Public Finance

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École polytechnique - CREST

Fall 2025

Introduction of the class

Focus: The economics of taxation

Organization of the Class

- PART I: Tax incidence, distortions and welfare losses, labor income taxation (by Pierre Boyer)
- PART II: Commodity, dynamic (capital and intergenerational) (by Jean-Baptiste Michau)

Lecture notes/slides will be made available.

References

- Laffont and Martimort, The theory of incentives, 2000.
- Mas-Collel, Whinston, Green, Microeconomic Theory, Oxford University Press 1996. Chapter 23
- Fundenberg and Tirole, Game Theory, 1991. Chapter 7
- **Salanie, The economics of taxation, MIT Press, 2003 and 2011.**

And research papers.

Exam

- ECTS credits: 4.0
- Written exams: questions on the classes and exercises

What about you?

- Background
- Interests: why are you here?
- Expectations
- ...

What we plan to achieve

- Canonical model of optimal labor income taxation
- Taxation of commodities
- Dynamic issues in optimal taxation (taxation of capital and intergenerational taxation)
- Material primarily theoretical but ability to apply this knowledge to policy issues
- Frontier for research in public finance

Joseph Schumpeter (1918): The crisis of the tax state

The spirit of a people, its cultural level, its social structure, the deeds its policy may prepare– all this and more is written in its fiscal history, stripped of all phrases. He who knows how to listen to its message here discerns the thunder of world history more clearly than anywhere else.

Economics of taxation $\in$ Public Finance - Public economics

- Public economics is the study of economic efficiency, distribution, and government economic policy
- Public economics attempts to understand both how the gov't makes decisions and what decisions it should make
- Public economics at the core of Economics

$\Rightarrow$ foundation for practical policy analysis.

Economics of taxation:

- Resource side of gov't budget constraint
- Also on spending side

$\Rightarrow$ Redistribution major role of gov't in modern democracies.

Methods

- Modern Public economics: use of economic models
- Models as a tool to develop arguments coherently with a rigorous logical basis

$\Rightarrow$ Models provide a guide to the consequences of new policies (few experimentation and past experience cannot always be relied on)

$\Rightarrow$ Each model intended to be a simplified description of the part of the economy that is relevant for the analysis

- Incorporation of independent decision-making by firms, consumers, and politicians

Mechanism design as major tool

What is mechanism design? The theory of mechanism design deals with the following questions:

- Which economic outcomes are achievable?
- How should we structure the interaction of economic agents so that we achieve a desirable outcome?

Why is this challenging?

- The goals of the mechanism designer and the interests of economic agents are not necessarily aligned.
- The relevant information may be in the hands of the economic agents.

Applications of mechanism design

I. Information Aggregation

- Public Goods
- Regulation of environmental externalities
- Auctions
- Multilateral trade

II. Screening

- Regulation of natural monopolies
- **Optimal taxation**
- Optimal pricing
- Optimal wage contracts

Mechanism design and optimal taxation

- The theory of optimal taxation is concerned with redistribution and studies an equity-efficiency tradeoff that arises if, one the one hand, it is desirable to tax the "rich" in order finance transfers to the "poor" and, on the other hand, taxation distorts decisions of individuals (labor supply, capital allocation).
- The first observation in this theory is very fundamental: it explains why the use of distortionary taxation unavoidable, i.e., it explains why it is impossible to base redistribution on a system of lump sum taxes that do not distort the decisions of individuals.
- As a second step, we will then characterize an optimal tax system.

Institutional setting

- Mixed economy where individual decisions are respected but the gov't attempts to affect these through the policies it implements
- Many alternative objectives can be assigned to the gov't

$\Rightarrow$ Gov't can be assumed to care about the aggregate level of welfare in the economy

$\Rightarrow$ Gov't composed by a set of individuals that pursue their own selfish agenda

- Benchmark ("Naive" approach): maximize social welfare (or achieve Pareto efficiency)

$\Rightarrow$ Perspective of economic advisor

Analyzing policy

- Normative analysis: what is the optimal policy? (Lectures 4-6)

$\Rightarrow$ Gov't assumed to have a specified objective and that its actions chosen in the way that best achieves these.

- Positive analysis: what are the effects of alternative policies? (Lectures 2 and 3)

$\Rightarrow$ Who pays taxes?

See the Note CAE no 42 *What Role for Economists in Policy-Making?* (July 2017): "positive economics" (the influence of variable x on variable y) and "normative" subjects (the desirable level of variable x).

Feasible policies

- Budget constraints
- Informational constraints

$\Rightarrow$ Information about tastes, income, skills, health status,...

- (Political feasibility $\Rightarrow$ Political Economy)

Scope

- Not many details on actual institutions

$\Rightarrow$ Focus on a common framework but frequent references to real-world

- Read **Introduction in Salanié's book**, Boyer (2024), Chapter about Public Sector Statistics in Hindriks and Myles, OECD annual reports, Eurostat "Taxation trends in European Union", Handbook of Public Economics.
- Empirical counterpart of this class: Labour Economics and Public Policy Evaluations.

What do we talk about

Definition of taxes (System of National Accounts-OECD): Taxes are compulsory unrequited payments, in cash or in kind, made by institutional units to the general government exercising its sovereign powers.

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- Tax is a compulsory transfer from individuals/firms to government
- Unrequited because the government provides nothing in return to the individual unit making the payment, although governments may use the funds raised in taxes to provide goods or services to other units, either individually or collectively, or to the community as a whole.

- Modern taxes: monetized

- Modern taxes: monetized
- In-kind tax:
  - Draft for military service
  - Dation en paiement: exceptional payment of inheritance or transfer taxes by handing over to the State cultural property of high artistic or historical value.

    Les Soleils, jardin du petit Genevilliers by Gustave Caillebotte

    `https://www.musee-orsay.fr/ja/node/218169`

Difference with mandatory deductions

- Mandatory deductions made to a public institution whatever the public institution provides something in return.

  Example of mandatory deduction which is not a tax:

  - Pension contribution in the pay-as-you-go system

    In the Bismarkian system, pension benefit is linked to pension contribution

    In the Beveridge system, it is much less true. Pension contribution is much more a tax.

