Outline of the course

I. Tax and benefit microsimulation models
   1. Static microsimulation models (MSM)
   2. Tutorial (1) : using python for microsimulation
   3. Behavioural responses and dynamic MSM
   4. Tutorial (2) : microsimulation in practice

II. Modelling macro shocks and policies
   1. Evaluating the impact of macro shocks and policies on poverty and income distribution
   2. Computable General Equilibrium models
   3. Integrating CGE and Microsimulation models
   4. Tutorial : Integrating CGE and Microsimulation models
Outline of the lecture

I. Why microsimulation?

II. Typology of modelling techniques

III. Static microsimulation models

IV. Example: TAXIPP model for France
I. Why microsimulation?

1. Evaluation
2. History
3. Modelling complexity
I. Why microsimulation?

Evaluation of public policies

• **Objectives**
  - Inform policy makers on the impact of policy
  - Contribute to academic knowledge
  - Part of the democratic process

• **Methods of evaluation**
  - Ex post evaluation methods
    - RCT
    - Natural experiments
    - Econometrics
  - Ex ante evaluation methods
    - Macrosimulation
    - Microsimulation
I. Why microsimulation?
Evaluation of public policies

- **Microsimulation: definition**
  - Simulation-based tool with micro unit of analysis
  - Simulate actual or counterfactual policies

- **Objective**
  - Ex post evaluation of complex policies
  - Computer-based laboratory for running policy experiment (ex ante evaluation)
I. Why microsimulation?

History

• Guy Orcutt (1917-2006)

Guy Orcutt, American Economist and Econometrician, Prof. at Harvard, Wisconsin and Yale. He joined the Urban Institute to develop DYNASIM, the dynamic microsimulation model of the Institute.

“Existing models of our socio-economic system have proved to be of rather limited predictive usefulness. This is particularly true with respect to predictions about the effects of alternative governmental actions”
I. Why microsimulation?

History

- **Orcutt (RESTAT, 1957; AER, 1960)**
  - Criticism of representative agent models common in macroeconomics
  - Criticism of sectorial modelling (a la Leontief)
  - Non-linear relationship at the individual level cannot be estimated at the aggregated level
  - Distribution of variables across household is of major interest

- **Main objectives**
  - Modelling at the unit of decision (individuals, households, firms, etc.)
  - Simulation of the economy with computer power
  - Very ambitious project for the time
I. Why microsimulation?

History

- **Slow beginnings**
  - Lack of computer power
  - Lack of micro-data
  - Few attempts in the 1970s, in demographics

- **Take-off of the field**
  - 1980-90s development of personal computer
  - Explosion in computer power

- **From academia to administrations**
  - Development of models in academia (1980s)
  - Administrations have incorporated these models (need for significant resources)
  - Specialized institutes (Urban Institute, NATSEM, IFS, DIW, ZEW, CPB, etc.)
I. Why microsimulation?

History

- Microsimulation: a tool for public debate
  - Debate around budget decisions
  - Debate around election platforms

- IFS and the Green Budget (U.K.)
  - TAXBEN model used for post-budget analysis
  - Green Budget: pre-budget discussions

- CPB (Netherlands)
  - Analysis of election platforms

- CBO (U.S.)
  - Impact evaluation of policy proposals
### Table 1: Some static microsimulation models

