Distributional Tax Analysis in Theory and Practice: Harberger Meets Diamond-Mirrlees

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Introduction

Who pays taxes, and who would be affected by tax reforms, are arguably some of the most important questions in modern democracies

- ▷ High-income countries collect 30%–50% of national income in taxes
- ▷ Large impact on disposable income income of all social groups
- ▷ Critical to have a sound & practical way to allocate taxes across groups and to analyze who would gain/lose from proposed changes to the tax system

This paper offers **a new framework grounded in optimal tax theory** to address these questions

Why is there a need for a new framework?

There is a long tradition of distributional tax analysis

- ▷ Theoretically: key work of Harberger (1964, 1966)
- ▷ Empirically: founding work of Colm and Tarasov (1941), Musgrave et al. (1951), and Pechman and Okner (1974)
- ▷ Building on it, US government agencies publish distributional tax tables to analyze distribution of federal taxes and impact of reforms

This conventional approach, we argue, has serious shortcomings

- ▷ Delivers inconsistent estimates of tax progressivity
- ▷ Fails to identify key information needed to assess desirability of tax reforms (revealed in contrast by the Diamond-Mirrlees 1971 optimal tax theory)

Two distinct objectives require two distinct methodologies

Distributional tax analysis serves two purposes:

1. Provide information on the current distribution of income and tax payments
   - ▷ Key to quantify income inequality and the direct effects of taxes
   - ▷ Call this **distributional current-tax analysis**
2. Simulate how a change to the tax system would affect the different groups
   - ▷ Key to assess desirability of reform
   - ▷ Call this **distributional tax-reform analysis**

Conventional approach: both types of analysis are done using the same models of tax incidence. Our argument: **each require distinct and new approach**

Contributions of the paper

- Present methodologies for current-tax and tax-reform analysis
- Contrast with the conventional approach
- Apply our methodologies to the United States
  - Evolution of tax progressivity since 1913
  - Analysis of key proposed tax reforms
- Provide a practical guide for implementing our methodologies globally

Presentation of current-tax and tax-reform analysis

Distributional current-tax analysis

Imagine one is interested in knowing the distribution of all taxes. Q: how to compute this consistently? Our A: with distributional current-tax analysis

Current-tax analysis describes price distortions created by tax system, as one writes a model of optimal taxation

- ▷ Taxes based on labor income are assigned to corresponding workers
- ▷ Taxes based on capital or capital income to owners of corresponding assets
- ▷ Taxes based on consumption to corresponding consumer
- ▷ Taxes are wedges between pre-tax prices (relevant for production) & post-tax prices (relevant for work, saving, & consumption decisions of households)

Distributional current-tax analysis: remarks

Current-tax analysis differs from following statutory incidence

- ▷ Ex: both employer and employee payroll taxes are a tax on labor, and hence are assigned to corresponding workers

Yet it does not require specifying behavioral responses

- ▷ Describes actual taxes and pre-tax incomes, not counterfactuals
- ▷ Thus very simple to implement

It is internally consistent & maximizes comparability of tax progressivity and inequality over time and across countries

- ▷ In contrast to conventional approach

Differences with the conventional approach

Conventional approach shifts taxes, most importantly corporate tax

- ▷ Corporate tax is assumed to reduce wages relative to "no-tax" counterfactual
- ▷ US government agencies assign 25% of corporate tax to workers, remaining 75% to capital owners (proportionally to reported capital income)
- ▷ No link between what a corporation pays in tax, and what its owners pay
- ▷ Tries to achieve too many things at the same time (equity + efficiency)

Our approach is simpler: focused on equity aspect, no shifting

- ▷ Corporate tax fully assigned to corresponding shareholders
- ▷ Ex: Warren Buffett owns 30% of Berkshire Hatthaway $\rightarrow$ is assigned 30% of its corporate tax (vs. ≈ 0 in conventional approach)

Inconsistencies in the conventional approach

Empirical inconsistencies

- ▷ Conventional approach affected by changes in businesses' organizational form
- ▷ Ex: if Berkshire Hatthaway becomes a partnership, tax progressivity rises
- ▷ Issue in the US given the rise of pass-through businesses since 1980s $\rightarrow$ official estimates under-estimate decline in effective tax rate of top 1%

Conceptual inconsistency

- ▷ Shifting taxes logically requires changing aggregate income, since shifting originates from behavioral responses to taxes that affect aggregate income
- ▷ But conventional approach keeps aggregate income constant