- Unemployment contribution
- Disability contribution

What do we talk about? Data

- Total taxes = about 40 % of national income Y in rich countries

  National income Y = GDP - capital depreciation+ net foreign factor income

  Typically Y = about 85-90 % of GDP

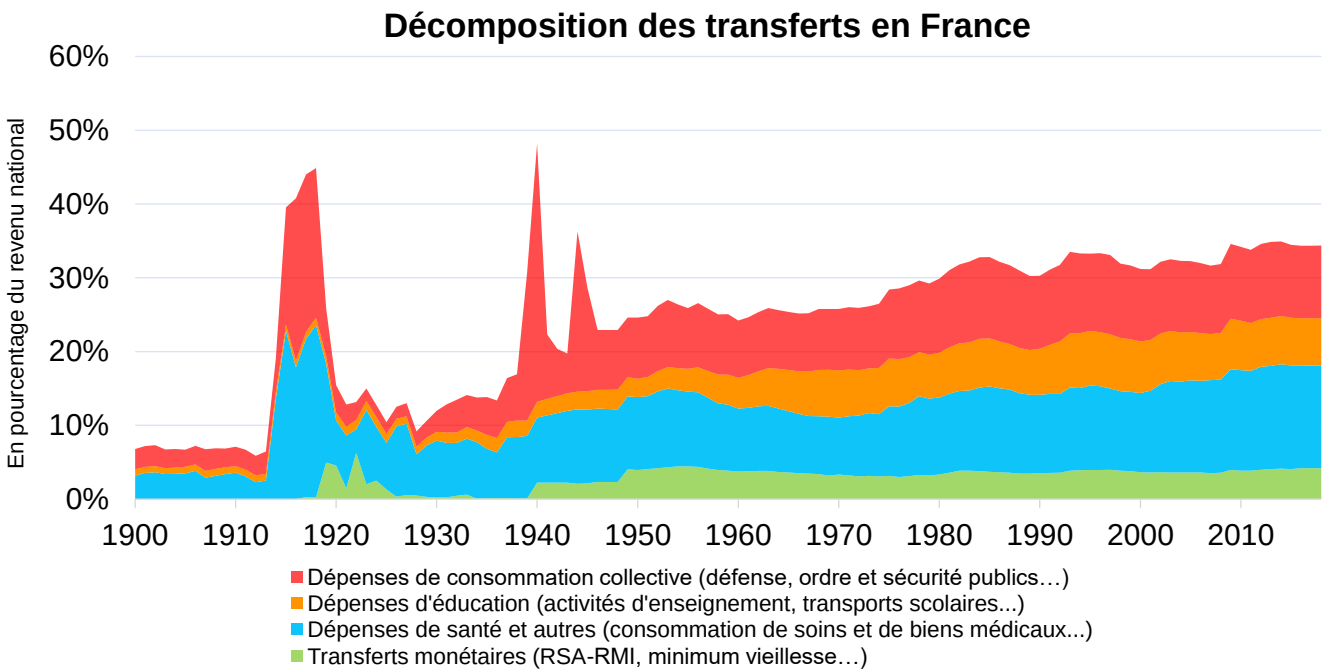
- Total monetary transfers = about 15 % of national income Y (e.g. public pensions, unemployment, family benefits, means-tested transfers,...)
- Other government spending = about 25 % of national income = in-kind transfers. Typically: 5 % education + 8-10 % health + 10 % police, defense, roads, etc.
- Social Spending =monetary transfers + education/health = around 30 % of national income

Government at a Glance 2021 - © OECD 2021
Version 1 - Last updated: 08-Jul-2021

2.25 General government expenditures by function as a percentage of GDP, 2019

	General public services	Defence	Public order and safety	Economic affairs	Environmental protection	Housing and community amenities	Health	Recreation, culture and religion	Education	Social protection
Australia	4,0	2,3	2,0	4,9	0,9	0,6	7,3	0,9	5,8	9,8
Austria	5,7	0,6	1,3	5,8	0,4	0,3	8,3	1,2	4,8	20,1
Belgium	6,9	0,8	1,7	6,7	1,3	0,3	7,6	1,3	6,2	19,4
Denmark	6,0	1,1	1,0	3,1	0,4	0,2	8,2	1,6	6,3	21,4
Estonia	3,5	2,1	1,8	3,9	0,7	0,4	5,3	2,0	6,0	13,2
Finland	7,9	1,2	1,2	4,2	0,2	0,3	7,1	1,5	5,6	24,0
France	5,5	1,7	1,6	6,0	1,0	1,1	8,0	1,4	5,3	23,9
Germany	5,7	1,1	1,6	3,3	0,6	0,4	7,4	1,0	4,3	19,7
Greece	7,9	2,0	2,1	4,0	1,4	0,2	5,3	0,8	4,0	19,8
Hungary	8,2	1,0	2,1	8,0	0,5	0,8	4,5	3,0	4,7	12,7
Iceland	7,2	0,1	1,5	4,9	0,6	0,5	7,8	3,0	7,0	10,9
Ireland	2,7	0,2	0,9	2,3	0,4	0,7	4,7	0,5	3,1	8,9
Israel	4,2	5,3	1,6	2,9	0,5	0,2	5,4	1,5	7,0	11,1
Italy	7,5	1,3	1,8	4,0	0,9	0,5	6,8	0,8	3,9	21,1
Japan	3,8	0,9	1,2	3,7	1,1	0,7	7,7	0,4	3,3	16,1
Korea	4,0	2,4	1,2	4,4	0,8	1,0	4,7	1,0	4,8	6,9
Latvia	3,8	1,9	2,2	5,3	0,6	1,0	4,2	1,5	5,8	12,1
Lithuania	3,5	1,6	1,4	3,0	0,4	0,5	6,2	1,2	4,6	12,3
Luxembourg	5,0	0,4	1,2	5,2	0,9	0,6	5,0	1,3	4,7	18,0
Netherlands	4,1	1,3	1,8	3,8	1,4	0,4	7,7	1,2	5,0	15,4
Norway	4,8	1,9	1,2	6,0	0,9	0,8	8,7	1,8	5,6	19,7
Poland	4,2	1,6	2,1	4,8	0,5	0,5	4,9	1,3	5,0	16,7
Portugal	6,7	0,8	1,7	3,6	0,6	0,5	6,6	0,9	4,4	16,9
Slovak Republic	5,4	1,1	2,3	5,1	0,8	0,5	7,7	1,2	4,2	14,4
Slovenia	5,2	1,0	1,6	4,5	0,6	0,4	6,7	1,4	5,5	16,5
Spain	5,5	0,8	1,8	4,0	0,9	0,4	6,1	1,1	4,0	17,4
Sweden	6,9	1,2	1,3	4,4	0,5	0,7	7,0	1,3	6,9	19,0
Switzerland	4,2	0,8	1,6	3,9	0,6	0,2	2,1	1,0	5,4	12,9
United Kingdom	4,3	2,0	1,8	3,5	0,6	0,8	7,7	0,6	4,9	14,8
United States	5,8	3,4	1,9	3,4	0,0	0,5	9,3	0,3	5,9	7,6
OECD	5,4	2,2	1,7	3,9	0,5	0,6	7,9	0,7	5,1	13,3

Sources: *OECD National Accounts Statistics* (database); *Eurostat Government finance statistics* (database).



