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Note on Tax Incidence Theory

I. Partial Equilibrium Tax Incidence Theory

Two types of tax incidence

- Statutory Incidence: The distribution of legal obligations for tax payments among different members of society.
- Economic Incidence: The distribution of the actual economic burden of taxes among different members of society.

Central question: How do taxes change the prices (dq/dt and dp/dt) paid by the demand side of the market and the prices received by the supply side of the market? Changes in these prices determine the economic distribution of the tax burden.

Key qualitative results from neoclassical tax incidence theory

1. [Tax neutrality] The economic incidence of a tax is independent of its statutory incidence. Regardless of who has the legal obligation to pay the tax, the ultimate distribution of economic burden is determined by how the market adjusts prices to clear the market in response to the tax. This market adjustment depends entirely on elasticities of supply and demand.

2. Who the tax burden falls on depends on how individuals can change economic activity away from the taxed activity. The more elastic side of the market can avoid the tax. Conversely, a greater burden is borne by the more inelastic side of the market.

   Example 1: if demand is very elastic (relative to supply), consumers can readily substitute into other goods in response to an increase in prices, so suppliers are unable to raise prices significantly and must therefore bear most of the tax burden.

   Example 2: if demand is very inelastic (relative to supply), suppliers can pass much of the tax onto consumers in the form of higher consumer prices without suffering an adverse drop in quantity demanded.

II. Elasticity formula for Partial Equilibrium Tax Incidence

Let quantity supplied as a function of the price sellers recieve be given by $S(q)$ and let quantity demanded as a function of the price consumers pay be given by $D(p)$. The prices $p = q$ are determined by the intersection of supply and demand (i.e., markets have to clear) so that in equilibrium, $S(q) = D(q)$.

Consider the effect of imposing a tax on consumers of t. Goal is to derive a formula for the change in market price because of this tax ($\frac{dq}{dt}$).

The new equilibrium price q must be such that $S(q) = D(q + t)$. Write $q(t)$ because q is a function of t. Differentiating this equilibrium condition and solving for dq/dt gives:

$$\begin{aligned} \frac{\partial S}{\partial p}\frac{dq}{dt} &= \frac{\partial D}{\partial p}(\frac{dq}{dt} + 1) \\ \Rightarrow \frac{dq}{dt}(\frac{\partial S}{\partial q} - \frac{\partial D}{\partial q}) &= \frac{\partial D}{\partial q} \\ \Rightarrow \frac{dq}{dt} &= \frac{\partial D}{\partial q}\frac{1}{(\frac{\partial S}{\partial q} - \frac{\partial D}{\partial q})} \end{aligned}$$

and using the trick of multiplying by $1 = \frac{Q}{Q}\frac{q}{q}$ gives:

$$\begin{aligned} \frac{dq}{dt} &= \frac{\partial D}{\partial q}\frac{1}{(\frac{\partial S}{\partial q} - \frac{\partial D}{\partial q})}\frac{Q}{Q}\frac{q}{q} \\ &= [\frac{\partial D}{\partial q}\frac{q}{Q}]\frac{1}{(\frac{\partial S}{\partial q}\frac{q}{Q} - \frac{\partial D}{\partial q}\frac{q}{Q})} \\ &= \frac{\varepsilon_D}{\varepsilon_S - \varepsilon_D} \end{aligned}$$

where ε_D is the uncompensated elasticity of demand and ε_S is the uncompensated elasticity of supply. Note that $\varepsilon_D \leq 0$ and $\varepsilon_S \geq 0$ so that $-1 \leq \frac{dq}{dt} \leq 0$. In words, the price that sellers receive goes down because of the tax.

Because q is the price that producers receive, $\frac{dq}{dt}$ measures the incidence on producers. Letting $p = t + q$, the incidence on consumers is given by

$$\frac{dp}{dt} = 1 + \frac{dq}{dt} = \frac{\varepsilon_S}{\varepsilon_S - \varepsilon_D}$$

and note that $0 \leq \frac{dp}{dt} \leq 1$.

Five special cases that are worth remembering:

1. Demand is perfectly inelastic ($\varepsilon_D = 0$):

$$\frac{dq}{dt} = \frac{0}{\varepsilon_S + 0} = 0$$

   $\Rightarrow$ No reduction in the price that producers receive. Full incidence falls on consumers.