Distributional tax analysis makes it possible to meaningfully study the tax payments of the rich

Millions of US$	Jeff Bezos	Warren Buffett
US federal taxes	**43**	**930**
Individual income tax	43	5
Corporate tax	0	925
Payroll taxes	0	0
Consumption taxes	0	0
US state and local income taxes	**140**	**241**
Individual income tax	0	1
Corporate taxes	70	53
Business property taxes	69	187
Consumption taxes	~0	~0
Residential preoperty taxes	~0	~0
Foreign taxes	**154**	**337**
Corporate taxes	123	337
Business property taxes	31	0
Total taxes	**337**	**1,508**
Pre-tax income	2,221	8,176
Effective tax rate	**15.2%**	**18.4%**
Federal	1.9%	11.4%
State and local	6.3%	2.9%
Foreign	6.9%	4.1%

Distributional tax-reform analysis

Imagine one is interested in knowing how a tax reform would affect pre-tax income, taxes paid, and welfare for each income group

- ▷ In contrast to current-tax analysis, requires a model of behavior
- ▷ Model should capture not only equity but also efficiency aspect of reform
- ▷ Classical tax incidence analysis emphasizes effect of taxes on pre-tax prices (e.g., if corporate tax $\nearrow$, wages will $\searrow$)

Contribution of paper: clarify the sufficient statistics needed to conduct tax-reform analysis in standard neoclassical models

- ▷ Key point: **price effects turn out to be normatively irrelevant**

Distributional tax-reform analysis: sufficient statistics

Distributional tax reform table only needs to report:

- ▷ Mechanical change in tax liability by income groups assuming no behavioral responses and no price effects ($\rightarrow$ directly given by current-tax analysis)
- ▷ Aggregate revenue effect due to supply side responses ignoring price effects

Along with social marginal welfare weights for each group of the population, these are sufficient statistics to evaluate the value or cost of the reform

- ▷ Pre-tax price effects can be ignored because they can be neutralized by adjusting other taxes at zero budget cost

Illustration with a simple model of capital taxation

Setup of the model

Production:

- ▷ Aggregate production function $Y = F(K, L)$
- ▷ Perfect competition
- ▷ $w =$ economy-wide pre-tax wage rate, $r =$ pre-tax rate of return on capital
- ▷ Profits maximization $\rightarrow w = F_L$ and $r = F_K$
- ▷ Assume CRS $\rightarrow$ no pure profits $\rightarrow F(K, L) = rK + wL$
- ▷ Denote by σ the elasticity of substitution between K and L and by $\alpha = rK/Y$ the share of capital income in the economy

Setup of the model

Supply side:

- ▷ Assume labor is fixed, labor income taxed at rate τ_L
- ▷ Capital depends on the net-of-tax return $\bar{r} = r \cdot (1 - \tau_K)$ where τ_K is tax rate on capital income
- ▷ We can express everything in terms of capital per unit of labor $k = K/L$. As L is fixed, the supply of capital $k = k(\bar{r})$ depends solely on $\bar{r}$
- ▷ Define $f(k) = F(1, K/L) = F(K, L)/L$ as output per unit of labor $\rightarrow$ $F_K = f'(k)$ and $F_L = f(k) - kf'(k)$

Equilibrium:

$$r = f'(k), \quad w = f(k) - kf'(k) = \int_0^k f'(k)dk - rk, \quad k = k(r \cdot (1 - \tau_K)) \quad (1)$$

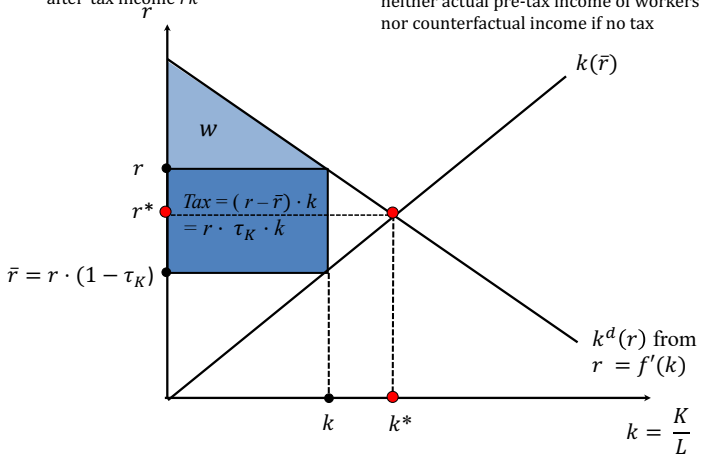
General equilibrium with capital tax

Current-tax analysis:

- Pre-tax income of workers is w
- Pre-tax income of capitalists is rk, after-tax income $\bar{r}k$

Conventional analysis:

- Ignores change in k and deadweight burden
- Pre-tax income of workers = $w+(r-r^*)k$: neither actual pre-tax income of workers w, nor counterfactual income if no tax



Tax-reform analysis

Consider small increase in the capital tax rate $d\tau_K$ and trace out its effects dk, dr, dw. Differentiating the 3 equations in (1), combining and rearranging:

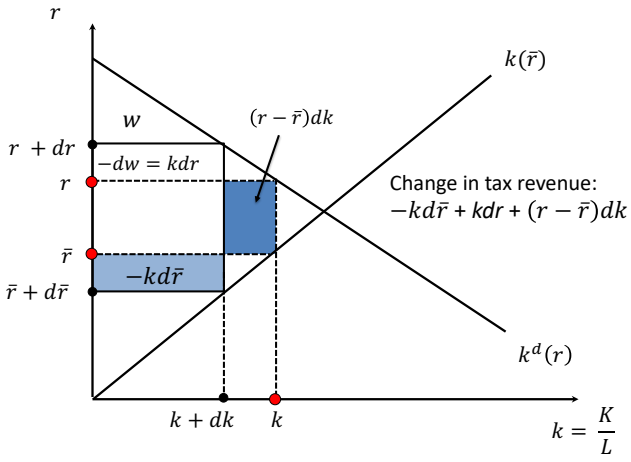
$$\frac{dr}{r} = \frac{(1-\alpha)e_K}{(1-\alpha)e_K + \sigma} \cdot \frac{d\tau_K}{1-\tau_K}$$

$$\frac{dk}{k} = -e_K \cdot \frac{\sigma}{(1-\alpha)e_K + \sigma} \cdot \frac{d\tau_K}{1-\tau_K}$$

$$dw = -kdr$$

Usual lesson of tax incidence: when $e_K = 0$ (or $\sigma = \infty$) capital pays the tax ($dr = dw = 0$); when e_K is large (relative to σ), tax is shifted to labor ($dw < 0$)

Capital tax reform and optimum



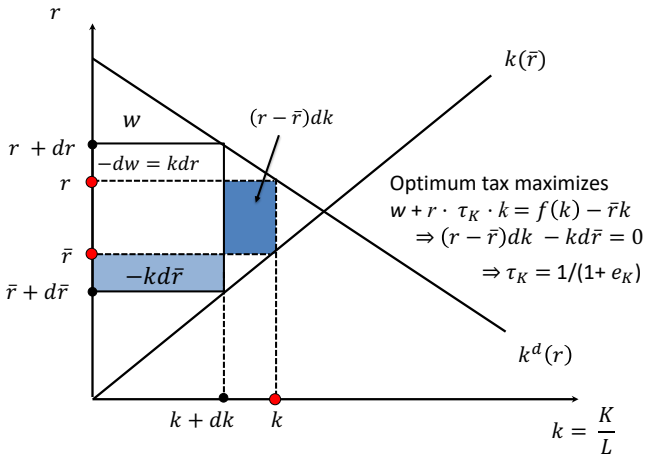
Optimal tax analysis

Suppose social marginal welfare weight on capitalists is zero

- ▷ Society sets τ_K to maximize $w + (r - \bar{r})k = f(k(\bar{r})) - \bar{r}k(\bar{r})$.
- ▷ This leads to the usual inverse-elasticity rule optimal tax rate $\tau_K^* = 1/(1 + e_K)$
- ▷ Key insight: optimal tax rate only depends on the supply elasticity e_K
- ▷ The supply elasticity is a sufficient statistics for the optimal tax rate and the elasticity of substitution σ is irrelevant (Diamond & Mirrlees, 1971)

$\rightarrow$ **The effect of capital tax increase on wages is irrelevant to assess whether this reform is desirable**

