Introductory Economics of Taxation

Lecture 1: The definition of taxes, types of taxes and tax rules, types of progressivity of taxes

Introduction

‣ Introduction

‣ Objective of the course

‣ Theory and practice in taxation

‣ Objectivity and ideology

‣ Economics of taxation is mathematics?

‣ Final result of the course

The definition of taxes

- "…Taxes are unrequited in the sense that benefits provided by government to taxpayers are not normally in proportion to their payments…"

- **A tax is a compulsory, unrequited payment to general government.**

  (OECD, 1996)

- "…General government consists of supra-national authorities, the central administration and the agencies whose operations are under its effective control, state and local governments and their administrations, social security schemes and autonomous governmental entities, excluding public enterprises…"

The definition of taxes

▸ **A tax is a compulsory levy made by public authorities for which nothing is received directly in return.**

(James and Nobes, 1997)

▸ "…Taxes are, therefore, transfers of money to the public sector, but they exclude loan transactions and direct payments for publicly produced goods and services …

The classification of taxes

▸ OECD classification:

  ▸ depending on the object of taxation,

  ▸ useful for international comparisons,

  ▸ not very useful for economic discussion,

  ▸ does not show the economic characteristics of taxes.

The classification of taxes

- The classification by nominal source of taxation:
  - i.e. by the way of collecting taxes;
  - direct and indirect taxes;
  - direct tax – assessed and collected directly from the individuals who are intended to bear it;
  - indirect tax – **not** collected directly from the individuals who are intended to bear it.

The classification of taxes

- The direct tax:
  - usually collected through an intermediary;
  - the most popular intermediary is your employer (income tax);
  - it is possible that you have no contact with tax authorities;
  - can depend on individual circumstances;
  - it is possible to change the average tax rate.

The classification of taxes

▸ The indirect tax:

  ▸ paid by one person but collected from another;

  ▸ included in the price, but not always visible on a bill;

  ▸ cannot depend on individual circumstances;

  ▸ can depend on the object you buy.

The classification of taxes

Direct taxes	Indirect taxes
+ It is easier to spread equally the tax burden.	+ More stable and systematic source of revenue.
– Delayed tax revenue.	+ Collection fast and constant.
– High cost of gathering.	+ Costs are low.
– Developed tax administration.	– Can impose higher burden on poorer people.
– People try to avoid them.	– Depend on the cycle.

The classification of taxes

‣ <u>The classification by the tax base:</u>

1. Base is a stock;
2. Base is a flow.

‣ Problem: how to distinguish stocks from flows?

‣ <u>The classification by the relationship of the amount of the tax to the size of the tax base:</u>

1. Taxes that depend on the existence of the tax payer– poll tax;
2. Taxes that depend on the weight or size of the tax base – e.g. 1 dl. per 1 kg.

The classification of taxes

▸ The classification by the authority imposing and collecting taxes:

  ▸ Central, regional or local taxes;

  ▸ Difference between imposing and collecting.

▸ The classification by the source of origin:

  1. Families;

  2. Firms;

  3. Financial institutions;

  4. Foreign entities…

The classification of taxes

▸ Progressivity ≈ rate structure;

▸ By changing the rate structure one can try to achieve social and political goals through taxes;

▸ Very controversial – are we really helping the poor by taking money from the rich?

▸ Three types:

1. Progressive;
2. Proportional;
3. Regressive.

Additional definitions

▶ Tax evasion – illegal manipulation of one's affairs in order to reduce the taxes due.

▶ Tax avoidance – manipulation of one's affairs within the law in order to reduce the tax dues.

▶ Tax planning – arranging one's affairs to take advantage of the obvious and often intended effects of tax rules in order to maximize one's after-tax returns.

References

- OECD (1996), *Definition of taxes, DAFFE/MAI/EG2(96)3*
- James, Nobes (1998); The economics of taxation, Prentice Hall Europe - chapter 2

Introductory Economics of Taxation

**Lecture 2: Efficiency of taxation**

Excess burden of taxation

Canons of good taxation

▸ **Equity –** fairness with respect to the tax contributions of different individuals;

▸ **Certainty** – a lack of arbitrariness or uncertainty about tax liabilities;

▸ **Convenience** – with respect to the timing and manner of payment;

▸ **Efficiency –** a small cost of collection as a proportion of revenue raised, and the avoidance of distortionary effects on the behavior of taxpayers.

How to measure efficiency?

▸ Pareto optimality – difficult to reach in practice.

▸ Efficiency

  ▸ when the gainers gain more than the losers lose,

  ▸ outcome of income and substitution effects,

  ▸ income effects represent a transfer of resources,

  ▸ substitution effects interfere with taxpayer's choices → can lead to economic inefficiency.

▸ The **income effect** depends on the average tax rate.

▸ The **substitution effect** depends on the marginal tax rate.

