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 (taxation) 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 last two sorts of 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 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 policy choices.

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 than today (in the West). Governmental interventions are increasingly important, because of the growth of most governments during the twentieth and twenty-first centuries. Contemporary governments directly influence over 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 regulations, in turn, 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 conclusion reached by the core models of microeconomics reviewed in Part I of the text.

This chapter demonstrates that microeconomics can be used to model 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 effects of various 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 or grant recipients acquire through 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 the allocate their expenditures on inputs and research to simultaneously attract consumers dollars and minimize production costs for the goods and services brought to market.

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 is simply 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 and 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 $(1-t)(Y^m + G) = P^A A + P^B B$.

This information can be used to characterize a typical member of group "n's" demand for good A by choosing the level of A that maximizes;

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

Differentiating with respect to A and setting the result equal to zero yields:

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

(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:

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

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

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

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

$$U_A + U_B(-P^A/P^B) = 0 \equiv H^n \text{ at } A^* \tag{12.5}$$

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

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

Notice that the first order conditions look exactly like those developed for consumers in chapter 2. However, note also that 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.)

The tax system has effects on consumers in group n, and both the tax system and the grant program have effects on the demand functions of the members of group m. These effects are completely absent from the core neoclassical model of consumer demand, namely variables t and G. Note that 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).

These differences also affect the overall market demand for good A (and B) thereby the prevailing price of good A (and good B). Given the simplifying assumptions, the market demand for good A can be characterized as:

$$A = ma^m(P^A, P^B, Y, t, G) + na^n(P^A, P^B, Y, t) \tag{12.7}$$

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, as demonstrated below. 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:

$$A_t = (nH^n_t + mH^m_t)/-[(nH^n_A + mH^m_A))$$

$$A_t = \frac{n\{(U_{AB}\left(-\frac{Y}{PB}\right) + U_{BB}\left(-\frac{Y}{PB}\right)\left(-\frac{P^A}{PB}\right)\} + m\{(U_{AB}\left(-\frac{[Y+G]}{PB}\right) + U_{BB}\left(-\frac{[Y+G]}{PB}\right)\left(-\frac{P^A}{PB}\right)\}}{-[nH^n_A + mH^m_A]} < 0 \tag{12.8}$$

and

$$A_t = (nH^n_G + mH^m_G)/-[(nH^n_A + mH^m_A))$$

$$A_t = \frac{m\{(U_{AB}\left(\frac{(1-t)}{PB}\right) + U_{BB}\left(\frac{(1-t)}{PB}\right)\left(-\frac{P^A}{PB}\right)\}}{-[nH^n_A + mH^m_A]} > 0 \tag{12.9}$$

An increase in income tax rates tends to reduce demand for ordinary goods and services, while an increase in grants tends to increase demand.

Insofar as supply functions are upward sloping in their own price (here P^A), market prices tend to decrease as taxes increase and increase in as the size of the personal grants increase. Market price, in part, are determined by government policies at the margin in conjunction with the factors focused on in Part I of the text.

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 are influenced by government tax and transfer policies.

III.   Governmental Demands for Inputs

In other cases, rather than transferring tax revenues to individuals to spend more or less as they please, governments use the tax revenues to purchase the inputs required to produce goods and services. In such cases, some portion of its tax revenues (e.g. the purchasing power shifted from taxpayers to the government) is allocated among the inputs required to produce the goods and services being tax-financed. In effect, the government is simply another producer purchasing inputs from input providers and owners.

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 governments 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.

$$K=k(w, r, t) \tag{12.9}$$

And $L=l(w, r, t)$ (12.10)

Where w is the price of labor and r is the rental cost of capital—assuming that either only one type of labor and one type of capital is required or that both inputs are essentially homogeneous. In most 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 it is the constraint on the resources ultimately available for producing the governmental services of interest, rather than profits from sales of goods or services.[1]

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.

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[1] 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 illustrate, 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.

The net effect of the production of government services is an increase in demand for the various inputs used to produce them.

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 a major purchaser 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.

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 which 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.

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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 not always possible to find a new method that both conforms to the regulation 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 firm 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 be 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 only 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 decision 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:

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

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

$$\Pi_Q = P - c_Q - g_Q = 0 \equiv H \ at \ Q^* \tag{12.12}$$

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

$$Q^* = q(P, w, r, R) \tag{12.13}$$

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

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

Recall that Π_{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.