<table>
<thead>
<tr>
<th>Country</th>
<th>Model</th>
<th>Institution</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>STINMOD</td>
<td>NATSEM</td>
<td>SAS</td>
</tr>
<tr>
<td>Belgium (Flanders)</td>
<td>MEFISTO</td>
<td>Leuven Univ.</td>
<td>Euromod ; Java</td>
</tr>
<tr>
<td>E.U.</td>
<td>EUROMOD</td>
<td>Essex Univ.</td>
<td>.NET</td>
</tr>
<tr>
<td>Finland</td>
<td>TUJA</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>France</td>
<td>INES</td>
<td>Insee/Drees/Cnaf</td>
<td>SAS</td>
</tr>
<tr>
<td>France</td>
<td>SAPHIR</td>
<td>DG Trésor</td>
<td>SAS</td>
</tr>
<tr>
<td>France</td>
<td>TAXIPP</td>
<td>IPP</td>
<td>Stata/Python</td>
</tr>
<tr>
<td>Germany</td>
<td>IZA$\Psi$MOD</td>
<td>IZA</td>
<td>Stata</td>
</tr>
<tr>
<td>Germany</td>
<td>MIKMOD</td>
<td>Min. of finance</td>
<td>Java</td>
</tr>
<tr>
<td>Ireland</td>
<td>SWITCH</td>
<td>ESRI</td>
<td>C++</td>
</tr>
<tr>
<td>Luxemburg</td>
<td>LuxTaxBen</td>
<td>LISR</td>
<td>SAS</td>
</tr>
<tr>
<td>Sweden</td>
<td>FASIT</td>
<td>Statistics Sweden</td>
<td>SAS</td>
</tr>
<tr>
<td>Sweden</td>
<td>SWEtaxben</td>
<td>Univ. of Gothenburg</td>
<td>SAS</td>
</tr>
<tr>
<td>U.K.</td>
<td>TAXBEN</td>
<td>IFS</td>
<td>Delphi/Stata</td>
</tr>
<tr>
<td>U.K.</td>
<td>Euromod</td>
<td>Essex Univ.</td>
<td>.NET</td>
</tr>
<tr>
<td>U.K.</td>
<td>FORTAX</td>
<td>A. Shephard</td>
<td>FORTRAN</td>
</tr>
<tr>
<td>U.S.</td>
<td>TRIM3</td>
<td>Urban Institute</td>
<td>C++</td>
</tr>
<tr>
<td>U.S.</td>
<td>TAXSIM</td>
<td>NBER</td>
<td>FORTRAN</td>
</tr>
</tbody>
</table>

*Sources:* Li et al., Table 3.1, p. 53, with additions.
I. Why microsimulation?
Modelling complexity

• **Population complexity**
  • Complex units of decisions (individuals, couples, family, firms, etc.)
  • Distribution of characteristics (income, demographics, occupation, etc.)
  • Joint-distribution of all these variables

• **Policy complexity**
  • Non-linear tax and benefit schedules
  • Interaction between benefits/taxes
  • Need modelling to assess impact of changes in policy
I. Why microsimulation?

Modelling complexity

- **Behavioural complexity**
  - Different margins of behavioural responses (labour supply, savings, education, etc.)
  - Heterogeneous preferences, information set
  - Difference in behavioural responses at the individual level

- **Temporal complexity**
  - Policy can depend on life-cycle history (e.g., pensions)
  - Behavioural responses can be dynamic
  - Historical analysis vs projections

- **Spatial complexity**
  - Location can matter for policy/behaviour/population heterogeneity
II. Typology of microsimulation models

1. Hypothetical models
2. Static models
3. Behavioural responses
4. Dynamic models
5. Agent-based modelling
II. Typology of microsimulation models

Hypothetical models

- **Definition**
  - Construct ideal/synthetic individuals/households
  - Focus on policy complexity

- **Objectives**
  - Illustrative purpose
  - Validation
  - Cross-country comparisons
  - Communication with the public
II. Typology of microsimulation models

Hypothetical models

- **Example : OECD Taxing Wages**
  - Annual publication to analyse labour taxation in OECD countries
  - 8 different households types:
    - Marital status
    - Number of children
    - Earnings

- **Focus on tax wedge**
  - Personal income tax + employee and employer social security contributions + any payroll tax
  - - cash transfers
II. Typology of microsimulation models

Hypothetical models

**Table 2: OECD Household types**

<table>
<thead>
<tr>
<th>Marital status</th>
<th>Children</th>
<th>Earnings (% of average)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Single individual</td>
<td>No children</td>
<td>67%</td>
<td></td>
</tr>
<tr>
<td>Single individual</td>
<td>No children</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Single individual</td>
<td>No children</td>
<td>167%</td>
<td></td>
</tr>
<tr>
<td>Single individual</td>
<td>2 children</td>
<td>67%</td>
<td></td>
</tr>
<tr>
<td>Married couple</td>
<td>2 children</td>
<td>100%</td>
<td>33%</td>
</tr>
<tr>
<td>Married couple</td>
<td>2 children</td>
<td>100%</td>
<td>67%</td>
</tr>
<tr>
<td>Married couple</td>
<td>no children</td>
<td>100%</td>
<td>33%</td>
</tr>
</tbody>
</table>