Partial equilibrium
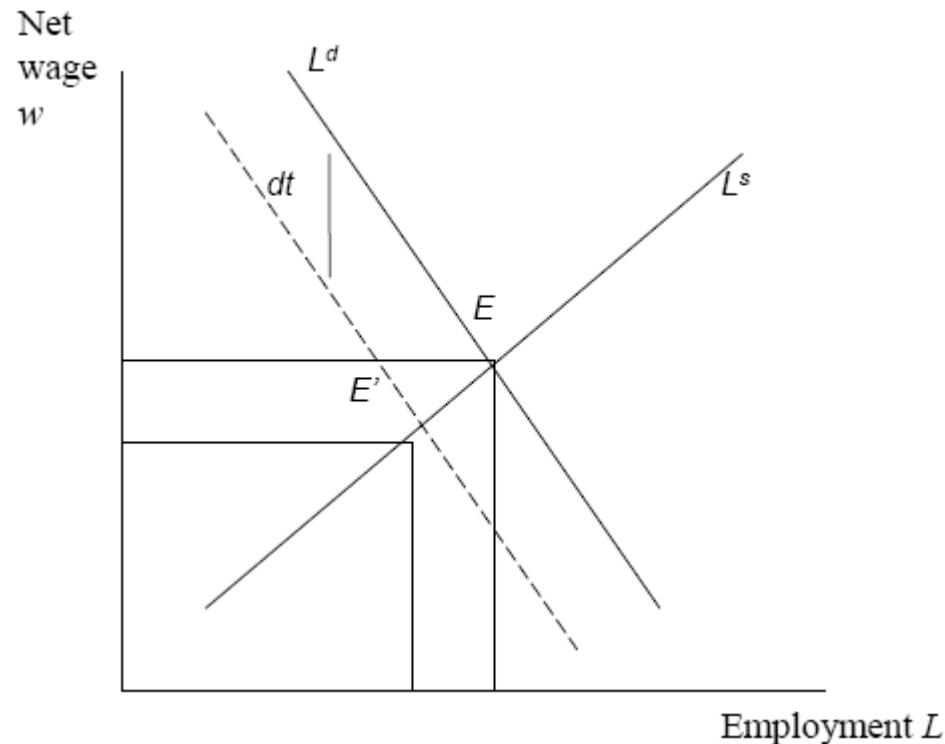
Let us introduce a tax of *dt. Its burden falls on both* employers and employees.

Gross wage *W=(1+dt)w*

Partial equilibrium

The actual impact of taxes depends on the elasticity of labor demand and labor supply: $\varepsilon_D = -\dfrac{wL^{d'}}{L}$ $\quad \varepsilon_S = \dfrac{wL^{s'}}{L}$

The equilibrium after the introduction of a tax:

$$L^d \left(w(1+t) \right) = L^s \left(w \right)$$
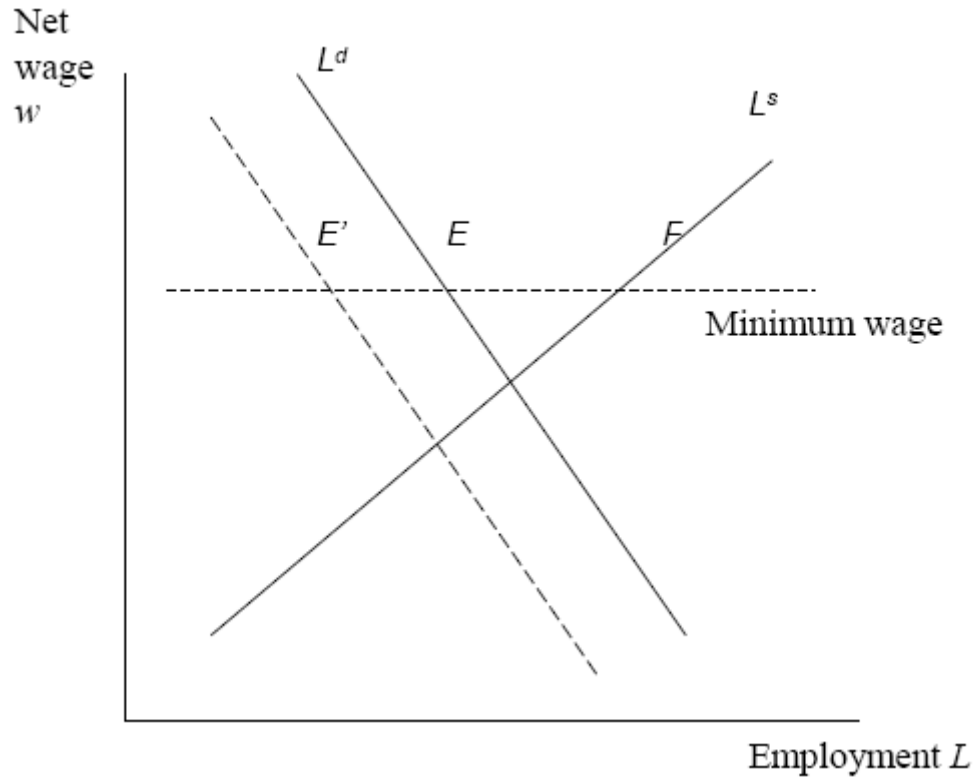
For $t=0$, differentiation yields:

$$L^{d'} \left(dw + wdt \right) = L^{s'} dw$$

The more elastic is the labor demand relative to supply, the more the net wage decreases: $\dfrac{\partial \log w}{\partial t} = -\dfrac{\varepsilon_D}{\varepsilon_S + \varepsilon_D} \in \left(-1, 0 \right)$

