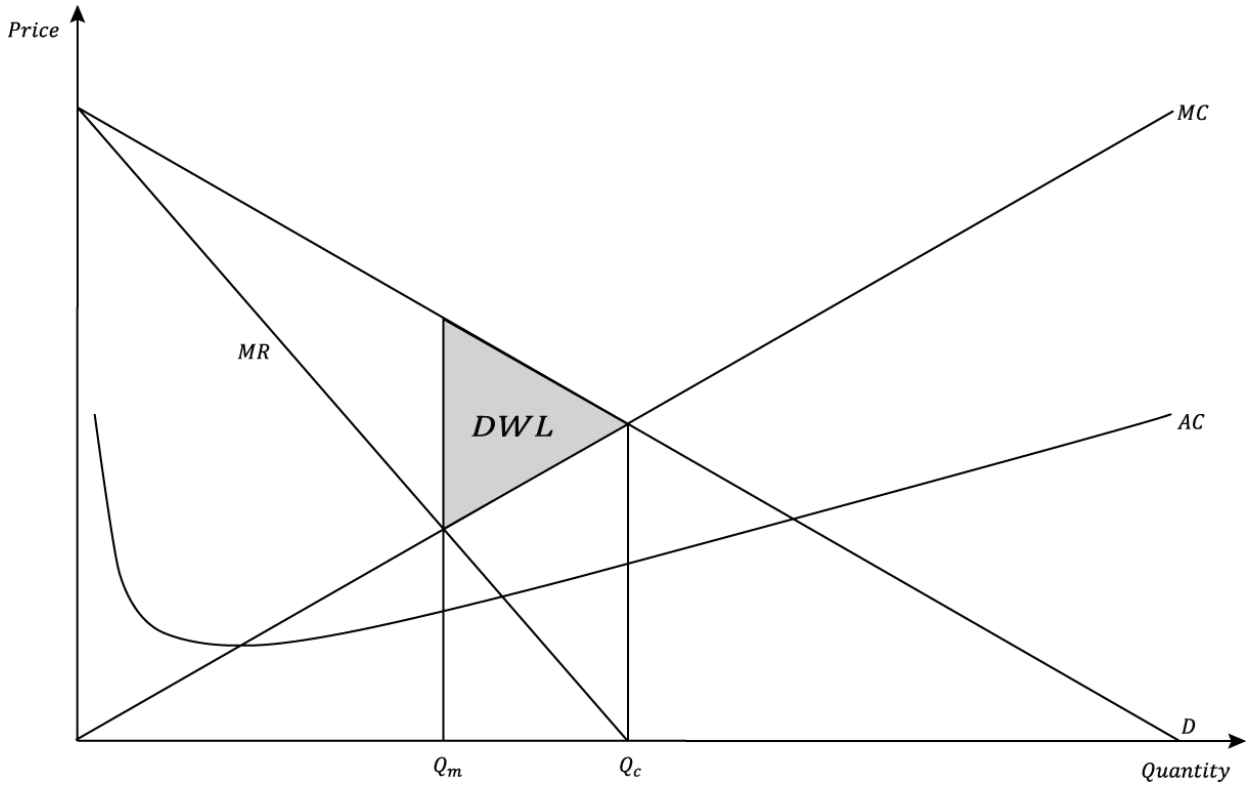

Figure 1

To understand the effect of the tax we have to examine the firm's profit function. The monopoly chooses the quantity which maximizes after tax-profits. The net profit function under the condition is given by:

$$\pi = \begin{cases} (1-\tau)(P(Q)*Q - TC(Q), & Q \leq Q_c \\ P(Q)*Q - TC(Q), & Q > Q_c \end{cases} \quad (6)$$

The normal outcome with $\tau = 0$ is plotted in Curve A of Figure 2. Profit is maximized where marginal profit is zero at Q_m. However, let us consider the tax-condition. Plugging in (1) yields:

$$\pi = \begin{cases} MC(Q)*Q - \dfrac{MC(Q)*TC(Q)}{P(Q)}, & Q \leq Q_c \\ P(Q)*Q - TC(Q), & Q > Q_c \end{cases} \quad (7)$$

(7) is continuous but not differentiable at Q_c. To determine the profit maximum we have to consider the derivative of profit for $Q \leq Q_c$:[1]

$$\pi' = \frac{MC'*P(P*Q-TC) + MC*P(P-MC) + P'*MC*TC}{P^2} \quad (8)$$

Profit is maximized at the quantity where π' is zero or maximized at Q_c if π' is positive. It is apparent that no general rule for the exact profit maximum can be inferred. It is specific to a firm's demand and cost functions. Nonetheless, we can consider a firm's behaviour at the original output Q_m as well as at the ideal case of a firm choosing to produce at Q_c in response to the tax-condition.