*Sources: OECD, *Taxing Wages*, 2011, Tab. IV.5.*
II. Typology of microsimulation models

Hypothetical models

**Figure 1:** Average tax wedge decomposition in France

Note: Level of gross earnings expressed as percent of the average wage.
II. Typology of microsimulation models

Hypothetical models

**Figure 2**: Average tax wedge decomposition in Germany

Note: Level of gross earnings expressed as percent of the average wage.
II. Typology of microsimulation models

Hypothetical models

**Figure 3:** Average tax wedge decomposition in the U.K.

Note: Level of gross earnings expressed as percent of the average wage.
II. Typology of microsimulation models

Hypothetical models

• **Limitations**
  • Lack of representativeness
  • Limited heterogeneity in population
  • Can focus on meaningless features of policy
  • Will often disregard detailed aspects of policy that matters a lot
    e.g., tax credits or tax reliefs
  • Cannot get aggregate effects of policy
  • International comparisons inherently difficult
    e.g., different earnings distribution : average gross earnings different
II. Typology of microsimulation models

Static models

• **Definition**
  - Micro-data as baseline
  - Modelling of policy
  - Static or arithmetical (tax and benefit simulator)

• **Advantage vs disadvantages**
  - Provides “day after reform” effects
  - Provides aggregate estimates
  - Provides redistribution impacts
II. Typology of microsimulation models

Static models

- **Large diffusion**
  - Very developed for tax and benefit
  - France: TAXIPP, INES, SAPHIR
  - Europe: EUROMOD

- **Limitations**
  - No behavioural responses
  - No time dimension
II. Typology of microsimulation models

Behavioural responses

- **Definition**
  - Static model as baseline
  - Modelling of policy impact on behaviour
  - Estimate the second-round effects

- **Specific margins of behavioural responses**
  - Mostly labour supply (extensive or intensive)
  - Or taxable income elasticity responses
  - More rarely substitution or avoidance margins
  - Many possible behavioural responses (education, fertility, entrepreneurship, etc.)
II. Typology of microsimulation models

Behavioural responses

- **Dynamic scoring debate in the U.S.**
  - Debate in the U.S. around simulations of tax reforms by CBO
  - Whether or not to incorporate macroeconomic effects
  - Auerbach (JEP 1996, AER 2005); Caroll and Hrung (AER 2005)

- **Trade-offs**
  - See Adam and Bozio (2009)
  - High degree of uncertainty around the dynamic scoring estimates
  - How to deal with that uncertainty?
II. Typology of microsimulation models

Dynamic models

- **Definition**
  - Incorporate time dimension
  - Dynamics of changes in population (ageing, careers, etc.)
  - Cohort vs cross-section

- **Advantages**
  - Projection of population into distant future
  - Analysis of pensions, elderly care, education policies
II. Typology of microsimulation models

Agent-based models

• **Definition**
  - Agent-based Computational Economics (ACE)
  - Development from artificial intelligence field
  - Modelling of interactions between agents in economics environment

• **Advantage vs disadvantages**
  - Adapted to simulate emergence of organisation, market structure, matching
  - Key focus on market equilibrium
  - Limitations in calibration and empirical test
III. Static models

1. Structure of static models
2. Baseline data
3. Coding policy
4. Incidence
5. Static ageing
III. Static models

Structure of static models

1. Data
   - Micro-data representative
   - Aggregate data on population
   - Aggregate data on policy outcomes

2. Policy
   - Parameters
   - Formulas
   - Incidence

3. Reforms
   - Counterfactual policy simulations
   - Representation of the impact
III. Static models

Baseline data

- **Baseline data**
  - Household surveys (links between individuals)
  - Administrative data (tax, social security)
  - Representativeness vs detailed characteristics

- **Grossing-up**
  - Re-weighting based on aggregated data
  - Get aggregate values for key variables
  - Careful exercises (O’Donoghue, Sutherland and Utili, 2000)
III. Static models

Coding policy

- **Policy scope**
  - Tax and benefits
  - Indirect taxation often separate
  - Excluded usually: pension benefit, unemployment insurance
  - Household level: exclusion of taxation at firm level