Lecture : En 1950, les dépenses d'éducation représentaient 2,5% du revenu national et 6,4% en 2018.
Notes : Décomposition des transferts, divisés par le revenu national net. Le revenu national net est défini comme le PIB plus les revenus nets reçus de l'étranger pour la rémunération des salariés, la propriété et les impôts et subventions nets sur la production moins la dépréciation du capital fixe par usure et obsolescence (définition de l'OCDE).
Source : Bozio Antoine, Garbinti Bertrand, Goupille-Lebret Jonathan, Guillot Malka, and Piketty Thomas (2023) Predistribution vs.

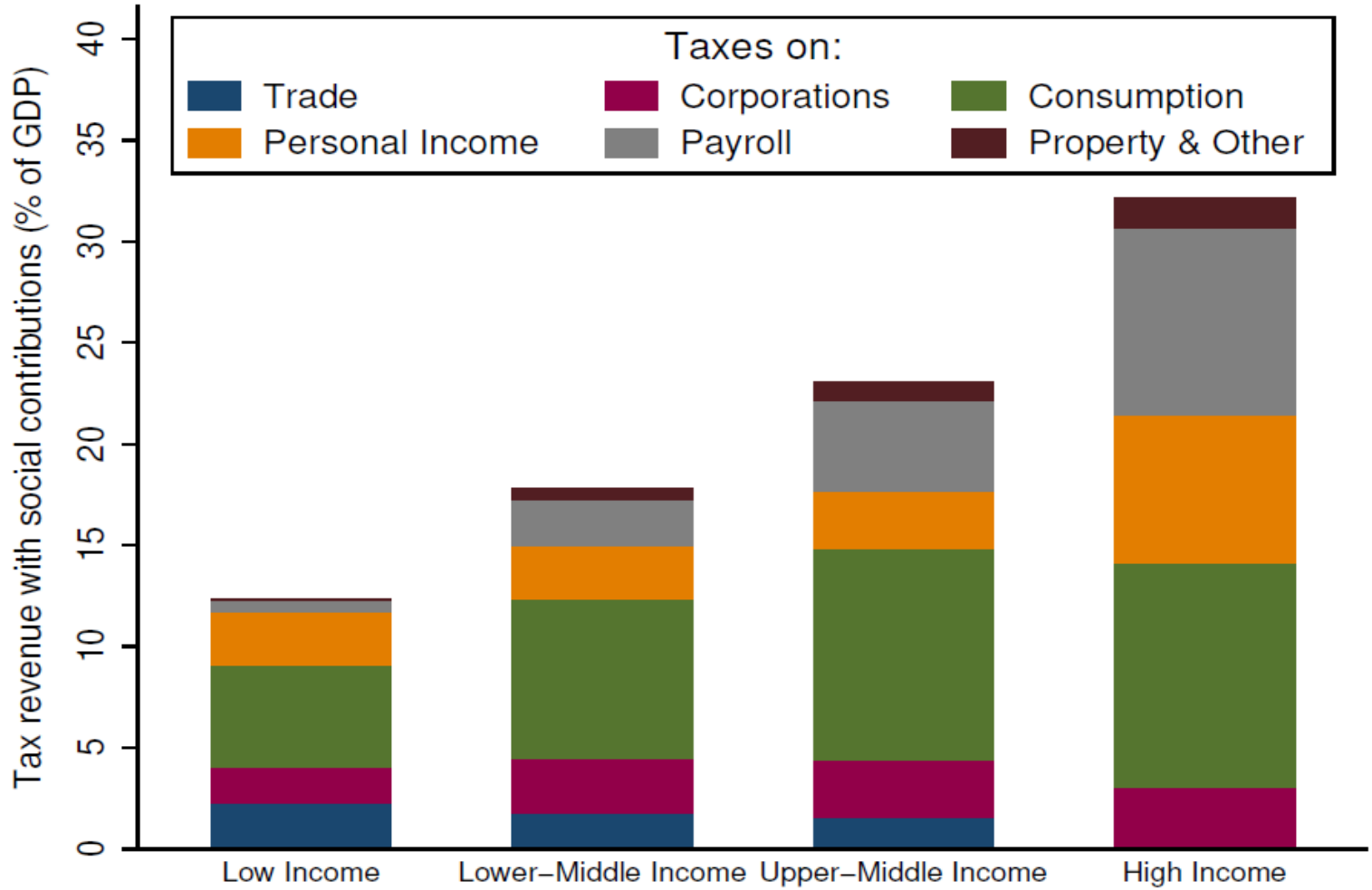
- Benchmark for developed countries: Total taxes = 1/3 indirect taxes + 1/3 direct taxes + 1/3 social contributions

  But: large variations between EU countries
- Large variations in tax levels: rich vs poor, also within rich countries
- Large variations in tax mix: continental EU vs UK vs USA

Tax revenues by sector - As a percentage of total tax revenues (2021)