2. Demand is perfectly elastic ($\varepsilon_D = -\infty$):

$$\frac{dq}{dt} = \frac{\varepsilon_D}{\varepsilon_S - \varepsilon_D} \rightarrow -1 \text{ as } \varepsilon_D \rightarrow -\infty$$

   $\Rightarrow$ Price received by producers drops by the full amount of the tax. Full incidence falls on producers

3. Supply is perfectly inelastic ($\varepsilon_S = 0$):

$$\frac{dq}{dt} = \frac{\varepsilon_D}{-\varepsilon_D} = -1$$

$\Rightarrow$ Price received by producers drops by the full amount of the tax. Full incidence falls on producers

4. Supply is perfectly elastic ($\varepsilon_S = \infty$)

$$\frac{dq}{dt} = \frac{\varepsilon_D}{\varepsilon_S - \varepsilon_D} \to 0 \text{ as } \varepsilon_S \to \infty$$

$\Rightarrow$ No reduction in the price that producers receive. Full incidence falls on consumers.

5. Demand and supply elasticities are the same ($\varepsilon_S = -\varepsilon_D$)

$$\frac{dq}{dt} = -\frac{1}{2}$$

$\Rightarrow$ Price received by producers drops by half of the tax, and thus the price paid by consumers rises by half of the tax.

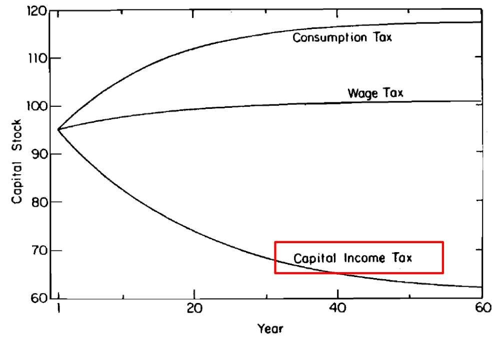
III. General Equilibrium Tax Incidence

Partial equilibrium only considers one market (labor market in particular industry). General equilibrium considers, e.g., factor inputs (capital, skilled labor, unskilled labor, land) in one or more sectors. Incidence still depends on mobility, but harder to characterize analytically.

Main idea: in the short run, the more inelastic factor bears the burden of a tax. In the long run, factors can move. Land is inelastic by definition since it is in limited supply. In the long run, tax burden will be reflected in land prices and rents.

Why is general equilibrium important? Consider the following argument: "Government should tax capital income b/c it is concentrated at the high end of the income distribution." Statement neglects general equilibrium price effects:

- Tax might be shifted onto workers
- If capital taxes $\to$ less savings and capital flight, then capital stock may decline, driving return to capital up and wages down.
- Auerbach and Kotlikoff's (1987) computable general equilibrium model shows this can happen over time even in a closed economy, multisector model.



Source: Auerbach and Kotlikoff 1987

Table 5.2. *Structural tax change*

	Capital-labor ratio			Wage rate, pre-tax			Real interest rate, pre-tax (%)			Net national saving rate (%)		
	Tax base			Tax base			Tax base			Tax base		
Year of transition	Consumption	Wage	Capital income	Consumption	Wage	Capital income	Consumption	Wage	Capital income	Consumption	Wage	Capital income
Initial steady state	5.0	5.0	5.0	1.00	1.00	1.00	6.7	6.7	6.7	3.7	3.7	3.7
1	4.8	5.1	4.8	0.99	1.00	0.99	6.9	6.6	6.8	9.3	5.3	−2.9
5	5.1	5.1	4.4	1.01	1.01	0.97	6.5	6.5	7.3	8.2	5.0	−1.9
10	5.4	5.2	4.1	1.02	1.01	0.95	6.3	6.4	7.7	7.2	4.7	−1.0
50	6.2	5.4	3.0	1.05	1.02	0.88	5.7	6.3	9.7	4.5	4.0	2.0
150	6.2	5.4	2.9	1.06	1.02	0.87	5.7	6.3	10.1	4.4	4.0	2.5

Note: Switch from 15% proportional income tax to specified proportional tax regimes. Base case parameters.

Source: Auerbach and Kotlikoff 1987

Auerbach and Kotlikoff's (1987) simulations show after tax wage at year 0 and year 150 are essentially equal (that is, tax is shifted onto workers) after switching to capital income tax:

$$\begin{aligned} w_0(1-\tau_0) &= 1 \cdot (1-0.15) = 0.85 \\ w_{150}(1-\tau_{150}) &= 0.87 \cdot (1-0) = 0.87 \end{aligned}$$

General structure of computable general equilibrium models:

- N intermediate production sectors
- M final consumption goods
- J groups of consumers who consume products and supply labor
- Each industry has different substitution elasticities for capital and labor
- Each consumer group has Cobb-Douglas utility over M consumption goods with different parameters
- Specify all these parameters and then simulate effects of tax changes
- Criticism is findings sensitive to structure of the model, functional forms, etc.