Capital tax reform and optimum



Application of Current-Tax Analysis: Evolution of US Tax Progressivity

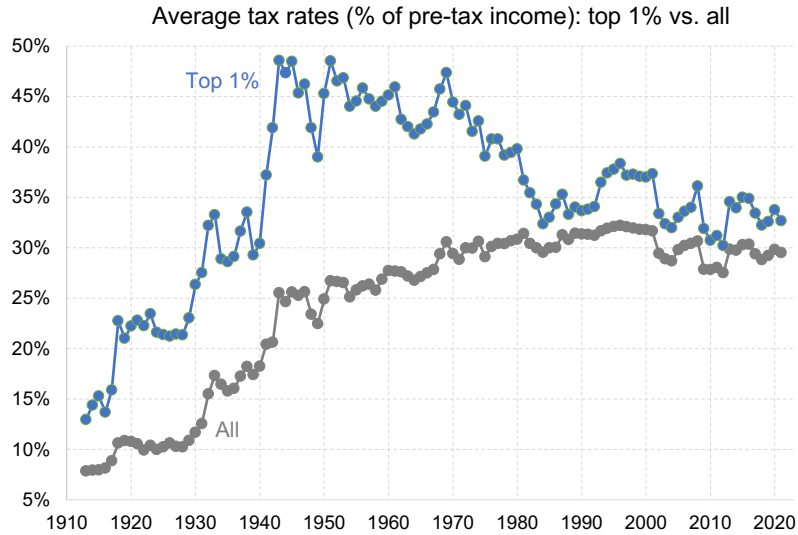
Data and methodology

Goal: compute evolution of effective tax rates by income groups

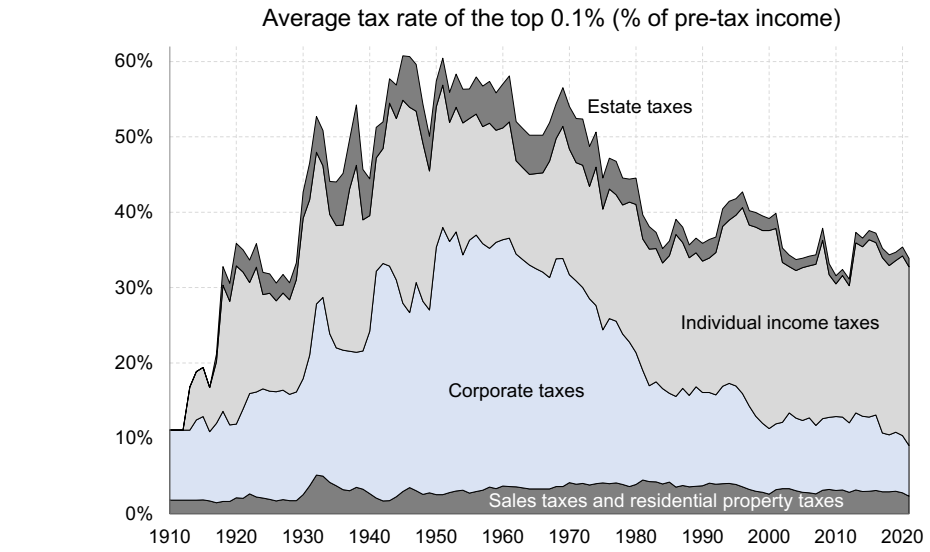
- ▷ Effective tax rate = taxes paid / pre-tax income
- ▷ Taxes include all taxes paid at all levels of government and are allocated following current-tax methodology
- ▷ Pre-tax income includes all income after the operation of the pension system (but before other government intervention) ands matches national income
- ▷ Data: Piketty-Saez-Zucman (2018) distributional national accounts, updated

Key result: **large decline in tax progressivity since middle of 20th century, driven by changes in the corporate tax**

The decline of tax progressivity in the US



It is through the corporate tax that US achieved high degree of progressivity in mid-20th century