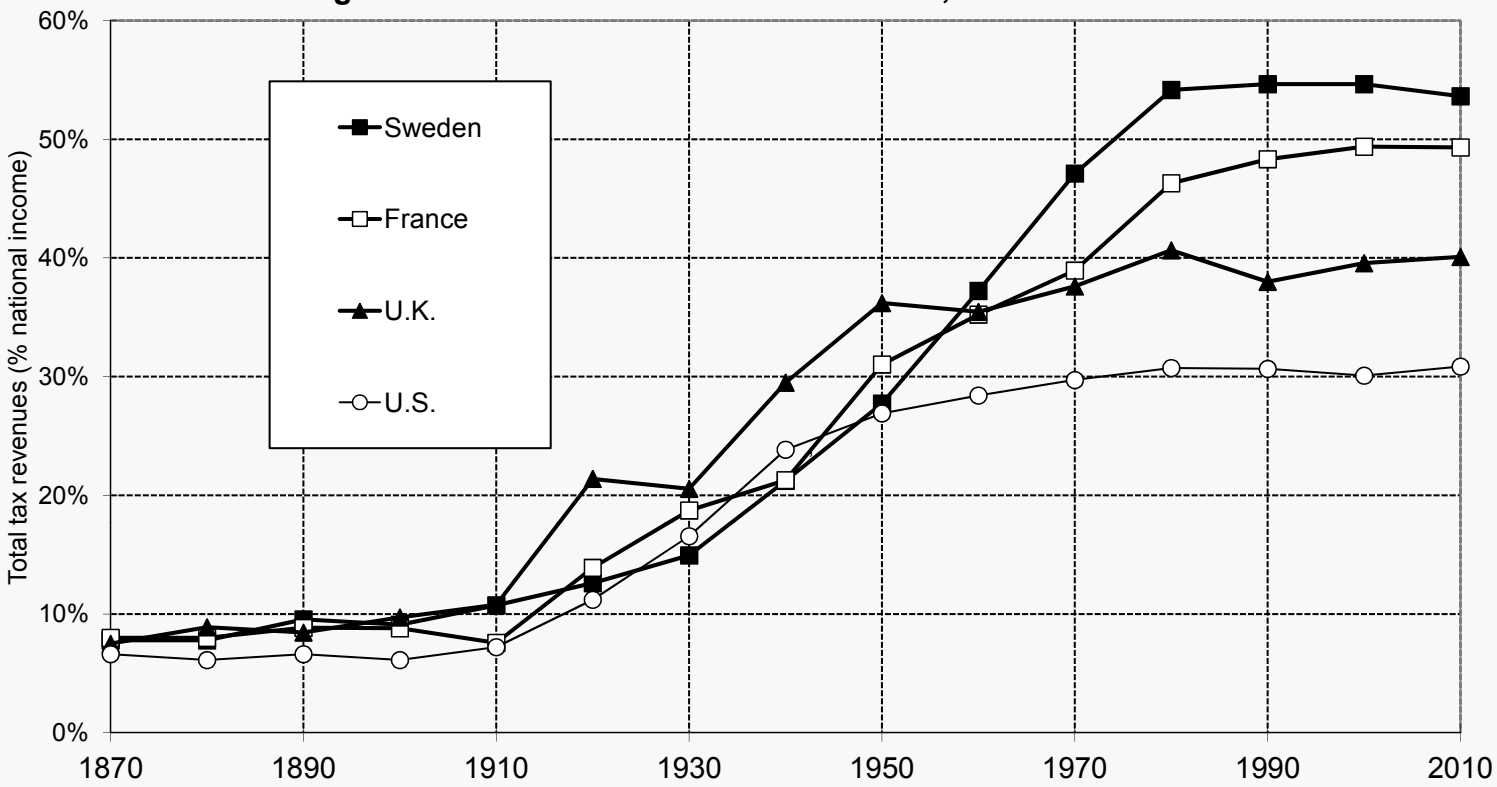
	Income and profits	Social security	Property	Goods and services
Denmark	66	1	4	30
France	27	37	8	28
Germany	33	38	3	27
Italy	32	31	6	31
Norway	48	23	3	26
Spain	30	36	7	27
Sweden	36	33	2	28
United Kingdom	38	20	11	31
United States	48	24	11	17

Reading : In 2021, social security tax revenues represented 37% of total tax revenues in France and 24% in the United States.
Notes : Taxes on payroll and workforce have been added to social security contributions. The "Other taxes" category has been added to goods and services. Values have been rounded.
Source : OCDE (2024), « Revenue Statistics : Comparative tables », OECD Tax Statistics (base de données), https://doi.org/10.1787/data-00262-en (consultée le 03 janvier 2024).



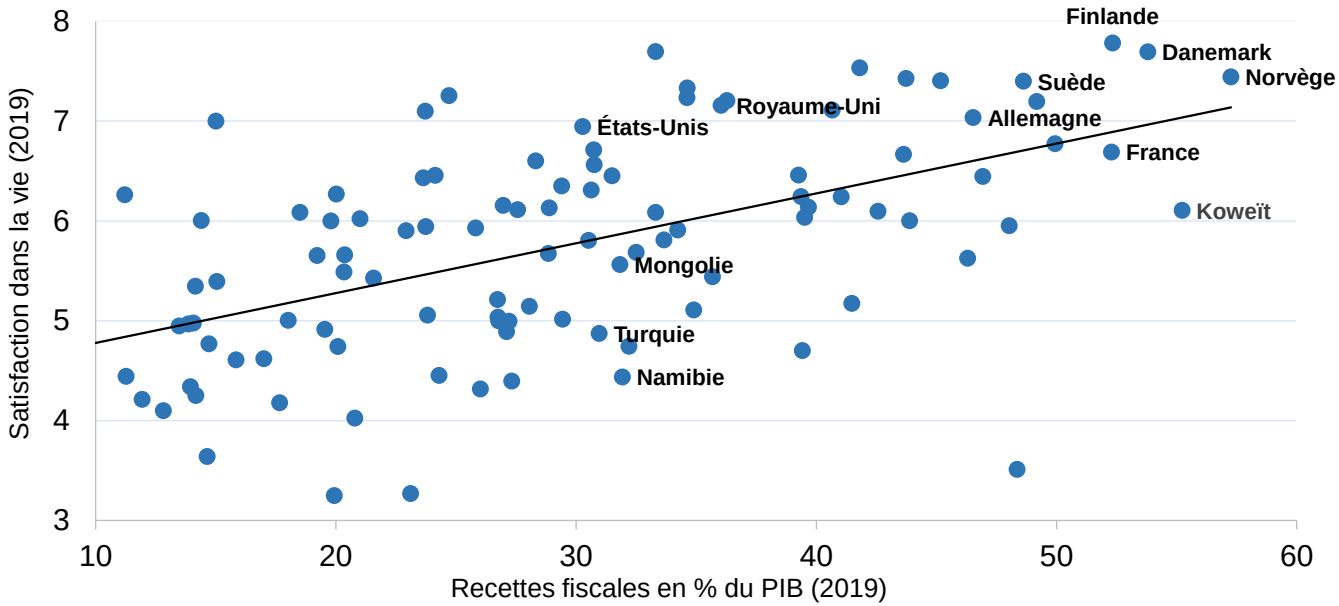
Source: ICTD/UNU-Wider "Government Revenue Dataset" 2020 & WDI.

