Evaluation of public policies : a general introduction

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Motivation of the course

• The rising demand for 'accountability' of policy-makers
  – The efficacy of public spending
  – Return on cost of public administration
  – Benchmarking brought about by globalization
  – Democracy is progressing (holding on commitments)
Motivation of the course (2)

• **Quantitative evaluation** of policy reforms as the main instrument of 'accountability'
  – The scientific bias of modern societies
  – Economic rationality and marketization of societies
  – Voters' fatigue about doctrinal and political discourses
  – New motto: "What works and what does not work"
  – Needed understanding (and transparency) of distributional impact of policies
Motivation of the course (3)

• Changes in the practice of evaluation
  – Evaluation evolves from:
    • Intuitive ex-ante justification (possibly through doctrinal arguments) and arithmetic simulation
    To:
    • Behavioral and general equilibrium modeling
    To:
    • Experimentation (Randomized control trials, RCT)

But numerous intermediate stages

• One way or another, evaluation now is at the heart of the reflection on policies
Methodological dimensions of policy reform evaluation

• Policy reform = Change in public supply of goods and services by the government, redistribution (taxes and benefits), regulation of all sorts

• "Evaluation" = impact of policy reforms on various dimensions of social welfare:
  – Aggregate (GDP per capita)
  – Distributional
  – Social
  – Environmental
  – ...

• Objective: use evaluation to check adequation to initial goals and improve the policies by modifying their design or parameters
Methodological dimensions of policy reform evaluation (2)

- Logical equivalence between 'evaluation' of policies and 'incidence' analysis
  - Tax or public spending 'incidence' = how the various agents in the economy are affected?
- Accounting vs. behavioral evaluation
- Partial vs. General equilibrium, micro vs. macro
- Ex-ante vs. ex-post
- Average vs. Marginal effects of policy reforms (the additional € taxed or spent)
- Qualitative vs. Quantitative
- The various dimensions of distribution: vertical, horizontal (including geography)
Methodological dimensions of policy reform evaluation (3)

• Common principle of all evaluation methodologies: the reference to a *counterfactual*

• This counterfactual may take different forms:
  – Before-after comparisons
  – Simple or sophisticated economic ex-ante modeling of reform
  – Control group (in RCT and similar ex-post methods)

• Counter-factual to be used depends on context and nature of the policy reform being considered
Some examples of policy evaluation used in the course

- Carbon tax
- RSA (Revenu de solidarité active)
- Conditional Cash Transfer Programs (CCT): Bolsa Familia, Progresa
- Trade policies
- Educational subsidy
- …
Outline of the course

A. Evaluation of micro-policies in partial equilibrium
   1. Ex-ante
      - Micro-simulation (accounting type) incidence analysis of taxes and benefits and of public spending
      - Behavioral micro-simulation
   2. Ex-post
      - Experimentation RCT type
      - Quasi-experiments
   3. Combing ex-ante and ex-post approaches
   4. Conclusion on evaluation tools for micro policies
Outline of the course (2)

B. Evaluation of macro policies or of macro effects of micro policies

1. Growth, distribution and poverty: another type of incidence analysis
2. The static general equilibrium framework with distributional effects
3. Recursive dynamic CGE modelling
4. Intertemporal dynamic CGE modelling
General reference

Part 1: Micro-oriented policies

Chapter 1
The accounting approach to evaluation: "arithmetic" microsimulation models
Introduction

• "Micro-oriented" policies: focus on the heterogeneity of agents (individuals, households or firms)
• "Arithmetic": policies are evaluated assuming NO behavioral response (= "accounting")
• Simple and fruitful approach in many circumstances: possibly the "first round" of effects of a policy
• Preferred fields of application: tax-benefit systems, all changes in households' budget constraints, including availability of public goods, taxation of firms ("cost of capital")
Outline

1. **Static** arithmetic micro-simulation:
   a. Implicit theory: partial equilibrium tax incidence analysis
   b. Practical considerations
   c. Examples
   d. Final remarks

2. The difficulty to generalize to a **dynamic** setting

3. Evaluating changes in the supply of **public services** (education)
An example of tax-benefit micro-simulation using the "accounting" approach

