Chapter 12: Governing Policies and the Scope of Markets

I. The Missing Microeconomic Effects of Taxation and Regulations

All governments adopt policies that directly affect the types and scope of market activities that take place with the territories governed by them. Some policies tend to broadly extend markets, and others tend to broadly constrain them. Some of those policies shift purchasing power from those outside government to those inside government as, for example, tax revenues from the private sector are collected to fund government activities. Other laws and policies attempt to modify the types of transactions undertaken or the methods of production that must be employed to bring products to markets. It is the effects of these policies that are the focus of this chapter. As true of the other chapters, this chapter is intended to serve as an introduction, rather than an attempt to replace courses or textbooks in fields such as public finance, public economics, urban economics, or regulatory economics. It introduces students to a subset of the core ideas and models that have been developed within neoclassical economics for analyzing the effects of such policies. They are the base from which various extensions are developed and empirical tests are conducted.

Governing policies were arguably less consequential in the period in which neoclassical economics emerged, because relatively fewer direct interventions were undertaken in the late nineteenth and early twentieth century in the West than today. Governmental interventions are increasingly important, because of the growth of most governments during the twentieth and twenty-first centuries. Contemporary governments directly influence more than a quarter of the economic activities in most nation states today, because they raise that much (or more) through taxation. How that revenue is distributed clearly affects the demand for goods and services in many markets. Government, itself, is a major demander of goods and services and how tax revenues are collected and distributed have effects on the distribution of income within their territories—and often lesser ones beyond those territories. Government regulations also increasingly affect the production decisions of firms.

Such policies thereby affect both the supply and demand of many goods and services, and their prices. These effects alter many of the conclusions reached by the core models of microeconomics reviewed in Part I of the text. And, thus they should be reviewed in any text that attempts to develop relatively complete models of market networks. We are not in the nineteenth century any more.

This chapter demonstrates that microeconomics can be used to model (and thereby explain and predict) the effects that a wide variety of government policies have on the extent, scope, and composition of economic activity in contemporary economies. Other related topics are explored in Part III including the effects of civil and criminal law enforcement (Chapter 14) and the extent to which rational choice models can be used to model public policy choices and thereby create more complete political-economic models (Chapter 15). Normative analysis is undertaken in Chapter 18.

This chapter regards public policies to be exogenously determined, rather than co-determined by the political and economic choices of consumers and firms as in Chapters 15 and 16. It illustrates how the consequences of relatively straightforward public policies can be modelled using modest extensions of the models developed in Part I. For a more complete analysis, students should consult public economic textbooks, regulatory economic textbooks, books on political economy, and journal articles. This chapter provides a useful grounding for such readings.

II. Taxes, Transfers, and Consumer Demand

Most tax revenues are ultimately allocated to various projects and programs, and then "spent" one way or another on goods and services that governments provide or as grants and subsidies to individuals and firms. The recipients, in turn, use the grants received to engage in various market transactions.

However, the process of allocating tax revenues is undertaken through decisions that are quite different than those of consumers and firms. They are determined by political processes rather than by individuals seeking to improve their own lives through purchases or profits.

This is not to say that individual actors within government are uninterested in improving their own lives through purchases and profits, but merely to state that the institutional setting in which government revenues are allocated differs in many respects from the circumstances of an individual allocating his or her income among goods, services, and investments and that of firms producing goods for sale that allocate their expenditures on inputs and research to simultaneously attract consumers' dollars and minimize production costs for the goods and services brought to market. For example, within democracies, those decisions are often made through voting and counting votes.

A Model of the Effect of a Tax-Financed Transfer Program on Markets

Consider, for example, the effects of a governmental grant program that provides grants of amount G to each of m consumers who qualify for the grant program (possibly as a result of their income, age, or employment status). Assume that there are n other consumers who do not qualify for the grants. Assume that both groups are subject to an income tax and that the tax system is a relatively simple proportional tax on income with a marginal tax rate of t. To keep matters simple, assume that the strictly concave utility functions of the individuals in both groups are very similar to each other, as with $U = u(A, B)$ where A and B are the quantities of two goods (or two general types of goods) available in local markets. Assume also that the within-group incomes of the members of groups n and m are Y^n and Y^m respectively. The budget constraint of the group that does not qualify for the grant is thus $(1-t)Y^n = P^A A + P^B B$ and that of members of the group that is eligible is $(1-t)(Y^m + G) = P^A A + P^B B.$

Notice that the direct effect of this program is to alter the budget constraints of both groups. The taxes affect both groups, but the grants affect only one of the groups.

We'll use the substitution method of chapter 2 to develop each group's demand function for good A to illustrate these effects. This allows us to characterize the effect of an income tax on a typical member of group "n's" demands for goods A and B. The typical member of the taxed group, as in the base consumer models, chooses the level of A and B that maximizes his or her utility. After substituting for B, this requires maximizing:

$$U = u(A, [(1-t)Y^n - P^A A]/P^B) \qquad (12.1)$$

Differentiating with respect to A and setting the result equal to zero characterizes the individual's (A's) purchase of A:

$$U_A + U_B(-P^A/P^B) = 0 \equiv H^n n \; at \; A^{n*} \qquad (12.2)$$

(Subscripts characterize partial derivatives of the variable subscripted. Superscripts characterize good type and group membership.) Applying the implicit function theorem allows a typical member of group n's demand function for A to be characterized as:

$$A^{n*} = a^n(P^A, P^B, Y, t) \qquad (12.3)$$

Note that "n" is being used to identify the individual's group and that the demand function is very similar to those developed in chapter 2. The only difference is that tax rate t is now a factor that influences a member of group n's demand for A. It also affects the demand for B for similar reasons. Consumers in group n can only spend their after tax income on goods and services, not their untaxed income, as in the models of Part I.