The less elastic is the labor demand relative to supply, the more the gross wage increases: $\dfrac{\partial \log W}{\partial t} = \dfrac{\varepsilon_S}{\varepsilon_S + \varepsilon_D} \in \left(0, 1 \right)$

The more elastic are demand and supply, the larger is the fall in employment: $-\dfrac{\partial \log L}{\partial t} = \varepsilon_S \dfrac{\partial \log w}{\partial t} = \dfrac{\varepsilon_S \varepsilon_D}{\varepsilon_S + \varepsilon_D}$

Partial equilibrium

- Assume that the minimum wage is higher than the equilibrium.
- Unemployment is shown by the distance *EF.*
- If taxes increase the net wage stays at the same level.
- The costs of labor increase with the rise in taxes.
- Therefore the labor demand falls.

Administrative costs, compliance costs and adjustment costs

▸ Direct cost of running a tax system:

1. The administrative costs to the public sector,
2. The compliance costs to the private sector.

▸ Some costs can be imposed either on the taxpayers or on the taxgatherers.

▸ The degree of complexity of the tax systems.

▸ The adjustment costs, after changes in tax system.

Administrative costs, compliance costs and adjustment costs

▸ The administrative costs:

  ▸ Relatively easy to measure,

  ▸ We know what are the costs of the tax administration, we can also evaluate the costs of other parts of the public sector connected with taxation, like services from other public sector agencies,

  ▸ These costs are usually presented as a percentage of he revenues collected, e.g. Slemrod et al. (2006):

  ▸ "…in the UK administrative costs comprise 1.15 percent of net revenue collected, considerably more that in the U.S. where they amount to only 0.52 percent of net revenue collected…"

Administrative costs, compliance costs and adjustment costs

▸ The compliance costs:

   ▸ Much higher than the administrative costs,

   ▸ Difficult to calculate – "hidden costs of taxation":

   ▸ According to Slemrod et al (2006) in US they were estimated at 10% of the revenues collected. James and Nobes give a figure for UK in 1986/7 of 4% of total tax revenues.

   ▸ There is no guarantee that a simpler tax system would reduce the compliance costs,

   ▸ Problem with the distributions of the compliance costs:

   Are the compliance costs regressive?

Administrative costs, compliance costs and adjustment costs

The adjustment costs:

- A crucial question in any tax reform - what are the costs of tax changes for both taxpayers and tax authorities?

- Problem with the direct adjustment costs

  - Have we considered all the consequences?

- Problem with the impact of taxes on economy

  - It takes time for economy to adjust to changes in tax system.

  - Before the adjustment process is completed the interim results may be opposite to intended ones.

  - The **announcement effect –** changes are still not introduced, but they already play a role.

- "Old taxes are good taxes" phenomenon

Taxation of externalities

- Coase theorem: in presence of externalities all sides involved can reach an agreement leading to the efficient solution.

- In practice there is a high number of parties involved and lack of clearly defined property rights.

- Market mechanisms may fail and there is place and need for government intervention.

- The government introduces taxes with objective to equalize the individual marginal costs with social marginal costs and individual marginal benefits with social marginal benefits - Pigou taxes (sin taxes).

- Example: pollution.

Excess burden of taxation

▸ In the perfectly competitive economy any Pareto optimum can be achieved through the lump-sum redistribution.

▸ Since there are not enough information to introduce the lump-sum taxes, the government can only introduce taxes on flow.

▸ This influences economic decisions and leads to inefficiencies.

Optimal taxation:

1. Given the revenues the government must raise, how should it choose the rates of different taxes to maximize social welfare?

