Capital Income Taxation with Imperfect Competition

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A key feature of modern dynamic economies is imperfect competition. Some imperfect competition is due to institutions such as patents and copyrights that allow firms to exercise market power over the sale of products they invent. Some imperfect competition is due to various forms of increasing returns to scale and product differentiation. Since market power is an essential feature of innovation and growth in the "new economy" (as it was in the "old economy") we need to know how imperfect competition affects the conventional wisdom on tax policy. We argue that it has particularly striking implications for the taxation of capital.

The current consensus among economists is that investment should be lightly taxed with most tax revenues coming from labor and consumption taxation; see Kenneth L. Judd (1999) for a discussion of this literature. These analyses assume perfect competition in all markets. Even though imperfect competition is common, economists generally prefer competitive models since analyses with imperfect competition usually get mired in strategic details

and seldom produce robust implications. However, recent work on imperfect competition and taxation makes the surprising claim that the presence of imperfect competition strengthens the case against capital income taxation. In fact, the optimal tax on capital may well be negative in an imperfectly competitive economy! Even if a fully optimal tax policy is impractical to implement, imperfect competition considerations substantially strengthen the case for moving away from income taxation and towards consumption taxation. This paper reviews the basic ideas which lead to these conclusions.

I. Dynamic Distortions from Factor Income Taxation

Factor income taxation in dynamic models is a special case of commodity taxation and applying basic ideas from commodity tax theory shows why capital income should not be taxed in the long run. We take the Arrow-Debreu approach to intertemporal general equilibrium by viewing consumption and leisure at different dates as different goods. With this view, we can examine the pattern of distortions across consumption and leisure at various dates caused by income taxation. For example, if we save some money at time 0 for consumption at time t, then a tax on investment income between time 0 and t essentially taxes consumption at time t. Suppose r is the before-tax interest rate, τ_K the interest tax rate, τ_L the wage tax rate, and τ_c the consumption tax rate. The social cost of one unit of consumption at time t in units of the time 0 good is $(1 + r)^{-t}$ and the after-tax price is $(1 + (1 - \tau_K)r)^{-t}$. This implies that $MRS(c_0, c_t)$, the marginal rate of substitution between time 0 consumption and time t consumption, is different from $MRT(c_0, c_t)$, the corresponding marginal rate of transformation. Their ratio expresses the tax

distortion and equals

$$\frac{MRS(c_0, c_t)}{MRT(c_0, c_t)} = \left(\frac{1+r}{1+(1-\tau_K)r}\right)^t \tag{1}$$

This distortion is the same as if the only tax were a consumption tax at time t equal to

$$\tau_c^* = \left(\frac{1+r}{1+(1-\tau_K)r}\right)^t - 1 \tag{2}$$

Equation (2) shows that the commodity tax equivalent is exploding exponentially in time! Neither wage nor consumption taxation contributes to the disortion in (1). Labor and consumption taxation affect the distortion between time s consumption and time t leisure, which is

$$\frac{MRS(c_s, \ell_t)}{MRT(c_s, \ell_t)} = \left(\frac{1-\tau_L}{1+\tau_c}\right)\left(\frac{1+r}{1+(1-\tau_K)r}\right)^{t-s} \tag{3}$$

Equation (3) shows that the consumption-leisure distortions also grow over time, but only because of asset income taxation, not because of wage or consumption taxation.

These exploding distortions violate the prescriptions of commodity tax theory (see, e.g., Anthony Atkinson and Joseph Stiglitz, 1972) unless the related elasticities of demand for consumption and leisure fall at a similar exponential rate, a hypothesis lacking empirical support. Since these exploding distortions are due only to capital income taxation, we can eliminate them by setting τ_K equal to zero in the long run. This simple intuition lies behind the various results arguing for zero long-run taxation of capital; see Judd (1985, 1999) for formal statements and analyses. This analysis of factor tax distortions also gives us the intuition for understanding taxation in an imperfectly competitive world.