Similarly, the demand for good A by a typical member of group m can be characterized by differentiating;

$$U = u(A, [(1-t)(Y^m + G) - P^A A]/P^B) \qquad (12.4)$$

with respect to A and setting the result equal to zero.

$$U_A + U_B(-P^A/P^B) = 0 \equiv H^m \; at \; A^{m*} \qquad (12.5)$$

The implicit function theorem implies that a typical member of group m's demand function can be characterized as:

$$A^{m*} = a^m(P^A, P^B, Y, t, G) \qquad (12.6)$$

Notice that the first order conditions look exactly like those developed for consumers in chapter 2. However, the implied demand functions differ because of the effects of taxes and grants on personal income. (Recall that the second argument in the utility functions of equations 12.1 and 12.4, which describe purchases of good B, is also present in both first-order conditions as arguments in the marginal utility functions.) For members of group m, both t and G are new parameters of their demand functions for goods A and B. The conditionality of the grant (only some persons are eligible for it) implies that identical consumers now have different demand functions for good A (and good B, although that is not shown).

This tax and transfer program (sometimes referred to as a demogrant program), affects both individual choices and individual demand functions.The changes in the demand functions differences affect the overall market demand for good A (and B) thereby the prevailing price of good A (and good B) as developed below. Such policy effects are completely absent from the core neoclassical model of consumer demand. Variables t and G are new.

Given our simplifying assumptions, the market demand for good A can be characterized as:

$$D^A = ma^m(P^A, P^B, Y, t, G) + na^n(P^A, P^B, Y, t) \qquad (12.7)$$

The location and slope of this demand function are both affected by the tax rate and the extent of the grant associated with qualifying for the grant program. How important these neglected variables are varies with their magnitudes. The larger taxes and grants are, the more important it is to take account of them if one wants to understand market demand and market prices.

The effects of the proportional tax on income, t, and of the grant benefit, G, on demand can be characterized with the implicit function differentiation rule, using equations 12.2, 12.5, and 12.7. Differentiating the market demand curve with respect to t and then G yields:

$$D_t^A = (nH_t^n + mH_t^m)/-(nH_A^n + mH_A^m) \tag{12.8a}$$

$$D_t^A = \frac{n\{(U_{AB}\left(-\frac{Y}{P^B}\right) + U_{BB}\left(-\frac{Y}{P^B}\right)\left(-\frac{P^A}{P^B}\right)\} + m\{(U_{AB}\left(-\frac{[Y+G]}{P^B}\right) + U_{BB}\left(-\frac{[Y+G]}{P^B}\right)\left(-\frac{P^A}{P^B}\right)\}}{-[nH_A^n + mH_A^m]} < 0 \tag{12.8b}$$

And

$$D_G^A = (nH_G^n + mH_G^m)/-(nH_A^n + mH_A^m) \tag{12.9a}$$

$$D_G^A = \frac{m\{(U_{AB}\left(\frac{(1-t)}{P^B}\right) + U_{BB}\left(\frac{(1-t)}{P^B}\right)\left(-\frac{P^A}{P^B}\right)\}}{-[nH_A^n + mH_A^m]} > 0 \tag{12.9b}$$

An increase in income tax rates tends to reduce demand for ordinary goods and services, while an increase in grants tends to increase demand through effects on the demands of those receiving the grants.[1]

Insofar as supply functions are upward sloping in their own price (here P^A), market prices tend to decrease as taxes increase and increase as the size of the personal grants increase. Market prices, thus, are partly determined by a government's tax and transfer policies in addition to the factors focused on in Part I.

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[1] Here, it should be noted that we are using a partial-equilibrium approach to analyze the price effects. At the individual level, this is the appropriate way to model the effects of taxes and government grants on individual behavior that is market relevant. However, for major programs, a general equilibrium approach should be applied because so many markets are affected and all are interconnected. Macro-economic analysis can be regarded as a highly simplified version of the general equilibrium approach required. A few similarly simplified public GE public finance models are included on the reference list for interested students.

The basic logic of this model would not change very much if instead of direct grants to a qualified group, the grants were paid out as insurance-like claims—as with unemployment insurance, some forms of flood insurance, and to some extent health insurance, although in the latter case the funds are normally paid directly to the healthcare providers rather than to the persons receiving the healthcare.

In all these cases and many others, the pattern of demand, production, prices, and innovation that emerges in markets is influenced by government tax and transfer policies.

III. Governmental Demands for Inputs

A substantial portion of a government's budget is transfer programs of the type analyzed in the previous section; however, governments also produce goods and services that are provided to consumer-citizens. In such cases, governments use tax revenues to purchase the inputs required to produce goods and services. In those markets, the government is simply another producer purchasing inputs from input providers and owners. The government's demand for inputs, thus naturally affects the prices of the inputs demanded and the supplies of the inputs available in markets. If governments demand accountants, then the average salaries of accountants tend to rise as do their numbers. If governments demand economists, the same effects are produced—as implied by the models of price determination developed in chapters 4 and 5.

In ideal cases, the government would attempt to purchase the vector of inputs that minimizes production costs, although it is not as constrained to do so as private producers are because the government is often a monopoly provider of the services that it produces. In such ideal (or nearly ideal) cases, a government's demand for inputs will resemble that of the firms modelled in chapter three, except that its funding is normally through taxes rather than sales of a product in a market.