2. The optimal taxes minimize the **excess burden** *of taxation, given the tax revenues*.
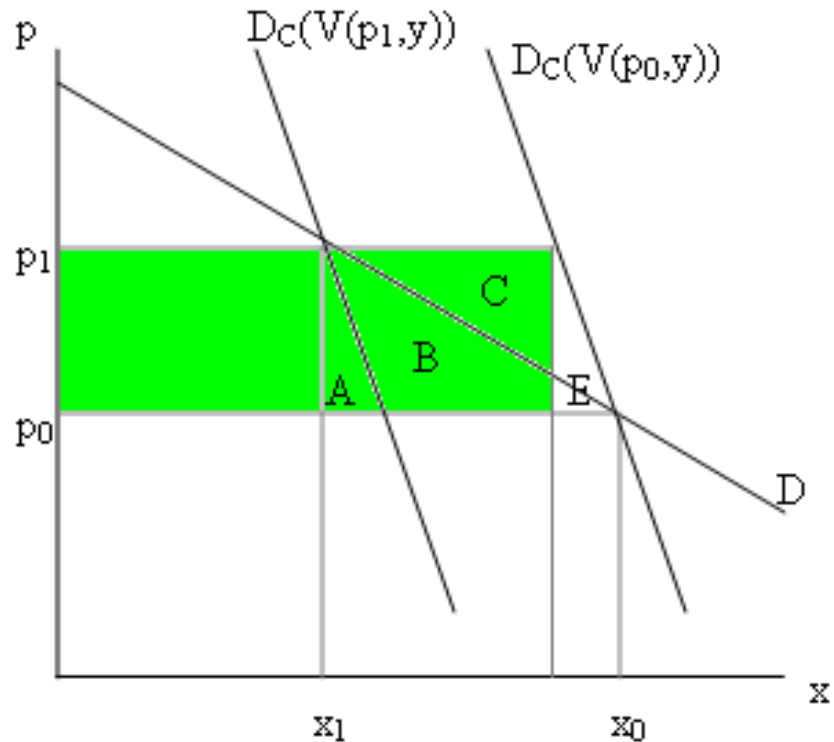
Excess burden of taxation

- Marschall: the excess burden is equivalent to the deadweight loss.
- Hicks (1942): The equivalent variation of a price change is the amount of income the consumer would forego to avoid a price change.
- Mohring (1971): The excess burden of taxation is the amount in the excess of taxes being collected that the consumer would give up in exchange for the removal of all taxes.
- Hicks (1942): The compensating variation of a price change is the amount of income the consumer must receive to leave utility unaffected be the price change.
- Diamond and McFadden (1974): The excess burden of taxation is the amount, in addition to the revenues collected, that the government must supply to the consumer to allow him to maintain the initial utility level.
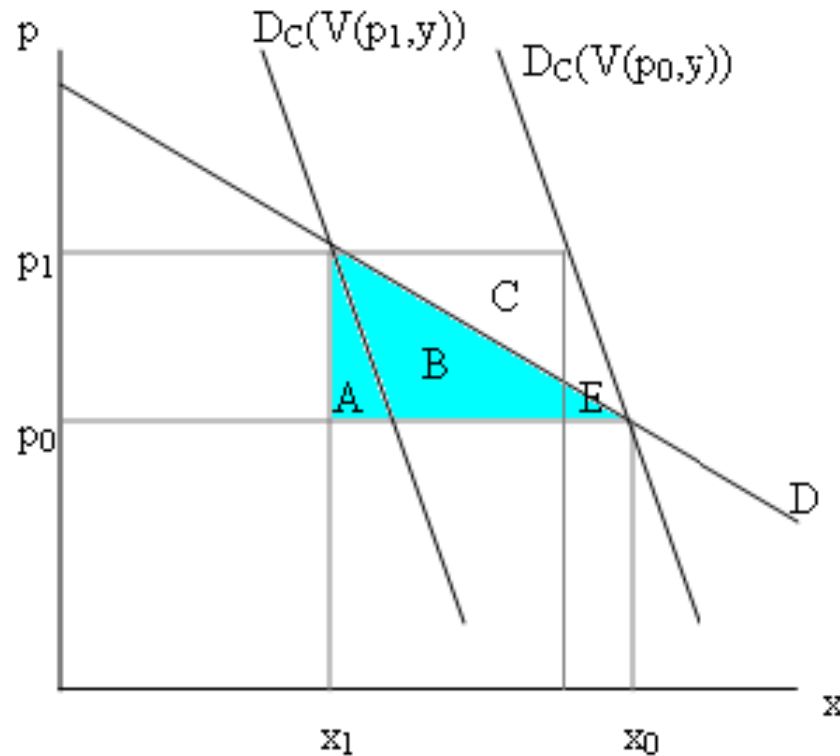
Excess burden of taxation
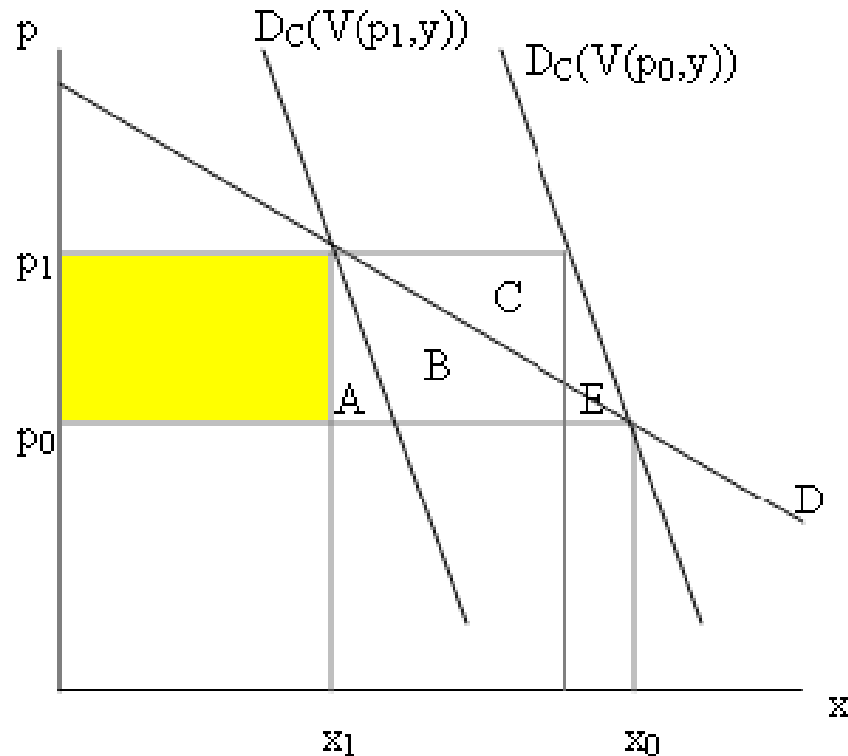
The equivalent variation is marked in yellow
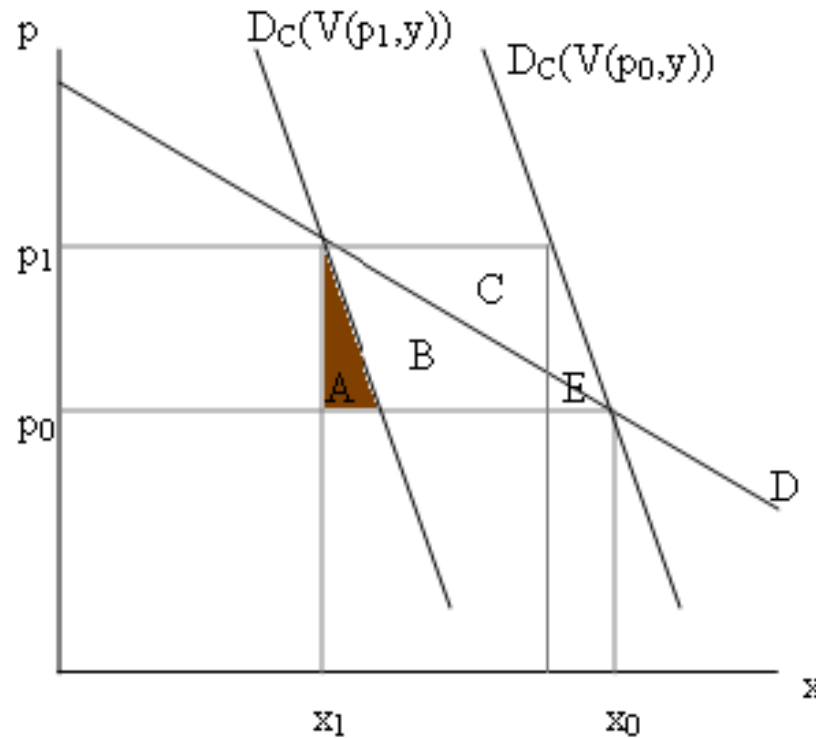
Excess burden of taxation