Figure 13.1. Tax revenues in rich countries, 1870-2010



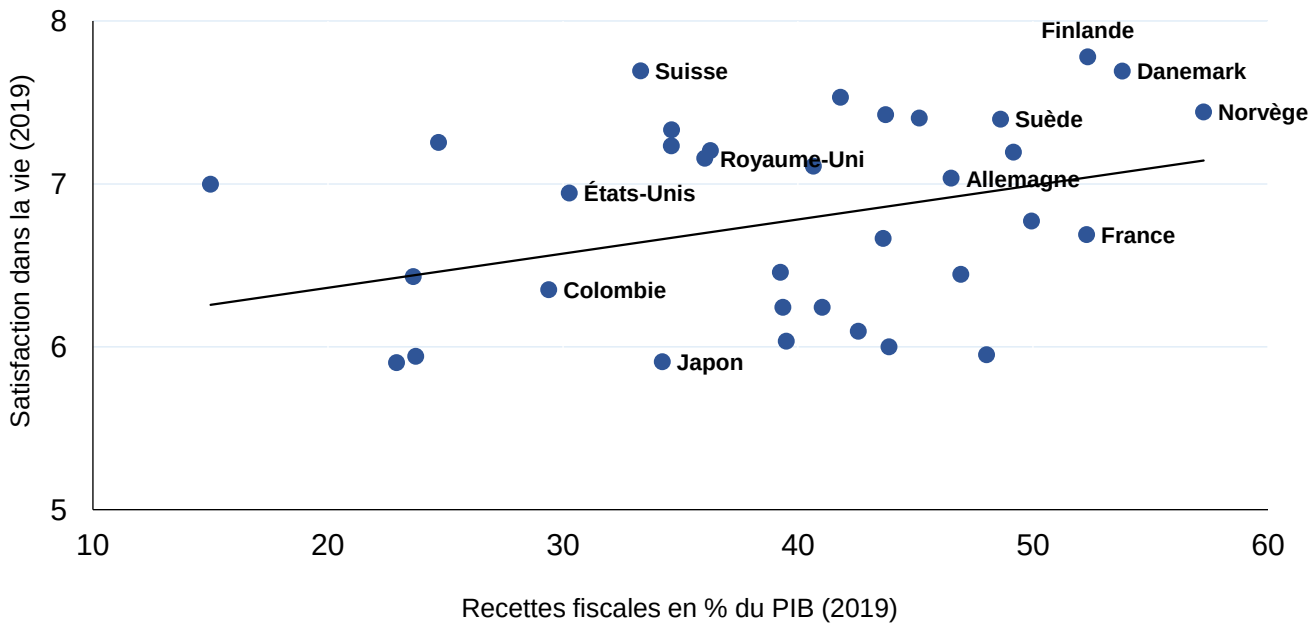
Total tax revenues were less than 10% of national income in rich countries until 1900-1910; they represent between 30% and 55% of national income in 2000-2010. Sources and series: see piketty.pse.ens.fr/capital21c.

Boyer (2024): life satisfaction and tax revenue (% PIB)



Lecture : En France, où les recettes fiscales représentent 52,29 % du PIB en 2019, l'indice de satisfaction dans la vie est de 6,69.
En Allemagne, les recettes fiscales représentent 46,52% du PIB et l'indice de satisfaction dans la vie est de 7,04 en 2019.
Notes : La ligne noire correspond à une droite de régression simple. Les valeurs ont été arrondies.
Champ : 109 pays
Source : Les recettes fiscales en pourcentage du PIB viennent du FMI et l'indice de satisfaction dans la vie vient du World

Boyer (2024): life satisfaction and tax revenue (OECD)

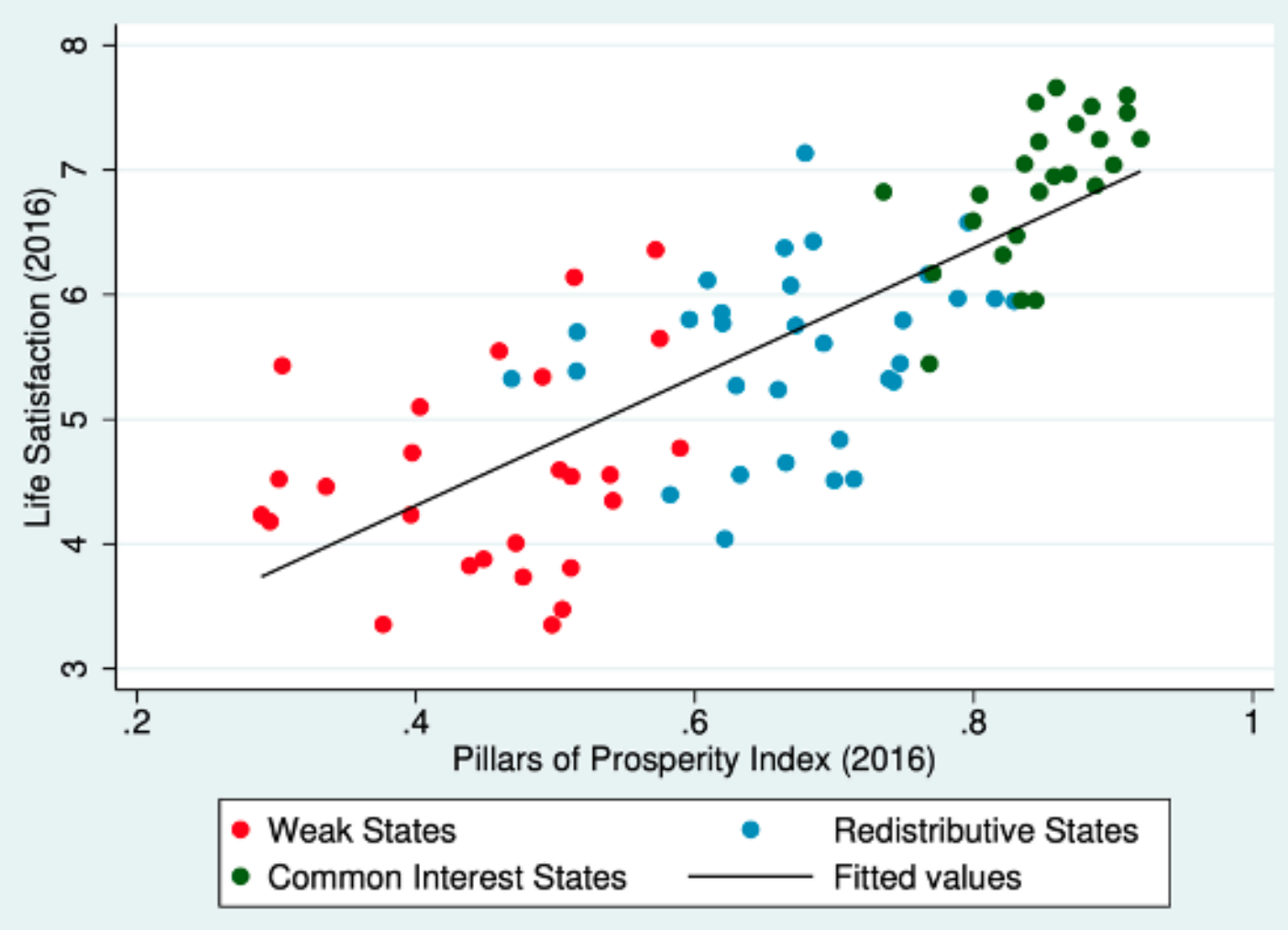


Lecture : En Norvège, où les recettes fiscales représentent 57,26% du PIB en 2019, l'indice de satisfaction dans la vie est de 7,44.
Notes : La ligne noire correspond à une droite de régression simple. Les valeurs ont été arrondies.
Champ : pays de l'OCDE
Source : Les recettes fiscales en pourcentage du PIB viennent du FMI. L'indice de satisfaction dans la vie vient du World Happiness Report 2021.

Puzzling?

- Besley (2017, Economic Ideas You Should Forget): size of government should not be debate.
- Fiscal and legal capacities, public good provision, key for successful states.
- Institutional constraints on government is crucial (separation of executive and legislative branches, constitutional constraints, free press, etc.).