First, at Q_m marginal revenue equals marginal cost implying[2]

$$P'(Q_m) = \frac{MC(Q_m) - P(Q_m)}{Q_m} \quad (9)$$

Plugging (9) into (8) yields:

$$\pi'_{Q_m} = \frac{[MC'*P*Q + MC*(P-MC)]*(P-AC)}{P^2} \quad (10)$$

The denominator is positive. $P > 0; Q > 0; MC > 0$ hold by definition. At the monopoly output $P - MC > 0$ holds and we can assume the shutdown rule, $P - AC > 0$, is applicable, too. Thus, under the assumption $MC' \geq 0$ expression (10) is positive. MC' may even be somewhat negative while the whole of (10) remains positive. Still, in general it seems reasonable to expect rising or at

[1] Starting with: $\pi' = MC'(Q)*Q + MC(Q) - \frac{[MC'(Q)*TC(Q)+MC(Q)^2]P(Q)-P'(Q)*MC(Q)*TC(Q)}{P(Q)^2}$
We drop the Q-indexes for readability.

[2] $MR(Q_m) = MC(Q_m) \quad \Leftrightarrow \quad P(Q_m) + P'(Q_m)*Q_m = MC(Q_m)$

least constant marginal costs at the monopoly output. As a result of the tax-condition the firm will want to increase its output beyond Q_m. The firm can always increase after-tax profits at the monopoly quantity Q_m by lowering its price and producing a greater quantity. It will produce a quantity greater than Q_m up to social optimum Q_c.

Let us consider the socially optimal quantity Q_c where price equals marginal costs. Plugging $P = MC$ into (8) yields:

$$\pi'_{Q_c} = \frac{MC' * (P * Q - TC) + P' * TC}{p^2} \qquad (11)$$

If this term is positive or zero the monopoly maximizes profits at Q_c. While the first term in the numerator may be positive, under the assumption of rising marginal costs at Q_c, the second is certainly negative due to downward sloping demand. The optimal outcome may be facilitated by higher profits at the social optimum $(P * Q - TC)$, more upward sloping marginal costs (high MC') and more price-sensitive demand (low P'). However, only in special cases will the tax-condition lead to the same outcome for a monopoly as in perfect competition. Such a case is plotted in curve C.

Otherwise, the new optimum will end up somewhere in between Q_m and Q_c. For example, a natural monopoly producing at social optimum would lead to a shut down decision and the tax-condition can merely improve efficiency ($AC > MC$). Or in case of constant marginal costs the monopoly will always prefer a lower quantity than Q_c and accept some taxation.[3] Such an intermediate output decision is illustrated in Curve B. Tax revenue possibly incurred under the condition increases government revenue and contributes to social welfare.

Concluding the analysis, the tax-condition unambiguously advances welfare even if it does not necessarily maximize welfare as defined in the partial equilibrium framework used. Nonetheless the model suggests that welfare gains are substantial. Marginal dead weight loss is maximal at the monopoly output and decreasing with quantity. Thus, even if the efficient output is not fully attained the proportional reduction in dead weight loss tends to be large. Also the ability alone to achieve theoretical welfare maximum for a monopoly is remarkable. Although potential gains are largest for monopolies the condition's welfare improving character can be expected to remain valid for all degrees of competition up to perfect competition.

[3] π'_{Q_c} is always negative when marginal costs are constant ($MC' = 0$).