The compensating variation is marked in green
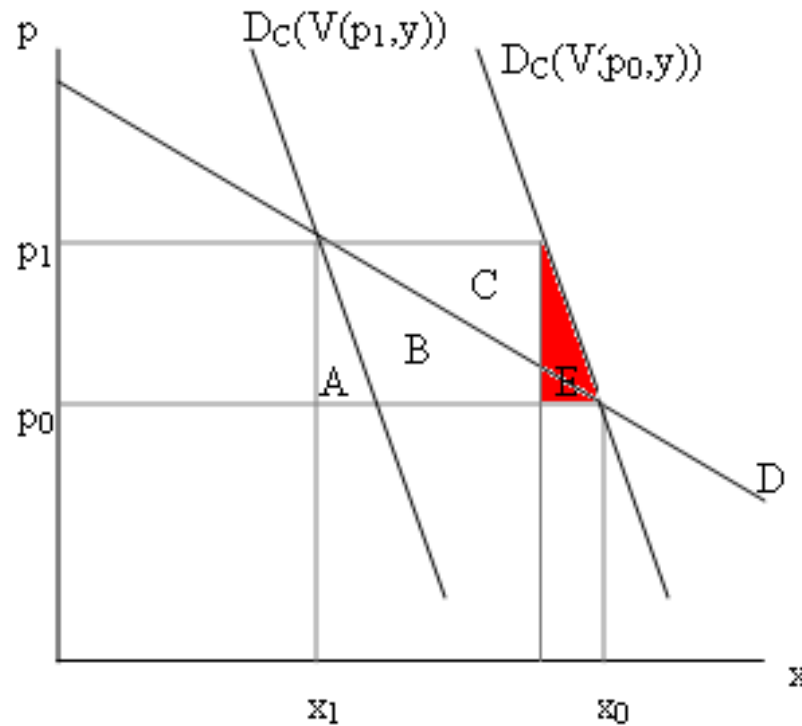
Excess burden of taxation

The deadweight loss is marked in blue

Excess burden of taxation

The excess burden based on the equivalent variation is marked in brown

Excess burden of taxation

The excess burden based on the compensating variation is marked in red

Excess burden of taxation

▸ If there are taxes on other markets, an introduction of a tax on our market do not have to worsen the situation.