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:

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

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 regulated subset of firms.

$$Q_R^S = mq_R^m < 0 \tag{12.16}$$

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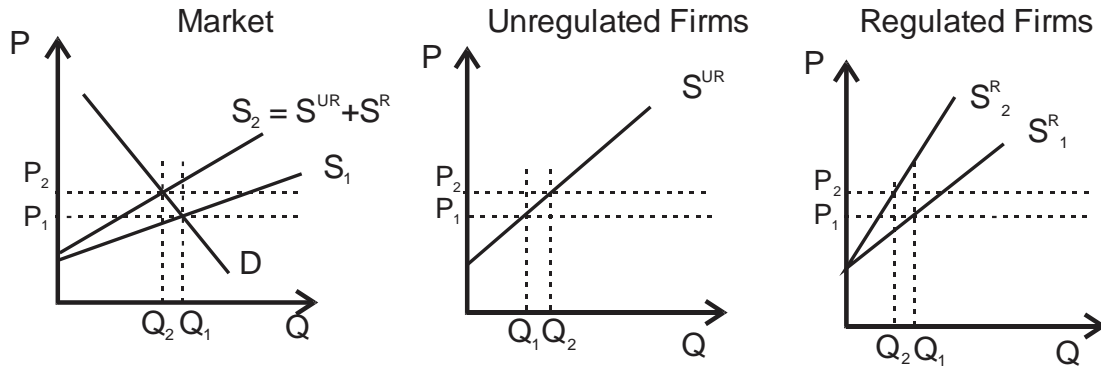
Note that in such cases, regulations affect market supply through effects that are quite different from those modeled in chapters 3 and 4. In addition to input costs and relative productivity, regulations and differences in regulations partly determine market prices and the extent to which various firms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

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 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 induces other some consumers to switch to the unregulated firms charging lower prices for the same goods, they would tend to increase their sales and (likely) their prices because of effects on their demand functions.

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. One 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 and 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 good or services at the regulated price that at the unregulated one.[2]

Figure 12.2 Effect of a Price Control on a Price-Making Firm
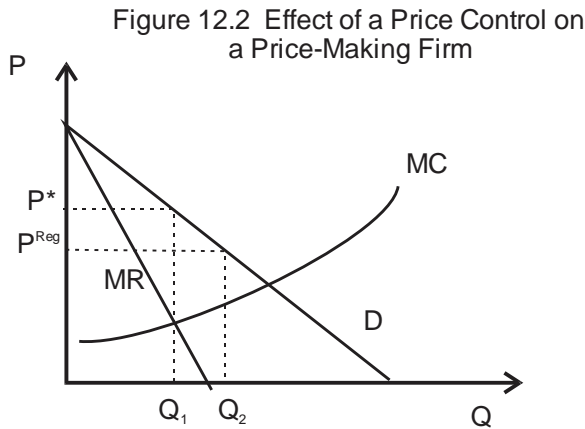
In cases in which a subset of firms (the relatively higher cost firms) become unprofitable enterprises at the regulated price, they will exit from the industry, which may reduce market supply overall for the category of goods subject to the regulation. Exit reduces the industry's supply function, but 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 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

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[2] 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.

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 affects 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 $Q^D = q(P, Y, P^0)$ and the supply function $Q^S = s(P, w, r)$. In the cases where there are no excise taxes (or tariffs) on the market of interest. The condition for a market equilibrium is generated by a single price, P^*, that sets market demand equal to market supply. $q(P^*, Y, P^0) = s(P^*, w, r)$.

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 proportional to the firm's net of tax price, it would be $(1-t)P^C = P^F$ 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. Thus, the new condition for a market equilibrium requires $q(P^{C*}, Y, P^0) = s(P^{F*}, w, r)$, 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 relationship between the two prices is $P^C = P^F + t$ or $P^C - t = P^F$.

At the market equilibrium, excess demand is zero:

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

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 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 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. Thus 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 firms price, $P^C = P^F + t$. At the market equilibrium:

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

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

$$P_t^{C*} = \frac{H_t}{-H_{P^{F*}}} = \frac{-q_P}{-[q_P - s_P]} < 0 \tag{12.22}$$

The sign of the term inside the brackets in the denominator is again the effect of an increase in price on excess demand, which is to diminish it (demand falls and supply increases, producing a surplus). 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, $q_P < 0$, thus 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 price is to diminish them. Given upward sloping supply, $s_P > 0$, any decrease in the firm's effective selling price reduces overall production in equilibrium. The latter will affect the demand for the inputs used in production.