In its role as a service or goods producer (as in mass transit, education, healthcare, highways, national defense, and so forth), its demand for capital (K) and labor (L) can be characterized as.

$$K = k(w, r, t) \tag{12.10a}$$

and

$$L = l(w, r, t) \tag{12.10b}$$

Where w is the price of labor and r is the rental cost of capital—assuming that only one type of labor and one type of capital is required or that both inputs are essentially homogeneous. In most realistic cases, both will be vectors of different types of labor and capital—the types most suited for producing the good or service of interest.

The tax rate "t" or total tax revenue would replace selling price in those demand functions, because tax revenues are the ultimate constraint on the resources available for producing the governmental services of interest, rather than profits from sales of goods or services.[2]

To determine market demands for the inputs of interest, the government's demand functions would simply be added to the demand functions of other users of the inputs of interest. The net effect of the production of government services is an increase in demand for the various inputs used to produce them. Insofar as governmental demands for inputs are systematically different from those of private firms, those demands have systematic effects on input relative prices and the quantities produced. For example, if governments demand more accountants and economists than the private sector, salaries in those professions would tend to increase, which would encourage more individuals to accumulate the human capital necessary to become accountants and economists.

The effect of an increase in demand in the usual case is to increase the price of the inputs purchased. That effect is offset to some extent by the effect of income and profit taxes on consumer demand and a firm's demand for inputs, but in many cases the price effects of the government's demand for inputs are significant because governments are often major purchasers of some inputs—as with its hiring of economists, tax accountants, and computer scientists, and also its purchases of fighter airplanes, subway cars, and paving services.

Such input providers benefit from higher prices, as they would from any increase in the demand for their services and intermediate goods. Indeed, there are many inputs that would not be produced at all were it not for the government's demand for them.

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[2] It is implicitly assumed here that some fraction of a government's revenues is budgeted for the governmental service of interest, as with $B = bT = bt\sum_{i=1}^{N} Y_i$. Note that b and t would both be exogenous factors as far as the agency charged with producing the service of interest is concerned. Both b and t are thus present in the demand functions for inputs. The function form for a proportional tax on income implies that it is simply their product, bt, that is relevant. For the purposes of the illustration, the tax rate included in the demand for input function, t, should be regarded as bt, the fraction of the tax rate that is devoted for the service being produced.

IV. Increasing Production Costs By Regulating Production Methods

In addition to the direct fiscal effects of government taxation and expenditures, there are many rules and regulations that governments promulgate. These rules often affect how goods and services are produced. Some regulations do so quite directly, as with building codes, environmental standards, and airplane safety regulation. Others do so indirectly, as with standardized measures and weights, and rules that determine whether a producer is liable for accidental damages associated with particular uses of their products. Some of these regulations affect the attribute mix that characterizes particular goods (as, for example, all present-day automobiles are required to have headlights, taillights, and air bags in the U. S.). Other regulations constrain the production methods that can be used to produce goods and services (as true of many environmental and safety regulations). Most such regulations raise the production costs of products by inducing shifts from cost minimizing methods to other production methods. In some cases, they increase the perceived quality of the goods or services produced, as arguably is the case for many of the safety features of automobiles, although not necessarily sufficiently to induce increases in demand—unless firms were making systematic errors before the regulations were introduced.

This section focuses on rules that constrain the production process directly. In the core model of a firm's production decision, the best inputs for the production process have already been worked out, and the problem to be solved is simply how to combine them in the most cost-effective manner to produce the goods being produced and sold to consumers. The products produced have profit-maximizing attributes that have also been previously worked out.

In the case of regulation-induced changes in production methods, the "first best" (least cost or most productive) methods are being replaced with a second or third best option. Thus, in the absence of systematic mistakes by firms, production costs necessarily increase.

Such regulations may spur innovation by the firms to discover new production methods—but that possibility is ignored in this subsection. It is often impossible to find a new method that conforms to the regulation and is no more costly than the pre-regulation process. If it was easy to develop such methods, they would already be in use, because all firms have incentives to reduce the cost of production—in which case, the new regulations would be irrelevant for the firms of interest.

Nonetheless, it should be acknowledged that innovation is often spurred by regulations that significantly increase production costs. Innovations often reduce the cost of implementing a regulation in the long run—although usually not to levels below those of the unregulated setting.

There are several ways to represent the effect of regulation on output, but all can be characterized as either rules that affect a typical regulated firm's fixed costs (as with reporting requirements), its marginal costs (through effects on production methods) or some combination of the two.

This section models the effect of production regulations on a firm's output and pricing decisions. To do so, a function that characterizes the effects of new production rules on production costs, G=g(Q,R), is simply added to the firm's cost function. That function has a positive first derivative with respect to the firm's output, $G_Q > 0$, if the stringency of the regulations raises marginal production costs. G_Q equals zero if the regulations only affect fixed costs. In the latter case, the regulation will not affect the supply choices of firms that continue to produce the inputs of interest, but the regulations would affect decisions to enter and exit the market and thereby may indirectly affect supply in the long run.

In the case in which the marginal cost of output is increased by regulation(s), possibly at a diminishing rate, it can be shown that the quantity supplied at the preexisting price by every regulated firm in the industry is reduced by the regulation. This in turn, implies that market supply is reduced, which induces an increase in market prices (because demand curves normally slope downward)—other things being equal.