- **From law to code**
  - Parameters
  - Formula

- **Gathering information**
  - Complex set of parameters
  - Not easy to find for past years
III. Static models

Coding policy

**Figure 4:** IPP tax and benefit tables: Pension SSCs in the private sector

<table>
<thead>
<tr>
<th>Date d'effet</th>
<th>Salaire sous plafond</th>
<th>Sur tout salaire</th>
<th>Références législatives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Salariés</td>
<td>Employeurs</td>
<td>Salariés</td>
</tr>
<tr>
<td>01/01/2016</td>
<td>6,90%</td>
<td>8,55%</td>
<td>0,10%</td>
</tr>
<tr>
<td>01/01/2015</td>
<td>6,85%</td>
<td>8,50%</td>
<td>0,10%</td>
</tr>
<tr>
<td>01/01/2014</td>
<td>6,80%</td>
<td>8,45%</td>
<td>0,10%</td>
</tr>
<tr>
<td>01/11/2012</td>
<td>6,75%</td>
<td>8,40%</td>
<td>0,10%</td>
</tr>
<tr>
<td>01/01/2006</td>
<td>6,65%</td>
<td>8,30%</td>
<td>0,10%</td>
</tr>
<tr>
<td>01/07/2004</td>
<td>6,55%</td>
<td>8,20%</td>
<td>0,10%</td>
</tr>
<tr>
<td>01/02/1991</td>
<td>6,55%</td>
<td>8,20%</td>
<td>0,10%</td>
</tr>
<tr>
<td>01/01/1989</td>
<td>7,60%</td>
<td>8,20%</td>
<td></td>
</tr>
<tr>
<td>01/07/1987</td>
<td>6,60%</td>
<td>8,20%</td>
<td></td>
</tr>
<tr>
<td>01/08/1986</td>
<td>6,40%</td>
<td>8,20%</td>
<td></td>
</tr>
<tr>
<td>01/01/1984</td>
<td>5,70%</td>
<td>8,20%</td>
<td></td>
</tr>
<tr>
<td>01/01/1979</td>
<td>4,70%</td>
<td>8,20%</td>
<td></td>
</tr>
<tr>
<td>01/10/1976</td>
<td>3,45%</td>
<td>7,70%</td>
<td></td>
</tr>
<tr>
<td>01/01/1976</td>
<td>3,25%</td>
<td>7,50%</td>
<td></td>
</tr>
</tbody>
</table>

*Source:* *Barème IPP – prélèvement sociaux*
III. Static models

Coding policy

- **Model**
  - Set-up tax/transfer functions depending on input variables $X$

  \[ T = f(X) \]

- **Simplification**
  - $f(X)$ is complex
  - Policy complexity often too high
  - Decreasing return to accuracy

- **Data and approximation**
  - Missing information in data
  - Imputation of tax and benefit
  - Imputation of characteristics $X$
III. Static models

Incidence

- **Statutory/formal incidence**
  - It is the legal liability of a tax (what the law says).

- **Economic/effective incidence**
  - It describes who actually bears the tax burden, i.e., who is worse off as a result of the tax.

- **Static microsimulation relies on incidence assumptions**
  - Usually exclusion of firm taxation
  - Indirect taxation incident on consumers (on prices)
  - Employer SSCs incident on employees (or consumers)
III. Static models

Incidence

- **Employer social security contributions (SSC)**
  - Debate on whether incident on consumers (higher prices) or employees (lower wages)
  - Obvious long vs short term incidence
  - It has consequences for analysing policy of reduction of SSC on low earners.

- **Indirect taxes**
  - Usual analysis lead to most indirect taxes are paid by consumers
  - Detailed analysis (Carbonnier 2007, 2009) suggest part is paid by factors
III. Static models

Incidence

- **Corporate income tax (CIT)**
  - Standard view: CIT paid by shareholders
  - Modern finance view: likely to be paid by capital owners at large
  - Some studies suggest that CIT is paid mostly by consumers or wage earners
  - Huge implications in terms of redistribution analysis!