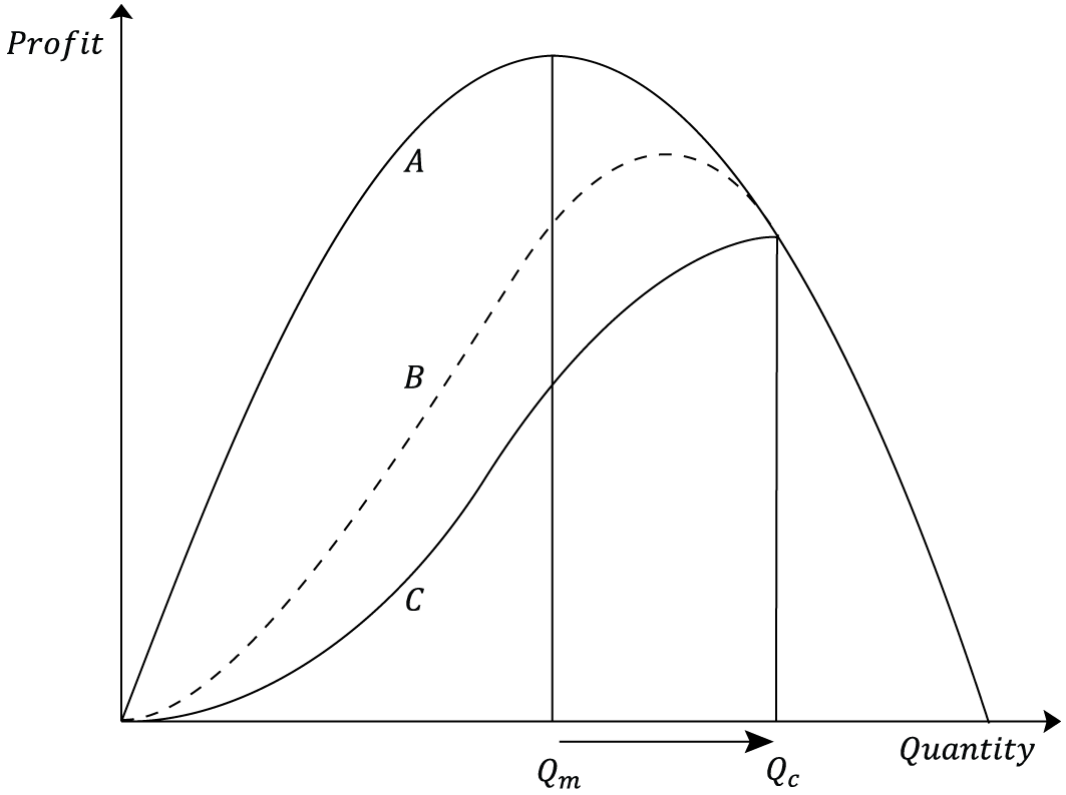

Figure 2

Applicability

This raises the question of whether economy-wide application of the tax-condition is advisable. It is beyond the scope of this paper to do justice to this question which should be approached with care and scrutiny. Notwithstanding the incompleteness of the effort I will discuss prerequisites for potential implementation. I address necessary research that may or may not bear out the basic proof-of-concept analysis conducted here; as well as the tax-condition's applicability for real-life policy makers.

First of all, the obvious question is whether theory will be borne out by reality. Do agents understand the taxing scheme? And how effectively are they able to maximize profits subject to the condition? Those questions can be answered experimentally. I would argue that there is a rather strong aversion to losing a portion of income because of taxation inherent to humans. The tax-condition uses this trait to encourage productivity so it seems plausible that agents will indeed be "conditioned" to behave more efficiently. Experiments as well as more complex economic and econometric analysis

can provide insight into whether or not market power can be reduced as substantially as my theoretical analysis suggests.

The next issue is how the scheme could be implemented by policy makers and what it entails for corporate taxation. Marginal costs are not observed directly in real life; nonetheless average variable costs are a viable proxy according to the literature (Marburger, 2008). However, reduced effectiveness due to practical inaccuracies is inevitable. Still, current accounting practices should allow for the implementation of the new scheme. Gross profit margin is an easily understood and widely used concept that seems appropriate to consider.