The mathematics behind these conclusions are developed below. Consider the case of a price-taking regulated firm. It selects the output that maximizes:

$$\Pi = PQ - c(Q,w,r) - g(Q,R) \qquad (12.11)$$

The firm's ideal output can be characterized by differentiating Π with respect to Q and setting the result equal to zero, which yields:

$$\Pi_Q = P - c_Q - g_Q = 0 \equiv H \ at \ Q^* \qquad (12.12)$$

Applying the implicit function theorem yields the firm's supply function:

$$Q^* = q(P,w,r,R) \qquad (12.13)$$

The effect of more stringent regulations on the firm's supply function can be obtained by using the implicit function differentiation rule to differentiate Q* with respect to R.

$$Q_R^* = \frac{H_R}{-H_Q} = \frac{-q_{QR}}{-\Pi_{QQ}} < 0 \qquad (12.14)$$

Recall that $\Pi_{QQ}<0$ if the profit function is strictly concave, and that $q_{QR}>0$ if more stringent regulations increase marginal production costs. In such cases, a regulated firm that is affected by regulations that increase marginal costs will supply less to the market at any given price.

Production regulations are not always universal because of "grand fathering" (exempting existing firms from new regulations) and the existence of national and state boundaries. Thus the effects of government regulations often affect only a subset of suppliers.

In a market composed of n unregulated price-taking firms (perhaps firms in a different town, state, or country) and m regulated price-taking firms, the market supply function is:

$$Q^S = mq^m(P, w, r, R) + nq^n(P, w, r, R) \qquad (12.15)$$

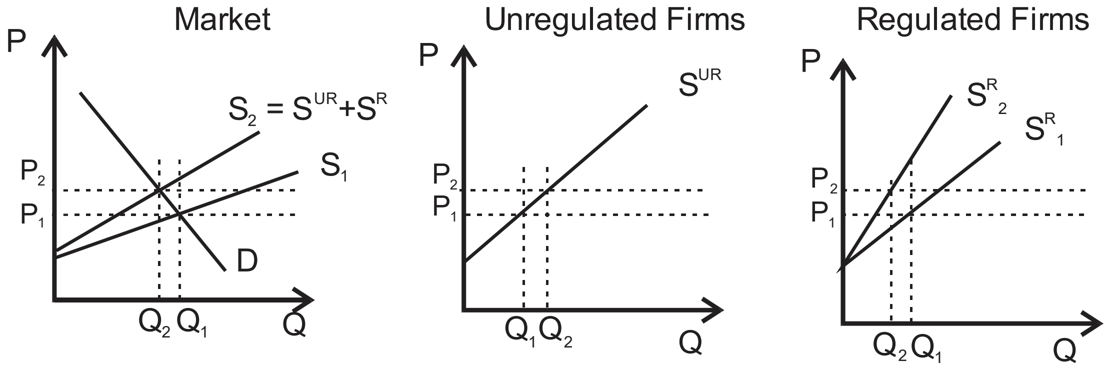
Using the results from chapter 3 for the typical unregulated firm's supply function and equation 12.14 for the typical regulated firm's supply function.

An increase in regulatory stringency would reduce overall supply, because of effects on the production costs of the regulated subset of firms.

$$Q_R^S = mq_R^m < 0 \qquad (12.16)$$

That effect will induce an increase in market prices in the markets serviced by the two types of firms. The price increase will offset part of the costs of the regulated firm, but since they do not affect the unregulated firms, more stringent regulations tend to increase the market share and profits of the unregulated firms.

Figure 12.1 Effects of Regulation



Note that in such cases, regulations affect market supply through effects that are quite different from those modeled in chapters 3 and 4. Regulations and differences in regulations partly determine market prices and the extent to which various firms produce goods for sale in addition to input prices and the relative productivity of firms.

The effects of such regulations on price-making firms are similar. By increasing marginal cost without affecting demand or marginal revenue, the profit-maximizing output of regulated price-making firms falls, market supply curves shift to the left, and prices increase.

If there are unregulated firms as well as regulated firms, the cost functions of the former are unaffected. If the higher prices charged by regulated firms induce some consumers to switch to the unregulated firms charging lower prices for the same goods, the regulations would tend to increase the sales of unregulated firms and (likely) their prices because of effects on their demand functions. State and national regulations often encourage such substitutions, which favor out-of-state and out-of-country suppliers.

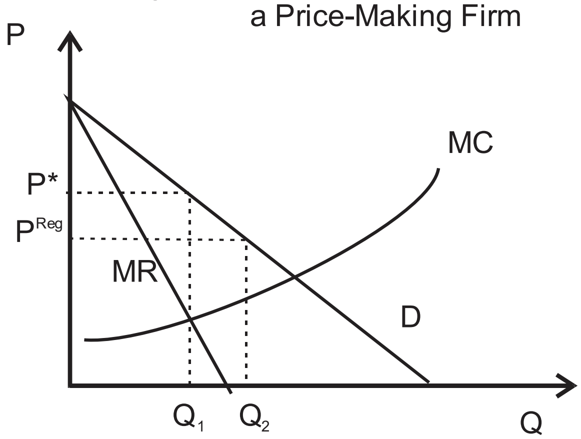
V. Three Possible Effects of Regulating Prices

In contrast with marginal cost increasing regulations, the effect of price regulation varies with the market type. Generally, price regulation attempts to reduce prices, rather than increase them. When firms are price-takers, any reduction in prices tends to reduce market output, as developed in Chapter 3. On the other hand, any decrease in price tends to increase the quantity demanded as developed in Chapter 2. Thus, the usual result of price regulation in markets with a high degree of competition is to replace prices that clear markets with a new price that does not.

Thus, shortages normally arise from modest price regulation in the Ricardian markets that this text devotes the most time to analyzing. In what we have termed Marshallian markets, firms produce at minimum average total cost, and any reduction in prices will induce such firms to close down. Insofar as prices cannot rise because of the price regulation, exit occurs until supply falls to zero, rather than simply diminishing as in the Ricardian case. However, extreme price controls can reduce Ricardian supply to zero.