▸ The excess burden of taxes is a non-linear function of tax rates.

▸ In case we impose a single tax on the market without taxes, the excess burden increases with the square of the tax rate.

▸ If there are other taxes already introduced, we have to consider also the cross effects, and the relation is no longer simple.

▸ It is possible that the overall excess burden will be smaller, if we introduce many small taxes, instead of one large tax.

▸ Each measure of excess burden will depend on the initial distribution of incomes.

References

▸ James & Nobes (1998); The economics of taxation, Prentice Hall Europe – chapter 3

▸ Salanie, B. (2003), *The economics of taxation, The MIT Press – chapter 1*

▸ Stiglitz, J.E. (2000), *Economics of the Public Sector, W.W. Norton and Company – chapter 17*

▸ Auerbach, A.J., M. Feldstein, *Handbook of Public Economics – volume 1, chapter 2*

Introductory Economics of Taxation

Lecture 3: Optimal taxation theories

Optimal taxes

▸ The optimal tax system minimizes the excess burden with a given amount which the government wants to raise through taxation.

▸ Optimal taxes maximize social welfare, given government's revenues.

▸ Right combination of efficiency and equity makes taxes optimal.

▸ What is the relation between efficiency and equity?

Optimal taxes

▸ Why is the equity criterion controversial?

　▸ **Vertical equity:** taxes are imposed subject to the taxpayers' incomes and their abilities to gain income.

　▸ **Horizontal equity:** identical individuals should pay the same taxes.

Optimal taxes

‣ The general conclusion of mathematical models is that optimal taxes should include high average tax rates for individuals with high incomes and low average tax rates for low incomes.

‣ At the same time the marginal tax rates should be low for everybody: those with low incomes as well as those with high.

Optimal taxes

▸ Optimal taxation theory goes round the problem of social welfare by assuming that there exist:

Bergson-Samuelson functional

$$W(V_1,\ldots,V_n)$$

where *V_i is the utility index of consumer i*

x, y - vectors of feasible social choices

x is socially preferred to y if and only if

$$W(V_1(x),\ldots,V_n(x)) > W(V_1(y),\ldots,V_n(y))$$

The monotonicity of the function *W reflects the* efficiency, while its concavity reflects redistributive properties, i.e. equity. Thus, maximizing *W implies* the trade-off between equity and efficiency.

A partial equilibrium on a goods' market

A simple model, in which there are only taxes on goods and linear tax on wages.

We impose a small ad valorem tax *ti on good i. The* deadweight loss is equal:

$$(1) \quad D_i\left(t_i\right) = -\frac{p_i t_i dx_i}{2} = \frac{\varepsilon_D^i \varepsilon_S^i}{\varepsilon_D^i + \varepsilon_S^i} t_i^2 \frac{p_i x_i}{2}$$

The total deadweight loss from the tax system is equal :

$$(2) \quad D(t) = D_1(t_1) + \ldots + D_n(t_n)$$

While tax revenues are given by:

$$(3) \quad R(t) = p_1 x_1 t_1 + \ldots + p_n x_n t_n$$

A partial equilibrium on a goods' market

min $D(t)$, s.t. $R(t)=T$

$$(4) \quad \frac{\varepsilon_D^i \varepsilon_S^i}{\varepsilon_D^i + \varepsilon_S^i} t_i = k$$

where *k is the Lagrange multiplier associated to the* government's budget constraint

We can rewrite it as "inverse elasticities rule":

$$(5) \quad t_i = k\left(\frac{1}{\varepsilon_D^i} + \frac{1}{\varepsilon_S^i} \right)$$

It suggests that it may be better to introduce a tax on a good whose demand and supply are less elastic.

Optimal taxation in general equilibrium model

I consumers -workers with utility functions $U_i(X^i, L^i)$

where X^i *is consumption of n goods and Li is the* labor supply.

Assume that the production has constant returns:

goods are produced from labor only. Production of one unit of good *j requires aj units of labor.*

In equilibrium $p_j = a_j w$

Taxes:

▸ linear taxes on goods, which raise consumer prices to $(1 + t_j)$,

▸ linear tax on wages, which lowers the net wage to $(1 - \tau)$.