Besley and Persson (2011): Pillars of prosperity



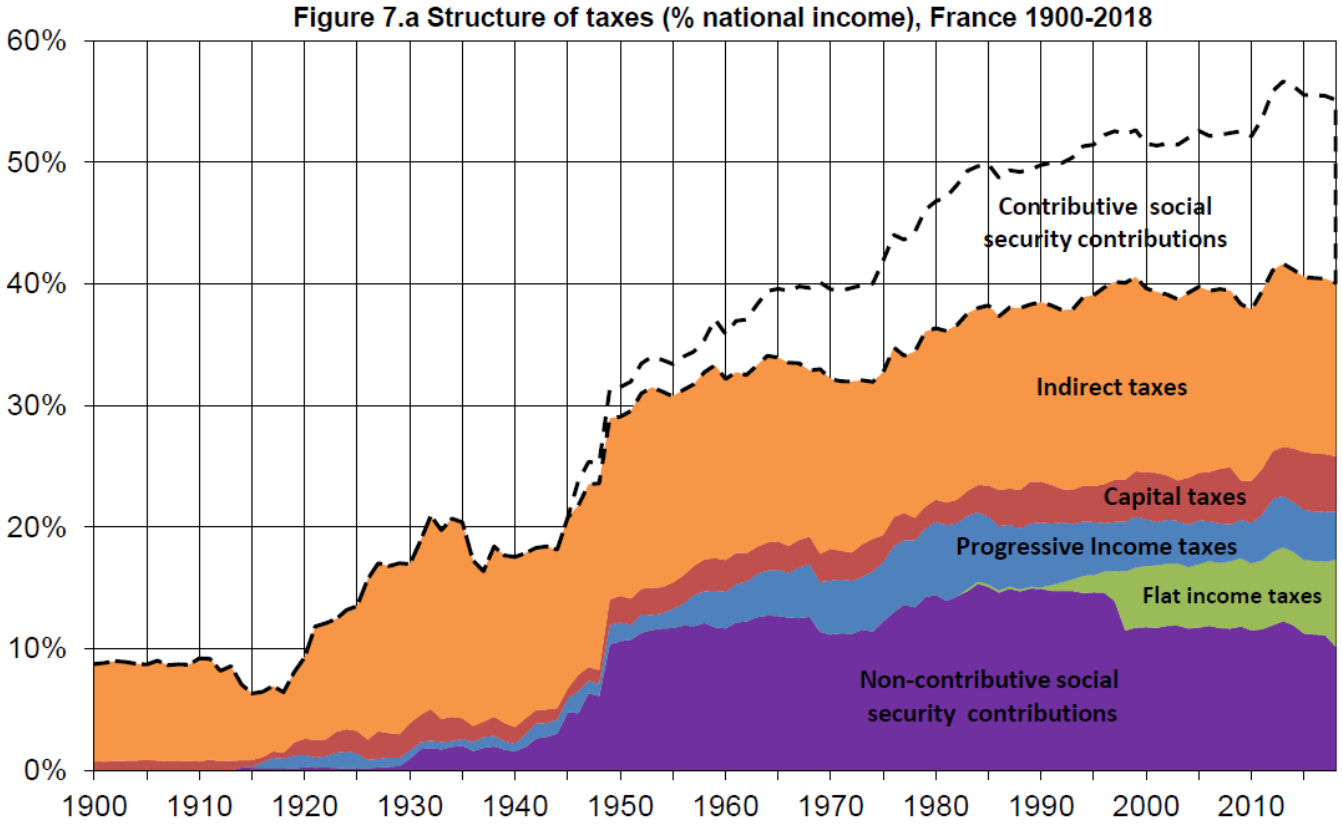
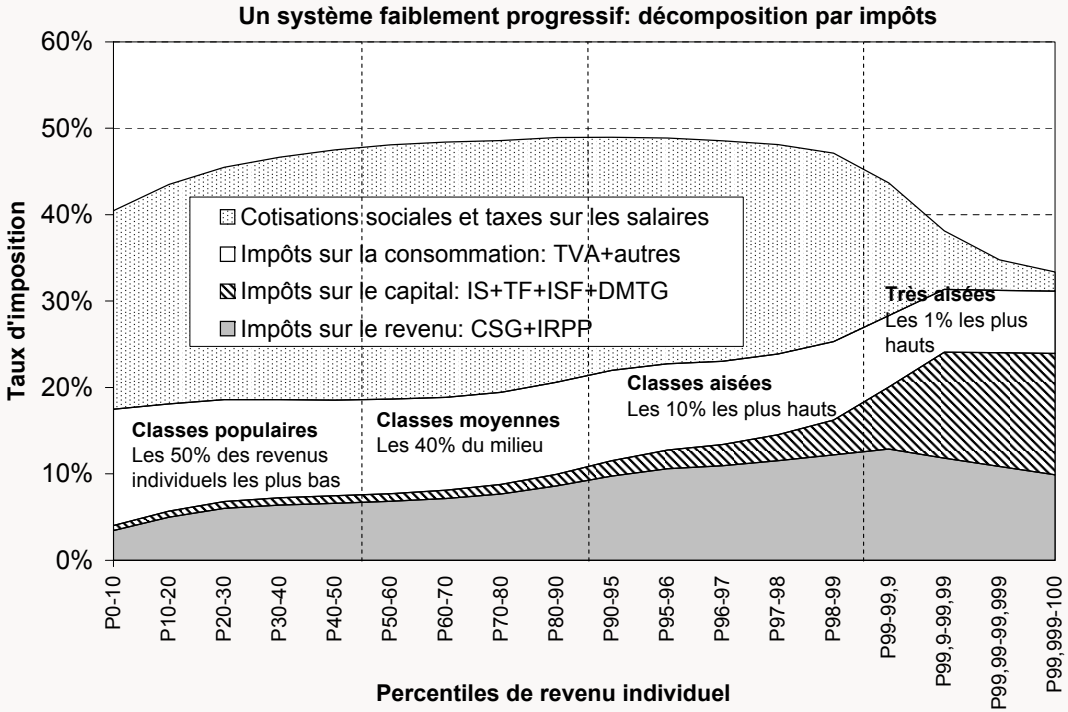


Figure 7.a Structure of taxes (% national income), France 1900-2018
60%
50%
40%
30%
20%
10%
0%
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Contributive social security contributions
Indirect taxes
Capital taxes
Progressive Income taxes
Flat income taxes
Non-contributive social security contributions



Lecture: le graphique montre le taux global d'imposition (incluant tous les prélèvements comme dans le graphique précédant) et sa décomposition par groupe de revenus au sein de la population 18-65 ans travaillant à au moins 80% du plein temps. Groupes de revenus: P0-10 désigne les percentiles 0 à 10, càd les 10% des personnes avec les revenus les plus faibles, P10-20 les 10% suivants, ..., P99.999-100 désigne les .001% les plus riches.