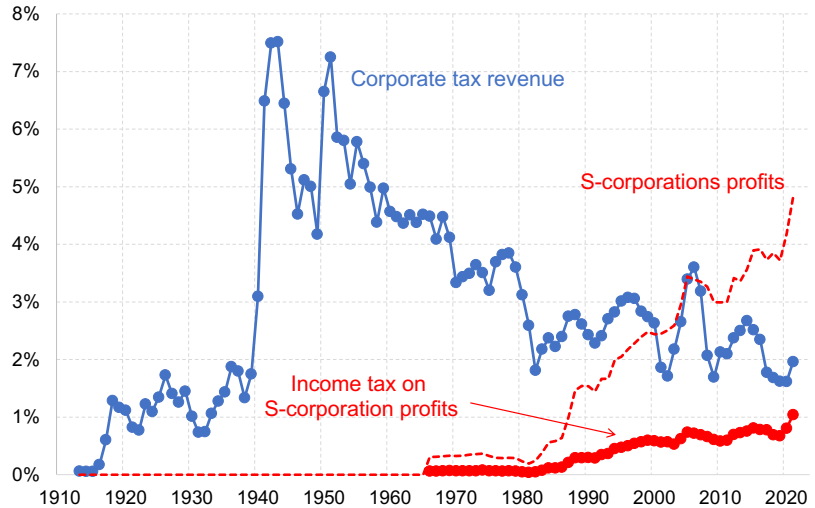


Comparison with conventional approach

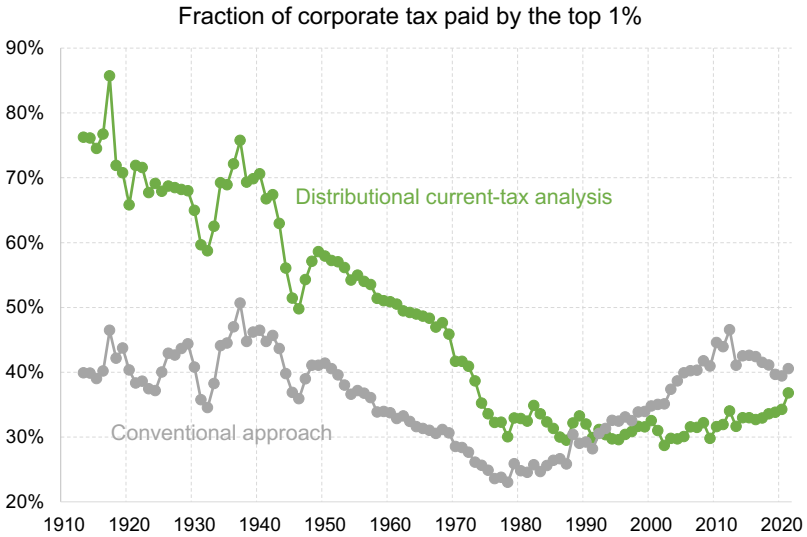
Proper treatment of corporate tax is key to establish trends

- Corporate tax very large in middle of 20th century (almost as large as individual income tax)
- Conventional approach (25% on labor, 75% on reported capital income): tax spread to workers and small unincorporated businesses in mid-century
- Additional issue in CBO methodology: no corporate tax assigned to pensioners, despite large ownership of equity by pension funds
  - Bias since the 1980s due to rise of pension funds
  - Too much corporate tax assigned to the rich today

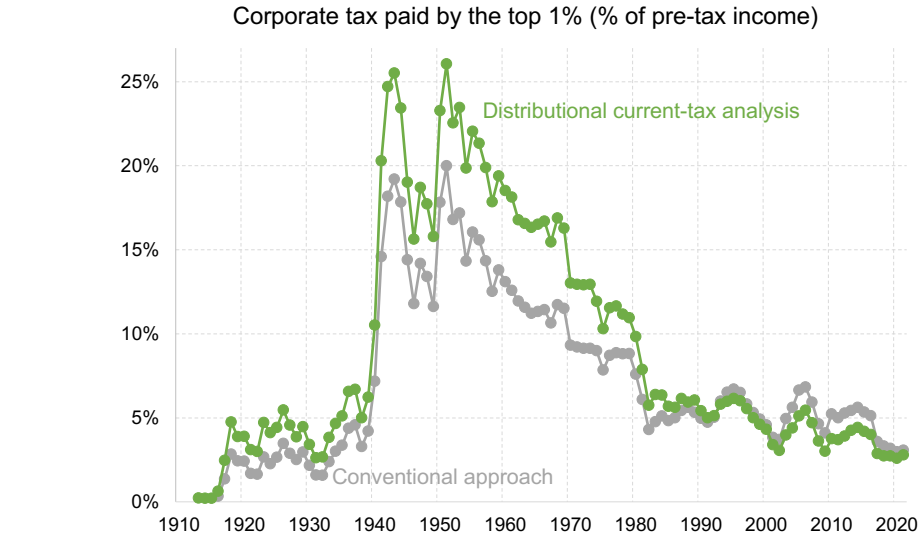
Corporate tax revenues in the United States (% of US national income)