Figure 12.3 illustrates the effect of a targeted subsidy. Note that the burden of the tax (effects on prices) is shared by firms and consumers in the usual case. Consumer prices rise, but by

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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
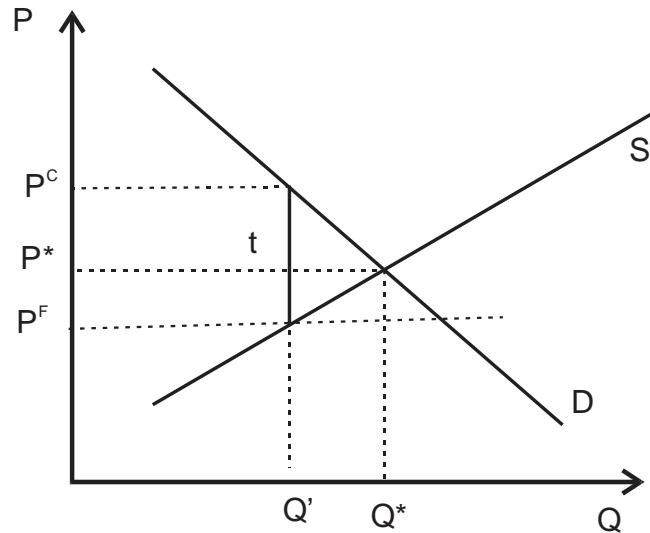
Note that the market equilibrium is changed from that which emerges from market factors alone. Output is less than it otherwise would have been in the absence of the tax (Q'<Q*).

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. 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 withing 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 than does not and thus sell 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:

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

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

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

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:

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

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.

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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 these effects modeled. 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 the tax on consumer prices of a tariff 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
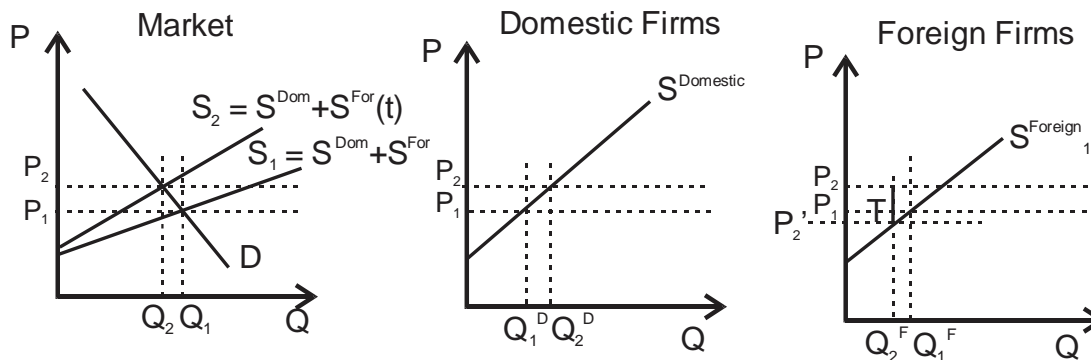
(Note that the Q in the market diagram is the sum of Q_2^D and Q_2^F after the tariff
in the other two diagrams. Thus, the effect of the Tariff is to reduce Market Supply from S_1 to S_2.

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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, in turn, often uses the revenues generated to produce services as noted above. In addition to producing services (and regulations), 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).

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 $(1+g)P^C=P^F$ Thus, 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 new condition for a market equilibrium requires q(P^C*, Y, P^0) = 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. To illustrate the effects of excise taxes 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:

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

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

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

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

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

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 is shared by firms and consumers.