Optimal taxation in general equilibrium model

The budget constraint of consumer *i,* who only owns his labor, is:

$$(6) \quad \sum_{j=1}^{n} \left(1 + t_j\right) X_j^i = \left(1 - \tau\right) \bar{L}^i$$

Then the tax on wages is equivalent to a uniform tax on goods:

$$(7) \quad t_j' = \frac{\tau + t_j}{1 - \tau} \Leftrightarrow 1 + t_j' = \frac{1 + t_j}{1 - \tau}$$

The budget constraint can be transformed into:

$$(8) \quad \sum_{j=1}^{n} \left(1 + t_j'\right) X_j^i = \bar{L}^i$$

The tax system *(t_j, τ) is equivalent to the tax system (t'_j, 0) in which wages are not taxed.*

Optimal taxation in general equilibrium model

The government collects from the consumer *i:*

$$(9) \quad \sum_{j=1}^{n} t_j X_j^i + \tau L^i = \sum_{j=1}^{n} \left(t_j + \tau \left(1 + t_j^{'} \right) \right) X_j^i = \sum_{j=1}^{n} t_j^{'} X_j^i$$

In both tax systems the government collects exactly the same revenue.

Consumers maximize their utility:

$V_i(q)$ - the indirect utility of consumers

q'=1+t' - the vector of consumption prices

$$(10) \quad V_i(q) = \max_{(X^i, L^i)} U_i \left(X^i, L^i \right)$$

Under *$qX^i = L^i$*

Optimal taxation in general equilibrium model

The government must maximize **W(q**) *in q,* subject to its budget constraint:

$$(11) \quad \sum_{i=1}^{I}\sum_{j=1}^{n}\left(q_j - 1\right)X_j^i(q) = T$$

where are the demands of the various consumers and
q'= I +t'.

λ - the Lagrange multiplier of the government's budget constraint

Differentiating Lagrangian in q_k *yields:*

$$(12) \quad \sum_{i=1}^{I}\frac{\partial W}{\partial V_i}\frac{\partial V_i}{\partial q_k} = -\lambda \sum_{i=1}^{I}\left(X_k^i + \sum_{j=1}^{n} t_j^{'}\frac{\partial X_j^i}{\partial q_k}\right)$$

Optimal taxation in general equilibrium model

By Roy's identity:

$$\frac{\partial V_i}{\partial q_k} = -\alpha_i X_k^i$$

where is the marginal utility of income of consumer i

Define

$$\beta_i = \frac{\partial W}{\partial V_i} \alpha_i$$

β_i - the social marginal utility of income of consumer i.

It is the increase in the value of the Bergson-Samuelson functional when i is given one additional unit of income.

Optimal taxation in general equilibrium model

$$(13) \quad \sum_{i=1}^{I} \beta_i X_k^i = \lambda \sum_{i=1}^{I} \left(X_k^i + \sum_{j=1}^{n} t_j' \frac{\partial X_j^i}{\partial q_k} \right)$$

We can use Slutsky's equation:

$$(14) \quad \frac{\partial X_j^i}{\partial q_k} = S_{jk}^i - X_k^i \frac{\partial X_j^i}{\partial R_i}$$

where

$$S_{jk}^i = \left(\frac{\partial X_j^i}{\partial q_k} \right)_{U_i}$$

Optimal taxation in general equilibrium model

Using Slutsky's equation we get:

(15)
$$\sum_{j=1}^{n} t'_j \sum_{i=1}^{I} S^i_{jk} = \frac{\sum_{i=1}^{I} \beta_i X^i_k}{\lambda} - \sum_{i=1}^{I} X^i_k + \sum_{i=1}^{I} X^i_k \sum_{j=1}^{n} t'_j \frac{\partial X^i_j}{\partial R_i}$$

Taking X^i_k out of brackets, we can introduce a new parameter:

(16) $\quad b_i = \frac{\beta_i}{\lambda} + \sum_{j=1}^{n} t'_j \frac{\partial X^i_j}{\partial R_i}$

The increase in tax revenue collected from i when his income increased by one unit.

b_i - the net social marginal utility of income of consumer i.

The social marginal utility of income of consumer i, divided by the cost of budget resources for government.

Optimal taxation in general equilibrium model

The aggregated demand for good k is equal: $X_k = \sum_{i=1}^{I} X_k^i$

Then, rearranging and using the symmetry of the Slutsky matrix, we get:

$$(17) \quad \sum_{j=1}^{n} t_j' \sum_{i=1}^{I} S_{jk}^i = -X_k \left(1 - \sum_{i=1}^{I} b_i \frac{X_k^i}{X_k} \right)$$

However, $\quad \sum_{i=1}^{I} \frac{X_k^i}{X_k} = 1$

Let $\overline{b}$ be the average of all b_i.

The empirical covariance across consumers is defined as: $\quad \theta_k = \text{cov}\left(\frac{b_i}{\overline{b}}, \frac{IX_k^i}{X_k} \right)$

Optimal taxation in general equilibrium model

Finally we obtain Ramsey's formula:

$$(18) \quad -\frac{\sum_{j=1}^{n} t'_j \sum_{i=1}^{I} S^i_{kj}}{X_k} = 1 - \overline{b} - \overline{b}\,\theta_k$$

The LHS of this formula is called the discouragement index of good k. *A tax t'_j on good j decreases the* consumption of good k *by consumer i by* $t'_j S^i_{kj}$ *at a* fixed utility level.