- **Undistributed corporate profits**
  - Undistributed profits are part of national income
  - CIT is imposed on them
  - Problem: who receive this income?
  - Shareholders are the likely recipients
III. Static models

Static ageing

- **Needs for updated data**
  - Simulate proposed reforms for next years’ budget
  - Delay in getting updated micro data (often 2-3 years lag)

- **Static ageing**
  - No modelling of dynamic processes
  - Use macro-aggregates to update population characteristics (income, employment status, etc.)
  - Problematic when far away from baseline data
IV. TAXIPP model for France

- A French tax and benefit model developed at the Institut des politiques publiques (IPP)

- Currently all tax systems from 1997 to 2019

- **A classic arithmetical model**
  - A static model
  - A module of behavioural response (still limited)

- **Specificities**
  1. Based on administrative data
  2. Incorporating top incomes
IV. TAXIPP model for France

- **Language**
  - Originally written in Stata (versions 0.x)
  - Transcription into Python (from versions 1.0)

- **Version control**
  - TAXIPP 0.5 last Stata version
  - TAXIPP 1.0 python version
  - TAXIPP 2.0 under way

- **Documentation**
  - IPP Methodological Guides

- **Part of larger set of models in development**
  - PENSIPP : dynamic microsimulation model of the French pension system
  - TAXIPP-LIFE : over the life-cycle
IV. TAXIIPP model for France

1. French tax and benefit system
2. Data sources
3. Measuring redistribution
4. Example studies
IV. TAXIPPP model for France
French tax and benefit system

• **The main components**
  • Social security contributions
  • Income taxation
  • Benefits
  • Wealth and transfer taxation
  • Corporate taxation
  • Indirect taxation

• **The main input characteristics**
  • Types of income (earnings, capital income, etc.)
  • Sector or type of occupation
  • Household composition (age and number of children, etc.)
  • Housing situation (renter vs owner)
  • Wealth
IV. TAXIPP model for France
French tax and benefit system

- **Social security contributions**
  - Different Social Security schemes
  - SSCs based on hourly gross wage
  - Schedule depends from Social Security Threshold (SST)

- **Very complex schedule**
  - postcode of employer (transport tax)
  - whether in Alsace-Lorraine or not
  - prevalence of work accident by occupation
  - size of firm
  - share of earnings from bonus (in the public sector)
IV. TAXIPP model for France

French tax and benefit system

- Contribution sociale généralisée (CSG)
  - Flat rate income tax to fund health care
  - Larger tax base than income tax or SSCs

- Deductability vs non-deductability
  - Part of CSG is deductible for income tax
  - Part is non-deductable
  - Result: taxable income in France is higher than net earnings!
  - In some countries taxable income = gross earnings
IV. TAXIPP model for France

French legislation

**Figure 5:** From labour cost to taxable income
### IV. TAXIPP model for France

**French legislation**

#### Table 3: From labour cost to disposable income

<table>
<thead>
<tr>
<th>Included</th>
<th>Cost of labour</th>
<th>Gross earnings</th>
<th>Taxable income</th>
<th>Net income</th>
<th>Disposable income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payroll tax (TS)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employer SSC</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employee SSC</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSG deductible</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non ded. CSG and CRDS</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Income tax</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Benefits</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
IV. TAXIPP model for France

French tax and benefit system

- **Income tax**
  - Progressive schedule with marginal rates
  - Income pooled at tax unit level: joint taxation
  - Size of the household taken into account for assessing progressivity: “quotient familial”

- **Complex tax base estimation**
  - Large number of tax reliefs (e.g., child care cost, gifts, etc.)
  - Complex rules for capital income (e.g., duration of ownership for capital gains)
IV. TAXIPP model for France

French tax and benefit system

- **Family Benefits**
  - Universal family benefits (depends on age, and rank of child)
  - Benefits for covering child care
  - Means-tested benefits for education costs

- **Housing benefits**
  - Subsidy for renters based on location, rent level, income and household composition

- **Income support**
  - RSA : for 25-64 year-olds
  - ASPA for 65 +
  - Other minima for unemployed, or disabled individuals
IV. TAXIPP model for France

Data sources

- **Micro-data**
  - Household survey *Revenus fiscaux* : French Labour force survey matched to tax and benefit data
  - Household survey *Budget des familles*
  - Household survey *Patrimoine*
  - Household survey *Logement*