Another point that has to be taken into account is the possibility to alter the impact of the tax-condition with a simple modifier.[4] A constant factor multiplied with the condition changes the firm's net profit function. With $m < 1$ it is altered towards the original profit function A in figure 2, introducing a rate cap and reducing efficiency gains. Conversely a more extreme shape with a maximum closer to social optimum but higher tax impact is possible. It may be a useful tool in actual policy making. The condition can be adjusted to actual demand and cost curves to increase efficiency and its impact can be softened or strengthened. Furthermore, there is no reason to believe that the condition isn't fully compatible with traditional taxation schemes. Although it may provide some government revenue without directly causing a dead weight loss like traditional taxes governments should not rely on it as a source of income; due to potential conflicts of interest and fluctuations that can be expected. Its purpose lies solely within the reduction of market power. After all, it should be clear that the less tax-income the condition raises the more effectively it achieves its goal of reducing market power.

Something the tax-condition shares with normal taxation is the problem of tax evasion and cheating. Moreover, it certainly exacerbates the problem and increases the tax gap, the difference between taxes owed and actually paid. According to the American IRS "the largest component of the tax gap comes from understated business income, including underreported receipts and overstated expenses" (2006). The tax-condition would further increase the incentive to illegally cheat tax-authorities since above misconduct may also reduce the conditional tax-rate. The condition's effectiveness clearly depends on the ability of institutions to enforce it; when taxation and actual market behaviour are not aligned it will not enhance productivity.

Does the incentive to minimize fixed cost expenses and limited profit margins discourage high fixed cost ventures, research and development? It is difficult to predict actual behaviour. However, the

[4] $\tau = m * \frac{P-MC}{P}$

tax-condition does not directly interfere with the breakeven point; only the portion of fixed costs which rises in relation to output will do so accordingly. Fixed cost expense and conditional tax-impact differences under the condition can be expected between sectors rather than between competitors. As long as demand supports profitable production along with fixed investment, research and other necessary fixed expenses there is no reason to believe that this demand will not be met under the condition. Currently, likewise only profitable investments are undertaken and excessive profits flow out of the firm.

A substantial reduction in market power would unarguably bring about important macroeconomic consequences. One would expect an increase in the natural rate of output and a reduction in the natural rate of unemployment. Inefficiencies generally associated with market power are quite significant. However, it is important to become aware of all aspects of the new scheme; possible hidden costs like above mentioned tax-evasion but equally potential positive effects like reduced downward price rigidity.

Conclusion

To conclude, market power is a most characteristic and defining aspect of capitalism. Moving towards an economic system that is able to produce goods efficiently regardless of the competitive environment promises great gains on all levels of society. Consequently we have much to learn. The question of efficiency obviously encompasses much more than mere competition. This paper puts forward a tax-condition that applies a price-cost ratio as a dynamic, individual tax-rate. It discourages firms from fully exercising their market power and facilitates a market outcome closer to social optimum. Essentially, the firm's ability to affect its own tax-rate leads to a more rational use of resources. Eventual application by policy-makers seems feasible although inaccuracies in establishing marginal costs and increased tax-evasion will be disadvantageous. The analysis in this paper serves the purpose of demonstrating the basic concept of a conditional tax-rate. Its conclusions ought to be verified in experiments and further research into its ability to contribute towards the "perfection" of imperfect competition is warranted.

References

Gagnon, M.-A., & Lexchin, J. (2008). The Cost of Pushing Pills: A New Estimate of Pharmaceutical Promotion Expenditures in the United States. *PLoS Med 5(1)* , e1 doi:10.1371/journal.pmed.0050001.

Internal Revenue Service, US Department of Treasury. (2006, July). *Cost of Goods Sold and the Tax Gap, Fact Sheet 2006-23*. Retrieved July 26, 2008, from http://www.irs.gov/newsroom/article/0,,id=160515,00.html

Lerner, A. P. (1934). The Concept of Monopoly and the Measurement of Monopoly Power. *The Review of Economic Studies* , pp. 157-175. http://www.jstor.org/stable/2967480?origin=JSTOR-pdf

Marburger, D. R. (2008, May). Reconciling Cost Theory with Cost Accounting Practices. Available at SSRN: http://ssrn.com/abstract=1138851.

Please note:

You are most sincerely encouraged to participate in the open assessment of this discussion paper. You can do so by posting your comments.

Please go to:

http://www.economics-ejournal.org/economics/discussionpapers/2008-28

The Editor