In cases in which firms are price makers, the effects of price controls (mandated reductions, or limited increases in prices) are ambiguous. There are cases in which firms will increase supply as illustrated below on Figure 12.2. The effect of a forced reduction in price from the profit maximizing one, P*, to some regulated price P^{Reg} is to transform a price-making into a price-taking firm in the domain where $P^{Reg}<P^*$. In cases in which the formerly price-making firm is profitable at the lower price, it will produce more of the goods or services at the regulated price than at the unregulated one.[3]

Figure 12.2 Effect of a Price Control on a Price-Making Firm



In cases in which a subset of firms (the relatively higher cost firms) become unprofitable enterprises at the regulated price, they will exit from the industry, which may reduce market supply overall for the category of goods subject to the regulation. Exit reduces the industry's supply function, but may increase the demand for products by the firms that remain. However, prices cannot rise to clear the market, and in some cases, shortages would occur as

[3] The firm's marginal revenue curve is discontinuous at the place where PR crosses the demand curve. For outputs greater than $Q^D(P^R)$, the original marginal revenue is the one that determines output by the price making firm. Thus, both adjustments to the quality of the product sold and innovation in production that lower production costs may return the firm's price-making ability in such regulated markets.

in the price-taking types of markets. There are also cases in which firms will economize on relatively costly attributes of the products sold. Such "cheapening" of the product sold may increase profits even though the demand for it tends to shrink when the cost savings more than offset the reduction in sales associated with a lower demand curve.

VI. The Effects of Excise Taxes and Other "Targeted" Taxes on Market Activities

As noted above, broad-based taxes, such as an income tax, have broad effects on markets through their effects on personal income. Narrower taxes have narrower effects, and their effects are generated through other processes. For example, excise taxes alter the conditions for market equilibria rather than affecting demand functions, per se. They do so because they transform market transactions from ones involving two parties (buyers and sellers) into ones involving three parties (buyer, sellers, and government).

Consider, for example, a market composed of price-taking firms and consumers, with the demand function $Q^D = q(P, Y, P^O)$ and the supply function $Q^S = s(P, w, r)$. In the cases in which there are no excise taxes (or tariffs) on the market of interest, a market equilibrium requires a single price, P^*, that sets market demand equal to market supply, $q(P^*, Y, P^O) = s(P^*, w, r)$, as developed in Chapter 5.

In the case of an excise tax, however, the price paid by consumers, P^C, is greater than the amount ultimately kept by firms, P^F. In the case of a flat per unit excise tax, $P^C = P^F + t$. In the case where the excise tax is a proportion of the selling price, it is $P^C = (1 + t)P^F$. In the case where it is proportional to the firm's net of tax price, it would be $P^C/(1 + t) = P^F$.

Thus, rather than a single market clearing price; in this case, *two different prices* are required to make supply equal to demand. Price taking consumers respond to their price, P^C, and price taking firms respond to their net of tax price P^F. The new condition for a market equilibrium in which demand equal supply requires $q(P^{C*}, Y, P^O) = s(P^{F*}, w, r)$, where the nature of the relationship between those two prices (P^{C*} and P^{F*}) varies with the type of excise tax applied—flat amount or proportional to selling price.

The implicit function differentiation rule can be used to characterize the effect of a tax on the consumer's net-of-tax price and also on the firm's net-of-tax price. To illustrate the effects of excise taxes on market output and consumer prices, we'll use the case where the excise tax is a flat per unit charge. In that case, the relationship between the two prices is $P^C = P^F + t$.

We'll focus on the consumer price in which case the firm's price is $P^C - t = P^F$. At the market equilibrium, excess demand is zero:

$$\mathrm{q}(\mathrm{P}^{C*}, \mathrm{Y}, \mathrm{P}^{O}) - \mathrm{s}(\mathrm{P}^{C*} - t, \mathrm{w}, \mathrm{r}) = 0 \equiv H \tag{12.17}$$

This allows the implicit function theorem to be used to characterize the consumer's equilibrium price:

$$P^{C*} = f(t, Y, P^O, w, r) \tag{12.18}$$

The implicit function theorem implies that the first derivative of the equilibrium consumer price with respect to the tax, t, can be characterized as:

$$P_t^{C*} = \frac{H_t}{-H_{P^{C*}}} = \frac{-s_P(-1)}{-[q_p - s_P\,]} > 0 \tag{12.19}$$

The sign of the term inside the brackets in the denominator is the effect of an increase in price on excess demand, which is to diminish it (demand falls and supply increases, producing a surplus). So, the term inside the brackets has a negative sign and the overall sign of the denominator is positive. The effect of an increase in price on supply is to increase supply, $s_P > 0$, thus the numerator also has a positive sign.

Consequently, given upward sloping supply and downward sloping demand, the effect of an excise tax on consumer prices is to increase them. Given downward sloping demand, $q_P < 0$, an increase in consumer price generated by an excise tax necessarily reduces overall sales in equilibrium.