- **Administrative data**
  - Income Tax returns (FELIN from DGFip)
  - Housing tax returns (FIDELI from DGFip-Insee)
  - Earnings data declared by employers (DADS)
IV. TAXIPP model for France

Data sources

- **Aggregate data**
  - Demographics
  - National accounts
  - Detailed tax revenues
  - Benefits spending and beneficiaries
IV. TAXIPPP model for France

Example: tax revenues

**Figure 6**: French income tax revenues 2008

Source: [www.impot.gouv.fr](http://www.impot.gouv.fr)
IV. TAXIPP model for France

Matching data sources

- **Principle**
  - Literature on data fusion
  - Select common variables (age, sex, household composition, income, types of income)
  - Create a score and minimize distance

- **Practice**
  - Main source is income tax records from *FELIN*
  - Matched with *Revenus fiscaux*
  - Matched with housing information from *FIDELI*
  - Matched with consumption data from *Budget des familles*
IV. TAXIPP model for France

Imputing top incomes

- **Limitation of survey sources**
  - Top of the distribution not well represented
  - Too few observations, under-reporting
  - Generally explains the under estimation of aggregate values

- **Solution**
  - Using tax data from administrative sources
  - Estimation of top income distribution (Piketty and Saez, 2001; Atkinson and Piketty, 2010)
  - Impute top incomes based on these distributions
  - Or matched with administrative data when available
IV. TAXIPP model for France
Weighting-up to aggregate data

- **Principle**
  - Systematic comparison between aggregates from micro data and macro data
  - Run the model to get estimates of tax revenues by type of revenues
  - Re-base variables on macro-data

- **Discrepancies**
  - Earnings :
    - Good fit for private sector
    - No identification of bonuses in public sector
    - 10% lower estimate than NA (black market, fringe benefits)
  - Other income : much lower estimate of dividends and other capital income estimates
## IV. TAXIPP model for France

Weighting-up to aggregate data

**Table 4:** Ratio of simulated gross earnings to aggregate estimates from CSG tax base and national accounts (NA)

<table>
<thead>
<tr>
<th>Year</th>
<th>Gross earnings (simulated) / CSG tax base</th>
<th></th>
<th>NA tax base</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>private</td>
<td>public</td>
<td>private</td>
<td>public</td>
</tr>
<tr>
<td>2004</td>
<td>99,6%</td>
<td>98,9%</td>
<td>91,9%</td>
<td>89,9%</td>
</tr>
<tr>
<td>2005</td>
<td>99,4%</td>
<td>99,2%</td>
<td>90,9%</td>
<td>90,9%</td>
</tr>
<tr>
<td>2006</td>
<td>99,4%</td>
<td>101,4%</td>
<td>90,8%</td>
<td>92,4%</td>
</tr>
<tr>
<td>2007</td>
<td>99,5%</td>
<td>103,0%</td>
<td>90,5%</td>
<td>93,6%</td>
</tr>
<tr>
<td>2008</td>
<td>98,5%</td>
<td>105,7%</td>
<td>91,0%</td>
<td>95,5%</td>
</tr>
<tr>
<td>2009</td>
<td>97,1%</td>
<td>102,6%</td>
<td>91,8%</td>
<td>93,0%</td>
</tr>
<tr>
<td>2010</td>
<td>100,7%</td>
<td>104,1%</td>
<td>91,8%</td>
<td>93,0%</td>
</tr>
</tbody>
</table>
IV. TAXIPP model for France
Measuring contributive capacity

- **Types of income**
  - Net incomes are not a good measure
  - Economic income: income before all taxes
  - Need to add all taxes to net income including imputed indirect taxes

- **Primary vs secondary income**
  - Primary income: income before transfer and taxes
  - Secondary income: income before all taxes but including transfer income (pensions, unemployment) but net of SSC funding these transfers
  - Primary income \(\simeq\) national income
IV. TAXIPP model for France
Measuring contributive capacity

- **Income vs consumption**
  - Income might not be a good measure of permanent income
  - Temporary variations in income are frequent
    e.g. unemployment: primary income drops to zero
  - Consumption might be a better measure of permanent income
  - Except that consumption does not capture systematic difference in savings over the life-cycle

- **Income vs wealth**
  - Income and wealth are not completely correlated

- **Philosophical backgrounds**
  - Social welfare functions depend on utilities
  - Utility is derived from income, consumption, wealth...
IV. TAXIPP model for France
Household vs individual