- Representative sample of households: \( \{Y_i, X_i = 1,2,..n\} \)
- Net income of household \( i \): \( y_i = Y_i - T(Y_i, X_i) \)
- Where \( Y_i \) = gross income,
  \( X_i \) = household characteristics relevant for tax calculation,
  \( T(\cdot) \) = tax function (possibly hundreds lines of code)

Reform:
\[
T(Y_i, X_i) \rightarrow T^*(Y_i, X_i) \quad y_i \rightarrow y_i^* = Y_i - T^*(Y_i, X_i)
\]

Micro-simulation:
- Compare \( \{y_i, i = 1,2,..n\} \) to the counterfactual \( \{y_i^*, i = 1,2,..n\} \)
- Compare tax receipts, inequality, social welfare. Identify gainers, losers, …
1.a Implicit theory behind arithmetic microsimulation

Basic consumer theory: welfare effect of a price change

• Changes in welfare of consumer $i$ due to a changes in income

**Indirect utility function**

$$V_i(p, y_i) = U\left[x^M(p, y_i)\right] \text{ with } x^M(p, y_i) = \text{Argmax} \left\{ U_i(x_i) \text{ s.t. } px_i \leq y_i \right\}$$

**Change in income:** $\Delta V_i = V_{iy} \Delta y_i$

**Equivalent income variation:** any change in welfare can be made equivalent to a change of income (up to $V_{iy}$):

$$\Delta \tilde{y}_i = \frac{\Delta V_i}{V_{iy}}$$

$\Delta \tilde{y}_i$ = money metric of change in welfare
Welfare change due to change in prices (e.g. indirect taxation)

• Changes in welfare due to changes in prices

Change in welfare: \[ \Delta V_i = \sum_j V_{ij} \Delta p_j \]

Sheppard's lemma or envelope theorem:

\[ V_{ij} = \sum_k U_k \frac{\partial x_{ik}^M}{\partial p_j}; U_k = \lambda p_k, \sum_k p_k \frac{\partial x_{ik}^M}{\partial p_j} + x_{ij}^M \Delta p_j = 0 \Rightarrow V_{ij} = -V^i_y x_{ij}^M (p, y_i) \]

It follows that the equivalent income variation to change of prices is:

\[ \Delta \tilde{y}_i = -\sum_j x_{ij} \Delta p_j \]

Equivalent income variation = change in the value of initial consumption basket.
(Alternative statement of envelope theorem) (not presented in class)

• Using direct utility function \( V = \max_x U(x) \mid p.x \leq y \)

• Lagrangian \( V = \max_x L(x) = U(x) + \lambda(y - p.x) \mid p.x \leq y \)

• First order conditions: \( U_x = \lambda p \quad p.x = y \)

• Differentiate (2) w.r.t. \( p, x \) and \( \lambda \): \( \Delta V = U_x \Delta x + \lambda(-p.\Delta x - x\Delta p) \)

• Use First order conditions, \( \Delta x \) cancels: \( \Delta V = -\lambda x \Delta p \)
Welfare change due to change in prices (e.g. indirect taxation)

\[ \Delta \tilde{y}_i = - \sum_{j} x_{ij} \Delta p_j \]

Equivalent income variation = change in the value of initial consumption basket.

*No need to evaluate change in consumption* to calculate change in welfare: observed consumption basket is enough

This is what justifies the arithmetic micro-simulation approach
Generalization to labor supply, returns to assets and household production

\[ \Delta \tilde{y}_i = \sum_j (q_{ij} - x_{ij}) \Delta p_j + \sum_k A_{ik} \Delta r_k + L_i \Delta w_i \]

Where \( q_i \) = vector of production
\( L_i = \) labor supply (with wage \( w_i \))
\( A_i \) = vector of assets (with returns \( r_i \))

Note, however, that actual change in income is given by:

\[ \Delta y_i = \sum_k A_{ik} \Delta r_k + L_i \Delta w_i + w_i \Delta L_i \]

assuming fixed supply of assets \( A \)
Change in government receipts (indirect tax case)

Accounting-type micro-simulation not enough to determine:

a) changes in consumption;

b) Changes in government budget

This requires explicitly taking into account changes in consumption behavior of each household $i$.

