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. I 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 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 toward consumption taxation. This paper reviews the basic ideas that lead to these conclusions.

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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. I take the Arrow-Debreu approach to intertemporal general equilibrium by viewing consumption and leisure at different dates as different goods. With this view, one can examine the pattern of distortions across consumption and leisure at various dates caused by income taxation. For example, if one saves 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 $\text{MRS}(c_0, c_t)$, the marginal rate of substitution between time-0 consumption and time-t consumption, is different from $\text{MRT}(c_0, c_t)$, the corresponding marginal rate of transformation. Their ratio expresses the tax distortion and equals

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

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

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

Equation (2) shows that the commodity-tax equivalent is exploding exponentially in time! Neither wage nor consumption taxation contributes to the distortion in (1). Labor and consumption taxation affect the distortion

between time-s consumption and time-t leisure, which is

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

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, one 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 provides the intuition for understanding taxation in an imperfectly competitive world.

II. Empirical Evidence on Imperfect Competition

The empirical literature 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 percent for many capital goods. Ian Domowitz et al. (1986) find that price–cost margins in the equipment sectors are substantial in size, lying generally between 15 and 40 percent. These are significant deviations of price over marginal cost for our purposes since even a 10-percent markup on a capital good is equivalent to a 10-percent 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 percent of sales for machinery and 4.7 percent 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

(4)
$$\text{MPK} = \bar{r}\,\frac{1 + m}{1 - \tau_K}.$$

If $m = 0$, equation (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

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

The concept of effective total tax in equation (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 equation (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 one ignores 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, I 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 the 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 equations (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 that 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 my 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

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

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 the 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 percent, 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 I assume plausible values for m, τ_{Π}, and MEB. For example, if $m \in [0.0, 0.3]$ and MEB $\in$ [0.0, 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, in their survey of optimal taxation, Alan J. Auerbach and James R. Hines, Jr. (2001 p. 59) present the Robinson argument but assert that "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 government 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 between capital goods and consumption goods. When one distinguishes between investment and consumption, one arrives 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 (1983), 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 I do not advocate any attempt to do so. My 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 the 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.

VI. 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 one considers 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.

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