Figure 12.5: Effect of a Subsidy on a Competitive Market
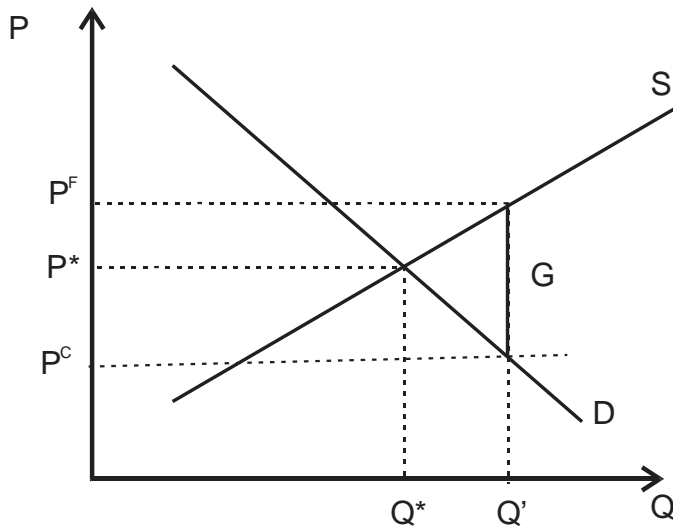
When a subsidy affects input prices, it will tend to lower production costs and thereby encourage firms in the industry within the territory subsidized to expand their production. In either case, the higher profits and/or lower input costs of subsidized industry will encourage entry in the long run. 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 arguably 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 were sufficient to provide many insights into the consequences of what individually are minor interventions on market activities—although overall quite significant ones in contemporary developed economies. Markets are not dead, but neither are they as determined by private decisions by consumers, firms, and input providers as they were in times past. In this chapter, the effects of government policies on markets are modelled as responses to the government policies generated by the political process. Possible interventions by firms and consumers on those political processes are examined several of the chapters of Part III of this text.

If market outcomes are not entirely the product of the independent choices of consumers, firms, and entrepreneurs, it also the case that governmental policies are not entirely the product of the independent decisions of government officials.

X.   References

Acemoglu, D. (2021). *Harms of AI* (No. w29247). National Bureau of Economic Research.

Behn, M., Haselmann, R., & Vig, V. (2022). The limits of model-based regulation. *The Journal of Finance*, *77*(3), 1635-1684.

Braunerhjelm, P., Eklund, J. E., & Thulin, P. (2021). Taxes, the tax administrative burden and the entrepreneurial life cycle. *Small Business Economics*, *56*, 681-694.

Browning, E. K. (1976). The marginal cost of public funds. *Journal of Political Economy*, *84*(2), 283-298.

Browning, E. K. (1978). The burden of taxation. *Journal of Political Economy*, *86*(4), 649-671.

Browning, E. K. (1985). Tax incidence, indirect taxes, and transfers. *National tax journal*, *38*(4), 525-533.

Browning, E. K. (1995). Effects of the earned income tax credit on income and welfare. *National Tax Journal*, *48*(1), 23-43.

Buchanan, J. M. (1987). The constitution of economic policy. *Science*, *236*(4807), 1433-1436.

Burtless, G., & Hausman, J. A. (1978). The effect of taxation on labor supply: Evaluating the Gary negative income tax experiment. *Journal of political Economy*, *86*(6), 1103-1130.

Conlon, C., Rao, N., & Wang, Y. (2024). Who pays sin taxes? understanding the overlapping burdens of corrective taxes. *Review of Economics and Statistics*, *106*(6), 1719-1729.

Crain, M. (2005). The impact of regulatory costs on small firms. *Report for the Office of Advocacy/US Small Business Administration*.

Epple, D., & Zelenitz, A. (1981). The implications of competition among jurisdictions: Does Tiebout need politics?. *Journal of Political Economy*, *89*(6), 1197-1217.

Epple, D., & Romano, R. E. (1996). Public provision of private goods. *Journal of political Economy*, *104*(1), 57-84.

Epple, D., Romano, R., Sarpça, S., & Sieg, H. (2017). A general equilibrium analysis of state and private colleges and access to higher education in the US. *Journal of Public Economics*, *155*, 164-178.

Feldstein, M. S. (1969). The effects of taxation on risk taking. *Journal of Political Economy*, *77*(5), 755-764.

Feldstein, M. (1995). Behavioral responses to tax rates: Evidence from the Tax Reform Act of 1986. *The American Economic Review*, *85*(2), 170.

Friedman, M. The Role of Government in Education. *Economics and the Public Interest*, 123-144.

Gray, W. B., & Shadbegian, R. (2024). When do firms shift production across states to avoid environmental regulation?. *Land Economics*.

Harrington, W., Morgenstern, R. D., & Nelson, P. (2000). On the accuracy of regulatory cost estimates. *Journal of Policy Analysis and Management: The Journal of the Association for Public Policy Analysis and Management*, *19*(2), 297-322.

Hasan, R., Mehta, A., & Sundaram, A. (2021). The effects of labor regulation on firms and exports: Evidence from Indian apparel manufacturing. *Journal of Comparative Economics*, *49*(1), 183-200.