- **What unit of reference?**
  - Individuals: income
  - Household: income is totally pooled among household members
  - Partly a philosophical choice

- **How to account for household size?**
  - Assessment of needs represented by each member
  - OECD equivalence scale
IV. TAXIPP model for France

Life cycle issues

- **Cross-section is misleading**
  - Data source essentially cross-section
  - Redistribution analysis is misleading

- **Life-cycle issues**
  - Redistribution through contributory pensions/unemployment
  - Age earnings profile explains part of the earnings inequality

- **Income variability**
  - Income shocks from one year to the other
  - Bottom of the distribution: the “poor” are the unemployed or people at the minimum wage?
IV. TAXIPPP model for France

Representation issues

- **Choice of redistributive capacity**
  - Current income
  - Measure of permanent income
  - Consumption

- **Choice of unit of reference**
  - Individuals, households, consumption unit

- **Scale of the distribution**
  - Quintile, decile, percentile
  - Absolute values
IV. TAXIPP model for France

Representation issues

**Figure 7:** Average tax rate on primary income by deciles (2010)

*Source: TAXIPP 0.3, Bozio, Guillot et Lafféter (2014).*
IV. TAXIPP model for France

Representation issues

**Figure 8:** Average tax rate on primary income by percentiles (2010)

Source: TAXIPP 0.3, Bozio, Guillot et Lafféter (2014).
IV. TAXIPP model for France

Incidence assumptions

**Figure 9:** Variants to incidence assumptions

Source: TAXIPP 0.3, Bozio, Guillot et Lafféter (2014).
IV. TAXIPP model for France

Conflicting sources

- **Measuring tax bases**
  - Advantage of TAXIPP is to measure the extent of pre-tax income
  - Assessment of the largest tax bases
  - Methodology rests on accuracy of aggregate data

- **Conflicting sources**
  - National accounts and tax records do not always match well
  - In particular for capital income
  - Tax optimisation/measurement error?

- **Large implications for measurement**
  - Capital income very concentrated in top incomes
  - Error for these incomes matter a lot in the top
IV. TAXIPP model for France

Conflicting sources

**Figure 10:** Average tax rates (excl. contributive contributions) – variants about dividends imputations.

**NOTE:** In scenario 1 aggregate dividends are based on national accounts, in scenario 2 dividends are based on tax records.
IV. TAXIPP model for France
Simulating reforms

- **Building a baseline**
  - Assumption about growth rates
  - Large implications in terms of tax revenues

- **No behavioural case**
  - Apply the change in tax system
  - Make comparative statistics

- **With behavioural response**
  - Imbed an elasticity of the tax base to a change in tax rate
  - Currently only done ad hoc for labour supply
IV. TAXIPP model for France

Issues

- **Interactions between tax bases**
  - Tax bases of one tax depends on other changes
  - e.g. increase in SSC $\Rightarrow$ lower taxable income
    $\Rightarrow$ lower income tax

- **Inconsistency**
  - No behavioural response is inconsistent
  - e.g. increase in income tax $\Rightarrow$ lower consumption or/and lower savings
    $\Rightarrow$ lower VAT or/and lower capital taxation
IV. TAXIPP model for France

Indirect taxation

- **Data set-up**
  - Income and consumption appear under-reported in *Budget des familles*
  - Need to scale them up to aggregate data

- **Case study where choice of earning capacity matters**
  - Regressive taxation based on current income
  - Flat taxation based on consumption level
IV. TAXIPP model for France
Indirect taxation

**Table 5:** Consumption under-reporting in *Budget des Familles*

<table>
<thead>
<tr>
<th>Survey Year</th>
<th>Consumption from BdF</th>
<th>Consumption from NA</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>569,1</td>
<td>660,97</td>
<td>86,1%</td>
</tr>
<tr>
<td>2000</td>
<td>670,8</td>
<td>782,19</td>
<td>85,8%</td>
</tr>
<tr>
<td>2005</td>
<td>784,5</td>
<td>946,12</td>
<td>83,0%</td>
</tr>
</tbody>
</table>

*Note:* in billion of euros.