To find the effect of an excise tax on the firm's net-of-tax price, the same steps are repeated after restating the equilibrium prices in terms of the firm's price, $P^C = P^F + t$. At the market equilibrium:

$$H \equiv \mathrm{q}(\mathrm{P}^{F*} + t, \mathrm{Y}, \mathrm{P}^{O}) - \mathrm{s}((\mathrm{P}^{F*}, \mathrm{w}, \mathrm{r}) = 0 \tag{12.20}$$

Which the implicit function theorem implies allows the consumer's equilibrium price to be written as:

$$P^{F*} = f(t, Y, P^O, w, r) \tag{12.21}$$

The implicit function theorem implies that the first derivative of the equilibrium consumer price with respect to t can be characterized as:

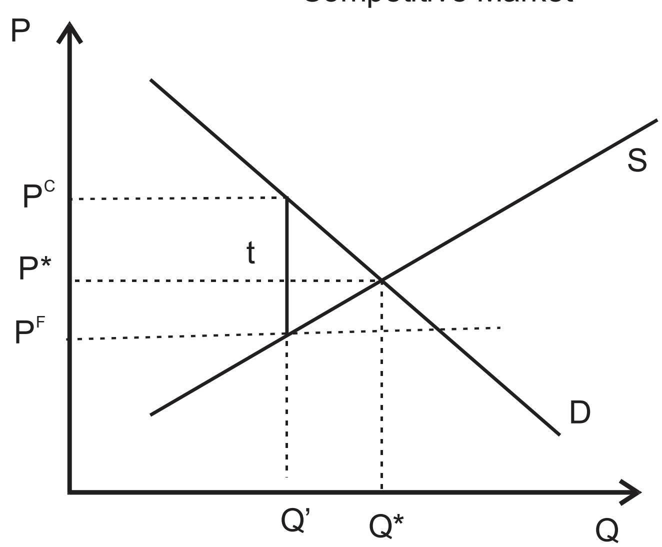
$$P_t^{C*} = \frac{H_t}{-H_{pF*}} = \frac{-q_P}{-[q_p - s_P]} < 0 \qquad (12.22)$$

The sign of the term inside the brackets in the denominator is again the effect of an increase in price on excess demand, which tends to diminish it in this case. So, the term inside the brackets has a negative sign and the sign of the denominator is positive. The effect of an increase in price on demand is to diminish purchases, $q_P < 0$. The numerator has a negative sign.

Thus, given upward sloping supply and downward sloping demand, the effect of an excise tax on a firm's net of tax selling price is to diminish it. Given upward sloping supply, $s_P > 0$, any decrease in the firm's effective selling price reduces overall production in equilibrium. The latter will also affect the demand for the inputs used in production.

Figure 12.3 illustrates the effect of an excise tax, as developed above. Note that the burden of the tax is shared by firms and consumers in the usual case. Consumer prices rise, but by less than the amount of the excise tax, t, which is the distance between the supply and demand curves at output Q', the new market equilibrium output.

Figure 12.3: Effect of an Excise Tax on a Competitive Market



The significant aspect of the above analysis for the purposes of this chapter is that market equilibrium in markets with excise taxes differs from that which would have emerged from market factors alone. Output is less than it otherwise would have been in the absence of the tax (Q'<Q*) and consumer prices are higher. They no longer equal marginal production costs in competitive markets.

In cases in which a local excise tax is placed on an input, rather than a final consumption good, it has effects on producer costs and thereby on the composition of suppliers similar to those of local regulations or an increase in the cost of the input taxed. Such marginal cost-increasing excise taxes tend to reduce the market shares and profits of local firms and increase those of firms producing their products elsewhere.

VII. Tariffs as Excise Taxes Imposed on a Subset of Market Suppliers

Excise taxes sometimes apply only to producers that are located within a particular nation, state, or locality. Tariffs are similar to such taxes, but have the opposite effect on the composition of firms selling products in the territories "protected" by tariffs. The intent of tariffs is often to favor local production over that in other countries or states—although in times past, tariffs were often among a nation state's largest sources of revenues.

For the purposes of this subsection, it is assumed that international markets for currency are in equilibrium and that the effect of the tariff on exchange rates is small enough that effects on exchange rates can be ignored. Similarly, it is assumed that the currencies of interest can be exchanged for a very small service charge, one that can also be ignored without significant loss of generality. It is also assumed that the international industry is competitive in the sense that firms behave as price takers rather than price makers.

Given these assumptions, tariffs can be modeled as an excise tax that is borne directly only by producers outside the territory of the government that adopts the tariffs. Thus there is one group of firms that experiences a direct effect on their effective selling price (P^F) and another group that does not. The latter group thus sells their products at the same price as consumers pay (P^C).

In this case, we'll assume that all firms are a bit different rather than homogeneous within their types (domestic and foreign). This more general approach is adopted partly to illustrate that general results do not require the assumption of firm homogeneity, and partly because in the case of international trade, variation is likely to be greater than within a country because of differences in access to inputs, the quality of education and infrastructure, the types of internalized norms, and the governmental regulations confronted. If there are m foreign suppliers and n domestic ones, the market equilibrium in this case, requires a combination of P^F and P^C such that:

$$q(P^{C*}, Y, P^{O}) = \sum_{i=1}^{m} s_i^m (P^{C*} - t, w, r) + \sum_{j=1}^{n} s_j^n (P^{C*}, w, r)$$

Steps similar to those undertaken to analyze the effect of excise taxes can be used to analyze the differential effects of tariffs on domestic and foreign firms. Or, rewritten in terms of excess demand, it requires:

$$q(P^{C*}, Y, P^{O}) - \left[\sum_{i=1}^{m} s_i^m (P^{C*} - t, w, r) + \sum_{j=1}^{n} s_j^n (P^{C*}, w, r)\right] = 0 \equiv H \qquad (12.23)$$