Le graphique décompose les impôts en quatre grandes catégories : cotisations sociales (et autres taxes sur les salaires), les impôts sur la consommation (TVA et autres impôts indirects), les impôts sur le capital (impôt sur les bénéfices des sociétés (IS), taxe foncière (TF), impôt sur la fortune (ISF) et droits de successions (DMTG)), et les impôts sur le revenu (CSG et IRPP).

Source: C. Landais, T. Piketty & E. Saez, Pour une révolution fiscale, chapitre 1, p.51

Source: Voir www.revolution-fiscale.fr, annexe au chapitre 1 (où nous montrons aussi les chiffres pour la population adulte totale).

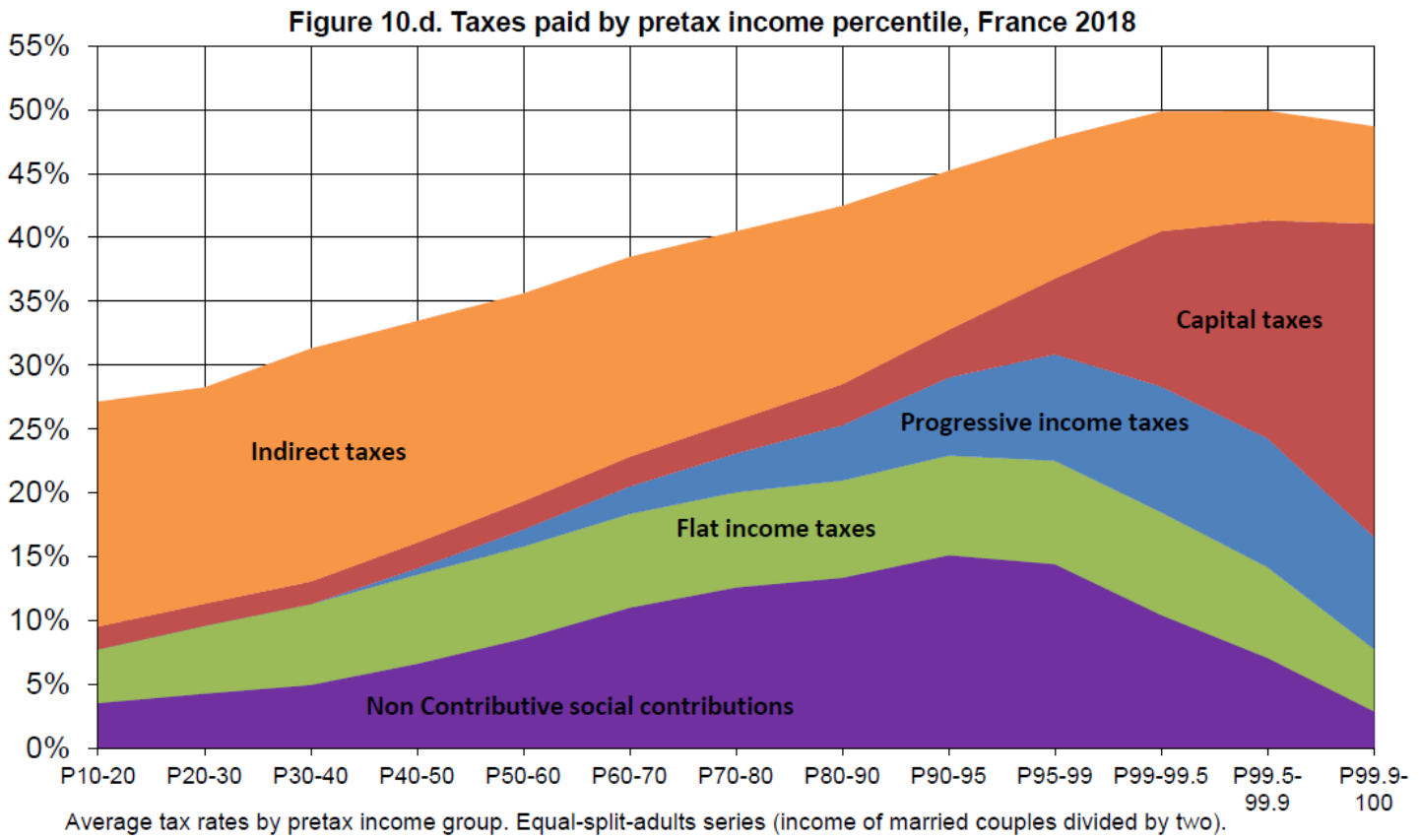
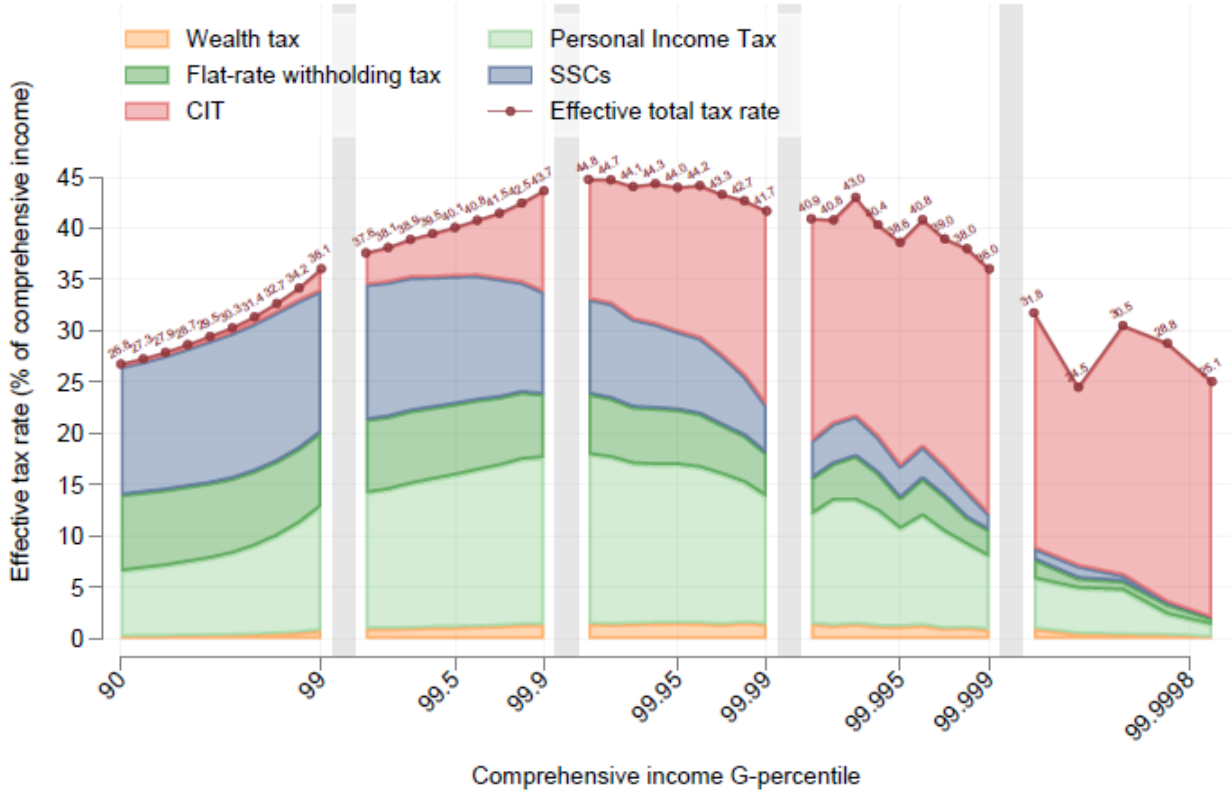