II. Empirical Evidence on Imperfect Competition

The empirical liteature shows that markups are economically significant and similar in magnitude to tax rates. For example, Elie Appelbaum (1982) estimates price-cost margins of around 20% for many capital goods. Ian Domowitz, R. Glenn Hubbard, and Bruce C. Petersen. (1988) find that price-cost margins in the equipment sectors are substantial in size, lying generally between 15% and 40%. These are significant deviations of price over marginal cost for our purposes since even a 10% markup on a capital good is equivalent to a 10% income tax on its return.

We do not need to rely only on empirical estimates of price–cost margins for evidence of imperfect competition. Fixed costs for many capital goods are large. For example, R&D expenditures equalled 9.2% of sales for machinery and 4.7% for electrical equipment in 1990 (see F. M. Scherer, 1980). Learning curves also produce increasing returns to scale which act essentially as a fixed cost. Unless firms face long-run decreasing returns to scale, an unlikely condition, these high fixed costs imply that price must exceed marginal cost. These considerations plus a conservative estimate of other sources of economies of scale and long–run fixed costs indicate that imperfect competition produces distortions comparable to taxation.

III. Imperfect Competition and Taxation

The distortions due to taxes levied by governments and markups charged by firms are similar since both push the buyer's price above the social marginal cost. Suppose a firm pays $1+m$ for capital that has social cost 1 to produce, and that the marginal product of capital is MPK. If the firm's owners pay a tax τ_K on the earnings from this investment and require an after-tax return

of $\bar{r}$ then the level of investment is determined by

$$MPK = \bar{r}\frac{1+m}{1-\tau_K} \tag{4}$$

If $m = 0$, (4) is the usual cost of capital formula. The situation in (4) is equivalent to the case of a zero markup and τ_K equal to τ_K^* where

$$\tau_K^* = 1 - \frac{1-\tau_K}{1+m} = \tau_K + \frac{m}{1+m}\left(1-\tau_K\right) \tag{5}$$

The concept of effective total tax in (5) shows how taxation and imperfect competition combine. Labor markets may be imperfectly competitive due to unionization and consumption good markets may also be imperfectly competitive. However, union premia are similar to labor income taxation and markups on consumption goods are similar to consumption taxes, both producing distortions like those in (3).

IV. Optimal Tax Policy

Joan Robinson (1934) noted that markups and taxes were similar and suggested that tax policy could use subsidies to bring buyer price down to social marginal cost. Robinson ultimately rejected this argument since such subsidies would likely increase profits and worsen income distribution. Even if we ignore income distribution, there is still a serious problem with using subsidies to neutralize markups. The subsidies would require substantial revenues since few goods (if any) have negative markups. The optimal policy would have to tax some goods sold above marginal cost in order to provide markup-reducing subsidies for other goods.

While it may appear difficult to choose which distortions to reduce and which to increase, we argue that consumption and wage income should be

taxed to finance subsidies to capital goods produced by imperfectly competitive firms, *even if all goods are produced in imperfectly competitive markets.* It is intuitively clear how our earlier arguments apply. Since markups on capital goods distort investment just as asset income taxes do, they combine to produce exploding distortions like those displayed in (1) and (3). While labor markets may also be imperfectly competitive due to unionization, union markups are similar to labor income taxation and do not create exploding distortions between social and private costs. Therefore, the exploding distortions due to markups in the capital market should be reduced with subsidies even if the necessary revenues use taxes which increase the more uniform distortions in labor and consumption distortions. This holds even when all markets suffer from imperfect competition because the exploding distortions in the capital market will eventually overwhelm the uniform distortions elsewhere.

We need a complete general equilibrium model before we can trust these intuitive arguments. Judd (1997) examines a simple model that formally establishes our arguments. It makes a few key assumptions. First, there is a fixed number of goods, each of which is produced by a monopolistically competitive firm. Each differentiated good is consumed and each good is used to create a differentiated capital good used in the production of all goods. Judd (1997) uses a representative agent model with elastic labor supply. All taxes are distortionary.