In other words it is the relative change of compensated demand for good k caused by the tax system.

The RHS of the formula is called the distributive factor of good k.

Optimal taxation in general equilibrium model

Ramsey's formula (simpler version):

$$(19) \quad \frac{t}{p} = k\left(\frac{1}{\eta_U^d} + \frac{1}{\eta^s} \right)$$

where

k – proportionality coefficient,

t – tax,

p – a net price (after tax),

η_U^d – the elasticity of compensated demand,

η^s – the elasticity of supply.

This formula says that taxes on goods, which minimize the excess burden, are proportional to the sum of the reciprocals of elasticities of supply and demand.

Optimal taxation in general equilibrium model

▸ Formula (18) indicates that the government should tax less the goods that are more intensively consumed by agents with a high net social marginal utility of income, i.e. goods with a positive covariance . θ_k

▸ This suggests that the tax system should discourage less the consumption of the goods that the poor buy more.

▸ Formula (19) suggests that the government should impose higher marginal tax rates on goods with low elasticity of demand (or low elasticity of supply).

▸ This means that we should tax more the goods consumed by the poor.

▸ This contradiction results from ignoring redistributive objectives in formula (19). In addition, this formula is true only for goods with no interdependent demands.

Optimal taxation of income (Mirrlees, 1971)

▸ Previous model was a very simple one. In more complex cases we have to take more factors into account.

▸ If we want to study income taxes, we have to consider e.g. the discouraging effect of taxes on labor supply.

▸ This problem was solved by Mirrlees (1971):

  ▸ Workers have heterogeneous earning capacities *w*.

  ▸ All individuals have the same utility function *U(C,L)*, with one consumption good *C* and a labor supply *L*.

  ▸ Since individuals have the same preferences we do not need to worry about horizontal equity.

Optimal taxation of income (Mirrlees, 1971)

Government collects taxes and uses them to achieve its redistributive objectives, which maximize the additive Bergson-Samuelson functional:

$$(20) \quad W = \int \Psi(\mathbf{U}(w)) dF(w)$$

where

$\mathbf{U}(w)$ - the after-tax utility of consumer w,

F - the cumulative distribution function of w in the population,

Ψ - *an increasing and concave function that weights* the utilities of the individuals according to the government's redistributive objectives.

Optimal taxation of income (Mirrlees, 1971)

Government's preferences:

1. Utilitarian - the government maximizes the sum of the individual utilities.

or

2. Rawlsian maximin - the government aims at maximizing the utility of the least favored member of society.

The government plans to collect from each individual a tax revenue *T(w)* to finance public good expenditures *R.*

Optimal taxation of income (Mirrlees, 1971)

In the competitive labor market each individual is paid his productivity level *wL(w)*.

Everyone chooses the labor supply to maximize the after-tax utility:

$$(21) \quad L(w) = \arg\max_L U(wL - T(w), L)$$

The government cannot observe the productivities of workers. It can only observe incomes, what changes the individual maximiza

$$(22) \quad L(w) = \arg\max_L U(wL - T(wL), L)$$

If the government cannot observe actual productivities, it cannot impose taxes which are both equitable and efficient.

Optimal taxation of income (Mirrlees, 1971)

The government problem is to choose the income tax schedule *T(.) to maximize*

$$(23) \quad W = \int_0^\infty \Psi(\mathcal{U}(w))dF(w)$$

where

$$(24) \quad \mathcal{U}(w) = U(wL(w) - T(wL(w)), L(w))$$

and *L(w) maximizes over L*

$$(25) \quad U(wL - T(wL), L)$$

all of this under the government's budget constraint

$$(26) \quad \int_0^\infty T(wL(w))dF(w) \geq R$$

.

Criticism of optimal taxation

1. Optimal taxation ignores many factors which are important for fiscal policy.

   ▶ The optimal taxation focuses on the vertical equity: taxes should be imposed subject to the taxpayers' incomes and their abilities to gain income.

   ▶ Optimal taxes could be very difficult and expensive to collect and control, not mentioning the compliance costs for taxpayers.

Criticism of optimal taxation

2. Many solutions and conclusions of this theory can be reached in more intuitive way.

   ‣ Governments, while designing tax systems, do not build models based on Bergson-Samuelson functional.

   ‣ Any changes in tax systems are introduced slowly and gradually, with the objective to improve situation under Pareto optimality.

   ‣ If we have a nonlinear income tax, it is always possible to introduce tax reforms improving situation in Pareto sense.

Criticism of optimal taxation

3. The optimal taxes' analysis do not give clear conclusions for the fiscal policy.

    ▶ Its results depend on the economic relations, which are difficult to study or measure in practice, and on information, which are not accessible.

    ▶ It is relatively easy to introduce a small change giving a Pareto improvement, but very difficult to run a complex reform of tax system.

    ▶ Often we cannot translate the results of optimal taxation models into precise, practical political actions.

References

- Salanie (2003) – chapters 3, 4 and 7
- Stiglitz (2000) – chapter 20