Figure 10.d. Taxes paid by pretax income percentile, France 2018
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
Indirect taxes
Capital taxes
Progressive income taxes
Flat income taxes
Non Contributive social contributions
P10-20
P20-30
P30-40
P40-50
P50-60
P60-70
P70-80
P80-90
P90-95
P95-99
P99-99.5
P99.5-99.9
P99.9-100
Average tax rates by pretax income group. Equal-split-adults series (income of married couples divided by two).

Figure 5: Effective tax rates as a share of taxable income

NOTES: This graph represents the distribution of effective income tax rate on taxable income, in G-percentiles (division of the last quantile into 10 quantiles, and into 5 quantiles at the very top) at the tax household level, sorted by taxable income, within the top 10% of this variable.

Figure 6: Effective tax rates as a share of comprehensive income



NOTES: This graph represents the distribution of effective income tax rate on comprehensive income, in G-percentiles (division of the last quantile into 10 quantiles, and into 5 quantiles at the very top) at the tax household level, sorted by comprehensive income, within the top 10% of this variable.

Functions of government

Basic rationales for taxes and transfers: Musgrave (1959)'s three main "branches" of the public sector

1. *Allocative branch:* Public good provision/Externalities
   - Raising tax revenue to finance public goods: defense, roads, education, health, etc.
   - Pigouvian corrective tax and subsidy schemes so to induce private agents to internalize external effects (e.g. global warming, carbon tax)
2. *Distributive branch:* designing taxes/transfers in order to implement a fair distribution of income, wealth and welfare
3. *Stabilization branch:* taxes/transfers can also serve as automatic stabilizers and reduce macroeconomic volatility

Basic rationales for taxes and transfers

- Rationales (1) and (3) = taxes/transfers generate Pareto improvements and correspond to failures of the first welfare theorem

- Rationale (2) = taxes/transfers shift the economy to another (second-best) Pareto optimum (illusory lump-sum payments of the second welfare theorem)

Why introducing taxes

1. Failure of first welfare theorem (improving Pareto-efficiency of market allocations).

   E.g. of market failure: public goods/ externalities but also insurance markets fail to insure against some risks

$\Rightarrow$ Tax finances public expenditures resulting from gov't intervention (e.g. finance fundamental research, national defense)

$\Rightarrow$ Progressive taxes provide a way to smooth the incomes on the life cycle.

2. Failure of second welfare theorem

$\Rightarrow$ Market allocations not in accordance with society's preferences.

Tax design: desirable characteristics of tax systems

Traditional concerns (in this class):

1. Efficiency
2. Equity (fairness): Horizontal equity / Vertical equity

Recently substantially extended (see Slemrod and Gillitzer (2013) *Tax systems*):

1. Administrative and compliance costs
2. Evasion and avoidance behavior (enforcement effort)
3. Multiple non-rate tax-system instruments (for example, withholding and public disclosure)

Politically feasible $\Rightarrow$ Political Economy class

How to levy taxes in order not to deteriorate efficiency? Lump sum transfers

- In the 2nd welfare theorem, transfers means lump sum transfers
- Transfers of property rights on land and capital (expropriation)
- Transfers of properties rights on labor cannot be done in society which bans slavery
- Transfers in cash unrelated to actions of selling or buying in markets (to economic behavior)

  Examples: poll tax, taxes on height, taxes on age

How to classify a transfer as lump sum or not:

Definition: a transfer is defined as lump sum transfer if no change in consumer's behavior can affect the size of the transfer.

Why lump-sum transfers efficient?

Definition: a distortion (inefficiency cost) with respect to laissez-faire (a world without taxes) is a distortion of prices which entails substitution effects (changes of behavior at the margin)

- Lump-sum transfers only have income effect: No substitution effect
- Lump-sum tax: tax liability does not depend on economic behavior; no way to avoid the tax.

Are lump sum transfers feasible?

Simplest form: uniform lump-sum tax (poll tax):

- low information requirement
- no direct redistribution
- but problem of bankruptcy

Historical examples: Introduced in the UK end of 80s; based on the number of people living in a house rather than on the house's estimated price. Unpopular replaced in the 90s (Poll tax riots, largest protest on March 31st, 1990).

Even if lump sum transfers were feasible, are *optimal* lump sum transfers feasible?

More sophisticated to be optimal: non-uniform lump-sum tax

- *Perfect instrument*: second welfare theorem.
- Redistribution without efficiency loss.

  Major issue: not feasible due to information requirement.

This will be shown formally in the optimal taxation lecture.

Taxes in real-wold are distortive

- In a way or another, taxes are distortive $\Rightarrow$ induce an efficiency cost and/or a welfare cost.

  A great question in economics : how to choose and calibrate taxes to minimize efficiency losses

  And to some extent restore justice and being themselves just?

  The issue of optimal taxation a cornerstone of economic theory

Focus of Lecture 1 and 2

Economic effect of taxation: Positive analysis

- Who does really bear the burden of taxation? **Tax incidence**

- How the social losses induced by taxation can be evaluated.

  Distortions and welfare losses

Outline of the class

Part I: Pierre Boyer:

- Introduction
- Lecture 2: Tax incidence
- Lecture 3: Distortions and welfare losses
- Lecture 4-6: Optimal labor income taxation (linear, non-linear)

Outline of the class

Part II: Jean-Baptiste Michau

- Lecture 7: Optimal labor income taxation: The extensive margin
- Lecture 8: Commodity taxation
- Lecture 9: Mixed taxation (commodity & labor income)
- Lecture 10: The taxation of capital
- Lecture 11: Insurance against wage fluctuations
- Lecture 12: Intergenerational taxation

Outline of the class

Introduction

Lecture 2: Tax incidence

Lecture 3: Distortions and welfare losses

Lecture 4-6: Optimal labor income taxation