Allocating the corporate tax: CBO approach vs. our approach



Effective corporate tax rate at the top: CBO approach vs. our approach



Simulation of Tax Reforms

Consider a 10% increase in the corporate tax rate

A. Reform of the US federal corporate income tax

	Current income and taxes				Tax reform analysis			
	Pretax income	All corporate taxes	Federal corporate tax		Consider a 10% increase in the federal corporate income tax rate, from 21% to 23.1%			
Income groups	Share	Share	Share	Taxes. ($ billion)	Mechanical tax increase ($ billion)	Tax loss supply side ($ billion)	Social welfare weights	Social welfare cost ($ billion) = -(5) x (7)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
P0-50	12%	4%	3%	$7	$0.7	-$0.1	1.38	-$1.0
P50-90	38%	29%	18%	$50	$5.0	-$0.7	0.69	-$3.4
P90-99	26%	30%	18%	$50	$5.0	-$0.7	0.35	-$1.7
P99-99.9	12%	16%	9%	$26	$2.6	-$0.4	0.17	-$0.5
top 0.1%	12%	21%	13%	$36	$3.6	-$0.5	0.09	-$0.3
Non-US residents	0%	0%	39%	$109	$10.9	-$1.5	0	$0.0
All	**100%**	**100%**	**100%**	**$279**	**$27.9**	**-$3.7**	**1.00**	**-$6.9**
					Net revenue:		**$24.1 billion**	
					Net value of reform:		**$17.2 billion**	

Consider a 10% increase in the individual income tax for the top 1%

	Current income and taxes (2021)					Tax reform analysis			
	Pretax income	Fiscal income	Federal individual income tax			Consider a 10% increase in the Federal individual income tax for the top 1% only			
Income groups	Share of total pretax income	as % of pretax income	Share of total individual income tax	Tax rate = Taxes / Pretax income	Taxes ($ billion)	Mechanical tax increase ($ billion)	Tax loss supply side ($ billion)	Social welfare weights	Social welfare cost ($ billion) = -(6) x (8)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
P0-50	12%	53%	2%	1.7%	$46	$0.0	$0.0	1.38	$0.0
P50-90	38%	67%	26%	6.8%	$552	$0.0	$0.0	0.69	$0.0
P90-99	26%	68%	30%	11.6%	$639	$0.0	$0.0	0.35	$0.0
P99-99.9	12%	72%	19%	16.5%	$404	$40.4	-$5.7	0.17	-$7.0
top 0.1%	12%	74%	22%	18.1%	$467	$46.7	-$6.3	0.09	-$4.0
All	**100%**	**67%**	**100%**	**9.9%**	**$2,108**	**$87.1**	**-$12.0**	**1.00**	**-$11.0**
						Net revenue:			**$75.1 billion**
						Net value of reform:			**$64.1 billion**

Incorporating non-standard behavioral responses

Tax	Who bears the burden of a tax change	Notes and key references	Nature/hierarchy of main behavioral Responses	Size of behavioral Responses
	(1)	(2)	(3)	(4)
Individual income Tax	Individuals 100%	Consistent with conventional incidence	Avoidance/evasion Real responses	Varies with context, can be large Likely small. Inattentiveness (Rees-Jones, Taubinsky 2020)
Corporate income tax	Profits 2/3* Workers 1/3* Consumers 0%*	Fuest, Peichl, and Siegloch (2018) for Germany and Kennedy et al. (2022) for the US. Likely depends on bargaining power. Asymmetric effects?	Avoidance/evasion Real responses	Varies with context, can be large Likely medium, varies with design
Consumption taxes				
Value-added-tax or excise tax **increase**	Consumers 100%	Benzarti et al. (2020) on VAT in Europe	Evasion Consumer demand	Varies with context, can be large Larger response for tax on specific goods
Value-added-tax or excise tax **decrease**	Consumers 50% Profits 37.5%* Workers 12.5%*	Benzarti et al. (2020) on VAT in Europe Benzarti and Carloni (2019). Likely depends on bargaining power	Consumer demand	Response muted by 50% price passthrough
Sales taxes (not posted on prices)	Consumers 100%	Consistent with conventional incidence. Poterba (1996) and Besley and Rosen (1999) for local sales tax in the US	Evasion Consumer demand response	Can be large for small retailers Muted by inattentiveness (Chetty et al. 2009)
Payroll taxes				
Employee side payroll tax	Workers 100%	Consistent with conventional incidence	Labor supply response	Likely small (higher for less attached subgroups)
Employer side payroll tax	Corresponding workers 0%	Saez et al. (2012) for Greece, Bozio et al. (2022) for France, Saez et al. (2019) for Sweden	Employer labor demand responses	Can be large for targeted tax changes
	Workers **collectively** 2/3* Profits 1/3* Consumers 0%*	Saez et al. (2019) for Sweden, Benzarti and Harju (2021) for Finland. Likely depends on bargaining power. Asymmetric effects?		