The formal result depends on the taxation of pure profits and the distortionary cost of taxation. If pure profits are taxed at rate τ_Π, Judd (1997)

shows that the long-run optimal choice for τ_K is

$$\tau_K^{opt} = -m\frac{1 + \tau_\Pi\ MEB}{1 + MEB} \tag{6}$$

where m is the markup of price over marginal cost and MEB is the marginal excess burden of taxation. These subsidies are financed by labor and consumption taxation, as are all other revenue needs.

Some special cases produce the implications of our simple intuition. If $MEB = 0$ (i.e., the marginal source of revenue is equivalent to a lump-sum tax) then the optimal tax $\tau_K^{opt} = -m$ is a subsidy that completely neutralizes the monopolistic price distortion. This repeats the Robinson argument, but only for capital goods since taxes on consumption and/or wages must be positive. The optimal tax rate on pure profits, τ_Π, is 100%, and in that case the optimal policy eliminates the monopolistic price distortion even if MEB is large. These special cases are not realistic, but the results are similar when we assume plausible values for m, τ_Π, and MEB. For example, if $m \in [.0, .3]$ and $MEB \in [.0, 1.0]$ then the optimal tax eliminates most of the margin m even if $\tau_\Pi = 0$. Furthermore, the optimal subsidy in empirically plausible cases is usually as large or larger than the investment tax credit (ITC) between 1964 and 1986. The optimal subsidies are economically significant for tax policy considerations.

These results are intuitive but they differ substantially from the conventional wisdom on taxation and imperfect competition. For example, Alan J. Auerbach and James R. Hines, Jr. (2001, p. 59) in their survey of optimal taxation present the Robinson argument, but assert "other policy instruments (such as antitrust enforcement) are also typically available and may be more cost-effective at correcting the problem." This view of imperfect

competition has no support in the industrial organization literature. In particular, there is no evidence that most, or even a substantial part, of pricing above marginal cost is related to violations of antitrust law. Furthermore, the purpose of patent and copyright law is to grant an innovator the ability to charge prices in excess of production costs. If a firm is using intellectual property rights in a legal fashion, it is hard to think of any policy instrument other than taxation which could alleviate the distortions due to imperfect competition.

Even Robinson dismissed this approach as impractical. The fully optimal tax policy may be too complex, but it provides guidance about priorities for tax policy. The key tax result in Judd (1997) says that we should subsidize only capital goods and impose taxes on other goods even if they were produced in imperfectly competitive markets. The simple version of Robinson's argument ignores the distinction capital goods and consumption goods. When we distinguish between investment and consumption we arrive at a more useful and robust case for tax policy intervention in some imperfectly competitive markets.

V. Imperfect Competition and the Benefits of Tax Reform

Full implementation of the optimal tax policy may be impractical but these results strengthen the case for limited tax reforms. For example, many writers, such as Robert Hall and Alvin Rabushka (1984), advocate a switch from income taxation to consumption taxation. Many analyses show that this reform would result in greater economic efficiency. The inclusion of imperfect competition substantially reinforces these arguments, qualitatively and quantitatively. The intuition is clear. In a competitive model, changing

from an income tax to a consumption tax causes the effective tax rate on capital to fall from τ_K to 0. By the conventional rule of thumb, the efficiency gain from tax reform would be (proportional to) τ_K^2 if capital goods markets were perfectly competitive. Since price-cost margins are essentially the same as taxes, a margin of m on capital goods implies that the total distortion is $\tau_K + m$. Consumption tax reform would cause the joint deadweight loss from taxation and imperfect competition to change from $(\tau_K + m)^2$ to m^2, a gain of $\tau_K^2 + 2m\tau_K$. If m and τ_K are of comparable magnitude then the gain from consumption taxation is about three times the estimated gain under the assumption of perfect competition. Judd (2001) demonstrates this more precisely in a simple model.

The optimal policy would be difficult to carry out given our imprecise knowledge of markups, and we do not advocate any attempt to do so. Our argument for consumption tax reform uses the optimal tax results in a very limited way. Capital market distortions arising from imperfect competition create exploding distortions in intertemporal allocations. If it would be optimal to reduce price-cost margins for capital goods, then it is surely not a good idea to impose capital income taxes which further aggravate distortions in intertemporal allocations.