The implicit function differentiation rule can be used to characterize the price paid by consumers, P^{C*}, as a function of the exogenous variables:

$$P^{C*} = f(Y, P^{O}, w, r, t) \qquad (12.24)$$

We'll again use the implicit function differentiation rule to characterize the effect of a tariff on the good of interest. (Tariffs often vary a good deal among imported products and the effect of raising a single tariff is unlikely to significantly affect exchange rates or the macroeconomics—although there are exceptions to this rule.) The implicit function differentiation rule implies that:

$$P_t^{C*} = \frac{H_t}{-H_P} = \frac{-\sum_{i=1}^{m} s_{iP}^m(-1)}{-\left[q_P - \left[\sum_{i=1}^{m} s_{iP}^m + \sum_{j=1}^{n} s_{jP}^n\right]\right]} > 0 \qquad (12.25)$$

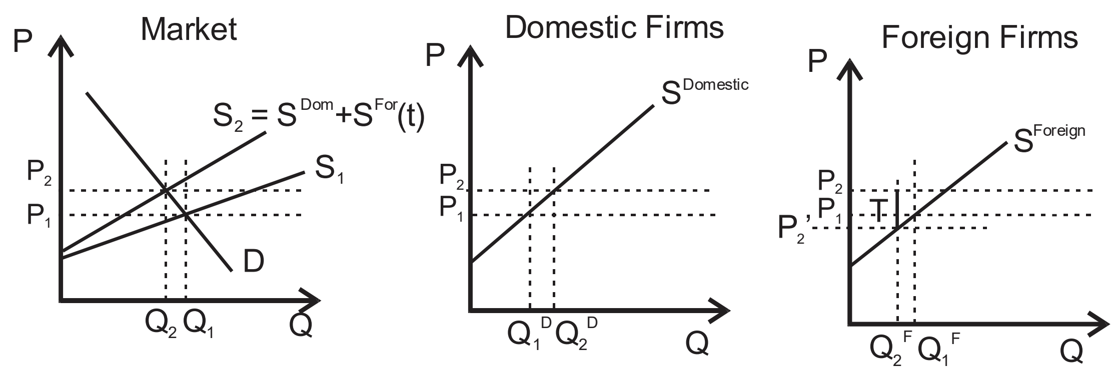
The term inside the large brackets in the denominator is again the effect of an increase in price on excess demand, which tends to diminish it (demand falls and supply rises as P increases), so the denominator has a positive sign. The main term in the numerator is the effect of a rise in prices on the firms subject to a tariff, which is positive whenever market supply curves slope upwards. Together with the various negative signs from equation 12.23 and from the composite function rule, this implies that the numerator also has a positive sign. The domestic selling price increases as tariffs increase—whenever supply curves slope upward.

More intuitively, as tariffs increase, the net of tariff price that "foreign" firms face, $\underline{P}^F$, declines as a tariff increases for the same reason as in the case of an excise tax. This reduces the overall supply of goods brought to market. This, in turn, causes the equilibrium selling price to consumers, P^C, to rise. The increase in the purchase price for consumers increases the sales price for domestic producers (if any exist), which increases their profits and induces them to increase their output, although not to the point that the entire reduction in supply from foreign producers is offset. This moderates the increase in domestic prices generated by a tariff.

However, if there are no domestic suppliers, the domestic part of the supply curve would disappear, and the result would be identical to that of an excise tax. In the case of tariffs by small countries on widely sold goods that are not produced domestically, the entire tariff is passed on to domestic consumers. (Supply is effectively horizontal in such cases.) In other cases, the burden of the tariff is shared between consumers and firms as in the case of most excise taxes. Again, government policies alter the equilibria from what they would have been in the absence of such policies.

Figure 12.4 illustrates the effects modeled above. Note that the tax on imported part of the market is shared by foreign firms and domestic consumers, in a manner similar to that of an excise tax—although the overall effect of a tax on consumer prices is smaller than that of an excise tax if there are domestic as well as foreign suppliers of the product of interest.

Figure 12.4 Effects of a Modest Tariff



The overall domestic market supply curve is the sum of the domestic supply and the foreign supply (including the effect of tariffs). In this case, the tariff reduces foreign supply, which reduces the overall supply in the domestic market from S_1 to S_2. This causes domestic prices to rise from P_1 to P_2 for domestic producers and consumers, but to $P_2' = P_2 - T$ for foreign producers.

VIII. Subsidizing Particular Market Activities

Taxes and tariffs are ways that governments can shift purchasing power from consumers and firms to the government. The government uses some of the revenues generated to produce services and for various forms of direct transfers to individuals. In addition to these uses of tax revenues, governments often subsidize particular products or types of production. For the past several decades this has, for example, been true of energy-saving types of products and also for methods of producing electricity that do not rely upon fossil fuels. Analytically, these types of government policies are very similar to those of taxes. They transform market transactions from ones involving two parties (buyers and sellers) into ones involving three (buyers, sellers, and governments). However, they tend to have an opposite effect on the prices of firms and consumers.

Again the conditions for a market equilibrium are altered; however, in the case of targeted subsidies, the effect is to lower the post-subsidy price for buyers and increase that for sellers. In the case of targeted subsidy, the net-of-subsidy price paid by consumers, P^C, is less than the amount ultimately kept by firms, P^F. In the case of a flat per unit subsidy, $P^C = P^F - G$. In the case where the subsidy is a proportion of the selling price, it is $P^C = (1-g)P^F$. In the case where the subsidy is proportional to the firm's net-of-subsidy price, it would be $P^C/(1-g) = P^F$.

Thus, as with excise taxes, rather than a single market clearing price; in this case, again two different prices are required to make supply equal to demand. Price taking consumers again respond to their price, P^C, and price taking firms again respond to their net-of-subsidy price P^F.