Consider replacing health insurance premiums by a payroll tax

	Current system			Reform replacing current employer health care contributions by flat 11.8% payroll tax								
				Conventional incidence and directed incidence			Employee payroll tax with rigid wages			Employer payroll tax with rigid wages		
Income groups	Average pre-tax income	Current head tax ($ per adult)	Current head tax (% pre-tax income)	New payroll tax (% pre-tax income)	% change in pre-tax income	Change in after-tax income (% pre-tax income)	New payroll tax (% pre-tax income)	% change in pre-tax income	Change in after-tax income (% pre-tax income)	New payroll tax (% pre-tax income)	% change in pre-tax income	Change in after-tax income (% pre-tax income)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
P0-50	$20,889	$1,440	6.9%	4.5%	0.0%	2.4%	4.5%	-3.3%	-0.9%	4.5%	-2.4%	0.0%
P50-90	$80,618	$6,505	8.1%	7.0%	0.0%	1.1%	7.0%	-2.1%	-1.0%	7.0%	-1.1%	0.0%
P90-99	$243,587	$7,826	3.2%	5.2%	0.0%	-1.9%	5.2%	2.1%	0.2%	5.2%	1.9%	0.0%
P99-99.9	$1,085,455	$6,212	0.6%	2.7%	0.0%	-2.1%	2.7%	3.5%	1.4%	2.7%	2.1%	0.0%
top 0.1%	$10,288,542	$5,841	0.1%	1.3%	0.0%	-1.3%	1.3%	3.8%	2.5%	1.3%	1.3%	0.0%
All	**$84,672**	**$4,259**	**5.0%**	**5.0%**	**0.0%**	**0.0%**	**5.0%**	**0.0%**	**0.0%**	**5.0%**	**0.0%**	**0.0%**

Conclusion

Two main lessons:

- ▷ It is possible to do conceptually consistent and practically relevant current-tax analysis that does not merely follow statutory incidence but rather follows economic reasoning and yet does not require to specify behavioral responses.
- ▷ Classical incidence analysis also turns out to be largely irrelevant for the distributional analysis of tax reforms

Supplementary Slides

US tax progressivity in 2018

	Pretax income		After-tax income		Taxes (all levels)		Tax rate composition					
Income groups	Average	Share	Average	Share	Share	Tax rate	Individual income taxes	Payroll taxes	Consump-tion taxes	Property taxes (incl. estate tax)	Corporate tax	Memo: Corporate tax, conventional approach
P0-50	$20,889	12.3%	$15,526	13.0%	10.7%	25.7%	2.2%	10.7%	10.5%	1.7%	0.6%	1.1%
P50-90	$80,618	38.1%	$57,498	38.6%	36.9%	28.7%	8.6%	10.3%	5.6%	2.7%	1.4%	1.1%
P90-99	$243,587	25.9%	$170,579	25.8%	26.2%	30.0%	14.7%	6.3%	3.5%	3.5%	2.1%	1.8%
P99-99.9	$1,085,455	11.5%	$741,550	11.2%	12.3%	31.7%	20.8%	2.4%	2.2%	3.8%	2.5%	2.8%
top 0.1%	$10,288,542	12.2%	$6,804,921	11.4%	13.9%	33.9%	22.8%	0.8%	1.8%	5.1%	3.2%	4.1%
All	**$84,672**	**100%**	**$59,593**	**100%**	**100%**	**29.6%**	**12.5%**	**7.3%**	**4.8%**	**3.2%**	**1.8%**	**1.8%**