Even if major reform is not possible, imperfect competition affects our estimation of the benefits from marginal changes. Using a competitive model, Judd (1987) showed that the marginal excess burden of capital income taxation was higher than that of wage taxation, and that increases in the ITC could even be revenue enhancing and Pareto improving. The presence of imperfect taxation in factor markets increases the relative benefits of reducing

capital income taxation even when it requires an increase in consumption and wage taxation. Even modest estimates of price-cost margins substantially increase the likelihood that an ITC increase enhances revenues and welfare for all.

One problem with consumption tax reform is that some older individuals may lose during the transition. Older investors may not live long enough to benefit from the efficiency gains and, in the short run, their assets may fall in value since the price of new capital relative to consumption falls. Imperfect competition in product markets blunts these adverse effects. The economic growth effects of consumption tax reform will allow monopolistically competitive firms to earn a rent on new sales since price exceeds marginal cost. This new profit flow will continue until entry of new firms eliminates these profits. However, the present value of all new rents, current and future, will be immediately capitalized in the market value of the old firms, allowing older investors to reap some of the gains from tax reform.

VII. Conclusion

Many economists argue that there are large long-run gains from reducing the tax burden on new investment. These arguments typically assume competitive factor and goods markets. When we consider imperfect competition the case for reducing the tax burden on capital is substantially strengthened since the estimated gains are larger and the range of Pareto-improving policies is greater.

References

Auerbach, Alan J., and Hines, James R., Jr. "Taxation and Economic Efficiency," NBER Working Paper No. 8181, March, 2001.

Appelbaum, Elie. "The Estimation of the Degree of Oligopoly Power," Journal of Econometrics, 1982, 19(2-3), pp. 287–299.

Atkinson, Anthony, and Stiglitz, Joseph. "The Structure of Indirect Taxation and Economic Efficiency" Journal of Public Economics, April 1972, 1(1), pp. 97–119.

Domowitz, Ian; Hubbard, R. Glenn, and Petersen, Bruce C. "Business Cycles and the Relationship between Concentration and Price-Cost Margins," Rand Journal of Economics, 1986,17 (Spring), pp. 1–17.

Hall, Robert E. and Rabushka, Alvin. Low Tax, Simple Tax, Flat Tax, New York: McGraw Hill, 1983.

Judd, Kenneth L. "Redistributive Taxation in a Simple Perfect Foresight Model," Journal of Public Economics, October, 1985, 28(1), pp. 59–83.

————. "The Welfare Cost of Factor Taxation in a Perfect Foresight Model," Journal of Political Economy, August, 1987, 95(4), pp. 675-709.

————. "The Optimal Tax on Capital Income is Negative," NBER Working Paper No. 6004, April, 1997.

————. "Optimal Taxation and Spending in General Competitive Growth Models," Journal of Public Economics 1999, 71(1), pp.1-26.

————. "The Impact of Tax Reform in Modern Dynamic Economies", in Kevin A. Hassett and R. Glenn Hubbard, eds., Transition Costs of Fundamental Tax Reform Washington, D.C.: AEI Press, 2001, pp. 5-53.

Robinson, Joan. The Economics of Imperfect Competition, London:

MacMillan, 1933.

Scherer, F. M. <u>Industrial Market Structure and Economic Performance</u>, (Second Edition), Chicago: Rand McNally, 1980.

Diamond, Paul A. and Mirrlees, James A. "Optimal Taxation and Public Production: I–Production Efficiency," <u>American Economic Review</u>, March 1971, <u>61</u>(1), pp. 8-27.

Feldstein, Martin S. "The Rate of Return, Taxation and Personal Savings," <u>Economic Journal</u> 1978, <u>88</u>(351), pp. 482-487.

References

Scherer, F. M., *Industrial Market Structure and Economic Performance,* (Second Edition), Rand McNally: Chicago (1980).