### IV. TAXIPP model for France

Indirect taxation

---

**Table 6: Income under-reporting in *Budget des Familles***

<table>
<thead>
<tr>
<th>Survey Year</th>
<th>Disposable income from BdF</th>
<th>Disposable income from NA</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>600.9</td>
<td>784.84</td>
<td>76.6%</td>
</tr>
<tr>
<td>2000</td>
<td>709.7</td>
<td>913.35</td>
<td>77.7%</td>
</tr>
<tr>
<td>2005</td>
<td>801.3</td>
<td>1108.69</td>
<td>72.3%</td>
</tr>
</tbody>
</table>

*Note:* in billion of euros. Disposable income includes imputed rents.

IV. TAXIPP model for France
Indirect taxation

Figure 11: Share of indirect taxes in consumption and net income in 2005, by decile of disposable income

Sources: Budget des familles 2005, TAXIPP 0.1.
IV. TAXIPP model for France

Indirect taxation

- **VAT reduction for restaurants**
  - July 2009, reduction from 19.5% to 5.5%
  - After a long debate with EU authorities

- **Contract with restaurant unions**
  - VAT reduction should be shifted into prices for 7 products
  - Restaurants should create 40’000 jobs
  - Open wage negotiations
IV. TAXIPP model for France
Indirect taxation

**Figure 12:** Evolution of prices

*Sources: Price index, base 2008.*
IV. TAXIPP model for France
Indirect taxation

**Table 7:** Gain in VAT reduction by decile

<table>
<thead>
<tr>
<th>Consumption Decile</th>
<th>Average spending</th>
<th>Share restaurant</th>
<th>VAT reduction (1)</th>
<th>VAT reduction (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>123</td>
<td>1,1 %</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>218</td>
<td>1,3 %</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>314</td>
<td>1,6 %</td>
<td>37</td>
<td>35</td>
</tr>
<tr>
<td>4</td>
<td>429</td>
<td>1,8 %</td>
<td>51</td>
<td>48</td>
</tr>
<tr>
<td>5</td>
<td>480</td>
<td>1,7 %</td>
<td>57</td>
<td>54</td>
</tr>
<tr>
<td>6</td>
<td>608</td>
<td>1,8 %</td>
<td>72</td>
<td>68</td>
</tr>
<tr>
<td>7</td>
<td>851</td>
<td>2,2 %</td>
<td>100</td>
<td>95</td>
</tr>
<tr>
<td>8</td>
<td>808</td>
<td>1,8 %</td>
<td>95</td>
<td>90</td>
</tr>
<tr>
<td>9</td>
<td>989</td>
<td>1,8 %</td>
<td>116</td>
<td>111</td>
</tr>
<tr>
<td>10</td>
<td>1266</td>
<td>1,6%</td>
<td>149</td>
<td>142</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>618</strong></td>
<td><strong>1,7 %</strong></td>
<td><strong>73</strong></td>
<td><strong>69</strong></td>
</tr>
</tbody>
</table>

*Note:* Price elasticity of restaurant demand is 0 in case 1 and 1 in case 2.

*Sources:* Rapport IPP no 1, 2012.
IV. TAXIPP model for France

Indirect taxation

- **Effect on prices**
  - 2-3% of price reduction
  - 30 to 45% of VAT cut shifted unto prices

- **Redistribution effects**
  - Regressive effects of the reduction in prices
  - But 55-70% not accounted: higher profits? higher wages? more jobs?
IV. TAXIPP model for France

Budget analyses

1. Measures
2. Distribution effects
3. Tax base vs tax rates
IV. TAXIPP model for France
Budget analyses

**Figure 13:** The effect of 2019 budget (Oct. 2018 version)

*Source:* TAXIPP, 1.0; IPP budget conference Oct. 2018.
IV. TAXIPP model for France
Budget analyses

**Figure 14:** Decomposition of 2019 budget (Oct. 2018 version)

*Source: TAXIPP, 1.0; IPP budget conference Oct. 2018.*
IV. TAXIPP model for France

Budget analyses

**Figure 15:** Effect of 2019 budget for active pop. (Oct. 2018 version)
IV. TAXIPP model for France

Budget analyses

**Figure 16**: Effect of 2019 budget for retired pop. (Oct. 2018 version)
References (1/2)

References (2/2)