The condition for a market-clearing equilibrium is the same as that for taxes: $q(P^{C*}, Y, P^O) = s(P^{F*}, w, r)$, but the nature of the relationship between those two prices (P^{C*} and P^{F*}) is now determined by the type of subsidy applied rather than by the type of excise tax—flat amount or proportional to selling price.

To illustrate the effects of subsidies on market output and consumer prices, we'll use the case where the relationship between the two prices is $P^C = P^F - G$ or $P^C + G = P^F$. At the market equilibrium, excess demand is zero:

$$\mathrm{q}(\mathrm{P}^{C*}, \mathrm{Y}, \mathrm{P}^{O}) - \mathrm{s}(\mathrm{P}^{C*} + G, \mathrm{w}, \mathrm{r}) = 0 \equiv H \quad (12.26)$$

This allows the implicit function theorem to be used to characterize the consumer's equilibrium price:

$$P^{C*} = f(G, Y, P^O, w, r) \quad (12.27)$$

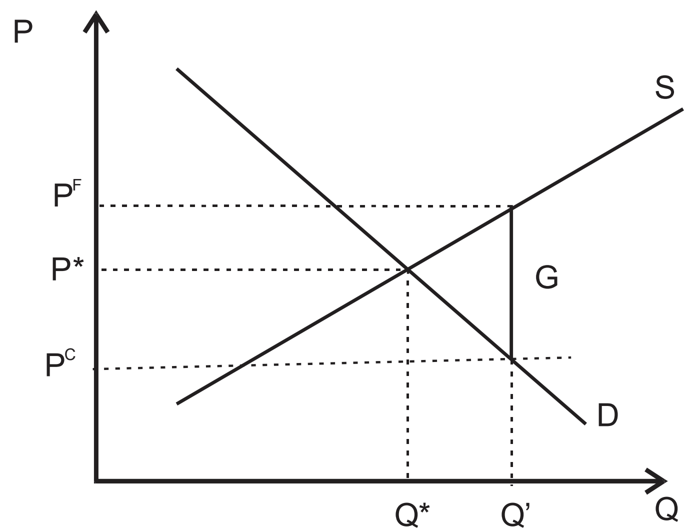
The implicit function theorem implies that the first derivative of the equilibrium consumer price with respect to subsidy G can be characterized as:

$$P_G^{C*} = \frac{H_G}{-H_{PC*}} = \frac{-s_P(+1)}{-[q_p - s_P]} < 0 \quad (12.28)$$

The net-of-subsidy price for consumers decreases as the subsidy increases.

The effect of this subsidy on firms' prices can be determined in the same way by characterizing the market equilibrium in terms of the firm's net-of-subsidy price as was done for the excise tax model. That price will increase as the subsidy is increased, which increases profits for the firms in the industry being subsidized, which tends to induce the entry of additional suppliers in the long run. Figure 12.5 illustrates the effect of a targeted subsidy. Note that the benefits of the subsidy in the usual case are shared by firms and consumers.

Figure 12.5: Effect of a Subsidy on a Competitive Market



When a subsidy affects input prices, it will tend to lower production costs and thereby encourage firms in the industry within the territory subsidized to expand their production. In either case, the higher profits and/or lower input costs of subsidized industry will encourage entry in the long run. Again, the prices paid in markets, the outputs, and in some cases the composition of the firms in the industry of interest is now partly determined by government policies—in addition to input prices and productivity of the firms in the market(s) of interest.

IX. Conclusions

During the late nineteenth century as neoclassical economics was being worked out, both market networks and governmental interventions in markets were much smaller, and the latter could be ignored with relatively little loss of accuracy in terms of the qualitative predictions that emerge from neoclassical price theory. Prices, outputs, and the composition of markets in the West were largely (although not entirely) consequences of entrepreneurship, input prices, understandings of nature, and consumer demand.

In the twentieth century, this became less true as Western governments grew and their interventions in markets increased. In today's "mixed" economies—the ones that are basically market driven, but regulated, taxed, and subsidized by contemporary governments—this is less true.

Markets, in the sense of competition among sellers for inputs and the purchases of consumers remain the main determinant of most market prices and of the composition and relative size of the industries that produce various types of final goods and services. Consumers can, thus, be said to "rule" even in economies in which governmental regulations and taxes have significant effects on market prices, the manner of production, and the scope of trading networks.

However, in areas in which governments are the principal supplier of services, as in education, law enforcement, and (increasingly) healthcare, this obviously is not true. In democracies, voters may be said to rule—but the details of production are determined substantially by non-market factors. There is little or no competition, no Schumpeterian gale of creative destruction, less entrepreneurship, and profits are unnecessary for survival. These are quite different "markets" from those of other privately produced goods and services. And, those markets are largely beyond the scope of this textbook.

This chapter has been intended as an introduction to models of the effects of government policies and their consequences for markets, rather than a complete overview.

The models that were applied were straightforward extensions of the neoclassical models worked out in Part I. They are sufficient to provide many insights into the consequences of relatively minor interventions on market activities—although overall, they are quite significant ones in contemporary developed economies.

Markets are not dead, but prices and outputs are no longer determined entirely by the private decisions of consumers, firms, and input providers, as they largely were in times past. In this chapter, the effects of government policies on markets are modelled as responses to the government policies generated by its political processes.

Possible interventions by firms and consumers on those political processes are examined in Chapter 15. If market outcomes are no longer entirely the product of the independent choices of consumers, firms, and entrepreneurs, it is also the case that governmental policies are not entirely the product of the independent decisions of government officials.

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