In the case of a pure indirect tax (price change = change in tax) change in aggregate consumption and tax receipts on good $j$ writes:

$$\Delta X_j = \sum_i \frac{\partial x^i_j}{\partial p_j} \Delta p_j \quad \Delta T_j = X_j \Delta p_j + t_j \Delta X_j \quad \Delta p_j = \Delta t_j$$
Changes in consumption …

\[ \Delta X_j = \sum_i \frac{\partial x_j}{\partial p_j} \Delta p_j \quad \Delta T_j = X_j \Delta p_j + t_j \Delta X_j \quad \Delta p_j = \Delta t_j \]

Full analysis thus requires knowledge of consumption behavior, not only for the good being taxed but possibly the others:

\[ \Delta X_k = \sum_i \frac{\partial x_k}{\partial p_j} \Delta p_j \quad \Delta T = X_j \Delta p_j + \sum_k t_k \Delta X_k \quad \Delta p_j = \Delta t_j \]

Note: possible to handle this step at the aggregate rather than disaggregated level
Final remarks on implicit theory of arithmetic micro-simulation of taxes and benefits

- Arithmetic micro-simulation may be taken as the first round of effects due to a change in the tax system (it will in general over-estimate tax receipts)
- Behavioral response will have spillover effects on prices, asset returns and wages (general equilibrium)
- The envelope theorem applies only to "marginal" changes
- No other constraint than the budget constraint should be binding: what about rationing?
- Same methodology may apply to firms
- The 'model' explaining how to go from changes in the taxation system to changes in prices ($p$), returns ($r$) and wages ($w$) has to be specified (general equilibrium model?)
  - $\Delta p = \Delta t$ only at perfectly competitive long-run equilibrium in a closed economy
1.b Practical considerations

- Combination of:
  - Micro-data base (typically household surveys or administrative data)
  - Official rules of the tax-benefit system
  - 'Model' = applies to each unit in the micro-data base the tax-benefit system rules and reforms of these rules
  - (the 'typical household' approach as a benchmark)

- Basic data requirement:
  - Representative sample of households
  - All data necessary to compute taxes and benefits available
  - Measurement errors to be taken into account
Practical considerations (2)

• Important assumption
  – Everybody behaves according to the rule: what about tax evasion or incomplete benefit take-up?
  – Tax evasion and benefit take-up as other behavioral dimensions

• The issue of grossing-up the baseline sample:
  – Updating demographic structure using sampling weights
  – Updating prices and incomes through proportional changes in all prices and incomes (from different sources)
  – Dealing with "no-response" (or with "zeros")
1.c Example: the Euromod model

- Comprehensive tax-benefit model for EU-15 with maximum comparability of data, instruments and performances
- Most helpful instrument to study possible integration – or the difficulty of integration - of EU tax or social policies
- Euromod: Immervoll- Sutherland, 1998
Figure 1: The Effect of Taxes and Benefits on Incomes in Poor Households, 2001
Figure 2: The Child Poverty Rate in EU-15 in 2001, with and without Child-contingent Incomes, all Transfers, and all Transfers and Taxes

Child poverty is defined as the proportion of households with children below the national poverty line (50% of the national median of equivalized household incomes, using the square root equivalence scale). Source: EUROMOD; Corak et al (2005)
1.d Other applications and extensions

- Mortgage tax relief (requires data on mortgage/interest payments)
- Gender issues (requires within household allocation rules)
- Population changes (re-weighing subgroups, e.g. age groups)
- Pension reforms (in a static sense)
- Basic income
- Average vs. Marginal effective tax rates (redistribution vs. incentives) …
Limitations of static arithmetic microsimulation

- The basic assumption of no behavioral response (including evasion and take-up) and the limited information delivered by marginal effective tax rates

- Mixed bag of policy instruments: contributory vs. non-contributory benefits

- How to handle unemployment benefits and public 'Pay as You Go' type of pensions?

- What to do with the public good counterpart of taxes?

- Applies mostly to households: what about firms