Lecture 4: Taxation of goods and services

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Course outline : taxation

Taxation of goods and services

> "*C'est au milieu de la profusion des repas que se payent les taxes sur le vin, la bière, le sucre, le sel et les articles de ce genre, et le trésor public trouve une source de gain dans les provocations à la dépense qui sont excitées par l'abandon et la gaieté des fêtes.*"

[It is while enjoying the pleasure of food that taxes on wine, beer, sugar, salt and other such goods, are paid, and the Treasury finds revenues in the excitement to expenses that are caused by the enjoyment of parties.]

Germain GARNIER
Introduction to the French translation of *The Wealth of Nations* (1821 ; 1859, p. L), quoted by Anthony Atkinson (1977, p. 603)

What is indirect taxation ?

- **A remittance's technique ?**
  - Historical distinction between direct vs indirect taxation
    - whether the tax is directly paid by the taxpayer
    - or paid indirectly through the purchase of goods
  - Not a satisfactory definition :
    - "direct taxes" can be remitted by employers or banks

- **Definition by the incidence of a tax ?**
  - Common definition in old school public finance :
    - Direct taxation : imposed upon the person who is intended to be the final bearer of the burden
    - Indirect taxation : imposed upon others than the person who is intended to bear the final burden
  - Not a satisfactory definition :
    - implies full shifting of indirect taxes and no shifting of direct taxes

More recent approaches

- **Individualization of the tax burden**
  - Direct taxes : may be adjusted to the individual characteristics of the taxpayer
  - Indirect taxes : levied on transactions irrespective of the circumstances of buyer and seller

- **Taxation of consumption**
  - Usual term in OECD/Eurostat/IMF
  - Macro approach : labour vs capital vs consumption taxes
  - Consumption does not equate expenditures
    e.g., home production ; durable goods ; property

- **Taxation of goods and services**
  - Preferred terminology here, but use also of "indirect taxation"

Policy debate

- **Politics of indirect taxation**
  - Left opposed to indirect taxation because regressive
  - (American) Right opposed to VAT because it favours big government

- **Cross-country variations**
  - Nordic countries use high VAT to fund welfare state
  - U.S. has low level of indirect taxation and no VAT
  - Indirect taxation prevalent in developing countries

- **Sign of development or not ?**
  - History of taxation dominated by indirect taxation
  - Historical debate on the superiority of direct taxation
  - VAT as an efficient modern form of taxation or regressive indirect tax ?

Outline of the lecture

I. **Institutions and history**
   – long history of indirect taxes
   – the invention of VAT

II. **Incidence**
   – who pays taxes on goods and services ?
   – is VAT regressive ?

III. **Optimal commodity taxation**
   – how to set different rates of taxes by goods and services ?
   – are reduced rates useful ?

V. **Direct vs. indirect taxation**
   – should we get rid of indirect taxation ?
   – or is VAT more efficient in raising revenue ?

I. Institutions and history

1. History of indirect taxation : excise taxes

2. The invention of VAT

3. Facts about indirect taxation

History of indirect taxation : excise taxes

- **From Antiquity...**
  - Taxes on goods sold (*vectigal rerum venalium*)
  - Taxes on salt, on slaves

- **...to Middle Age and Modern period**
  - Called *aides* in France, or excise in England
    - e.g., salt (*gabelle*)
    - e.g., alcoholic drinks (*droit de barrage*, *de remuage*, *les vingts sous de Sedan*, *les cinq sous des pauvres*, etc.)
    - e.g., meat (*droit du pied fourché*)
    - e.g., card games, soap, oil, leather, etc.

- **Taxation as constraint by technology**
  - Taxes on transaction easier to enforce (market is public)
  - Controlling few goods (necessities) is enough

▸ More on excise vs ad valorem taxes

# History of indirect taxation : trade taxes

- **Erecting barriers to tax goods**
  - Taxation of imports/exports
  - Taxation at points of entry to cities, crossing bridges, etc.

- **Taxes on commodity transport**
  - *portorium* during Roman antiquity
  - *octroi* on products entering cities

Figure 1 – Barrière d'Enfer in Paris

Source : Par Coyau / Wikimedia Commons.

Figure 2 – Indirect taxation as a share of total tax revenues (U.S. vs France – 1900–2018)
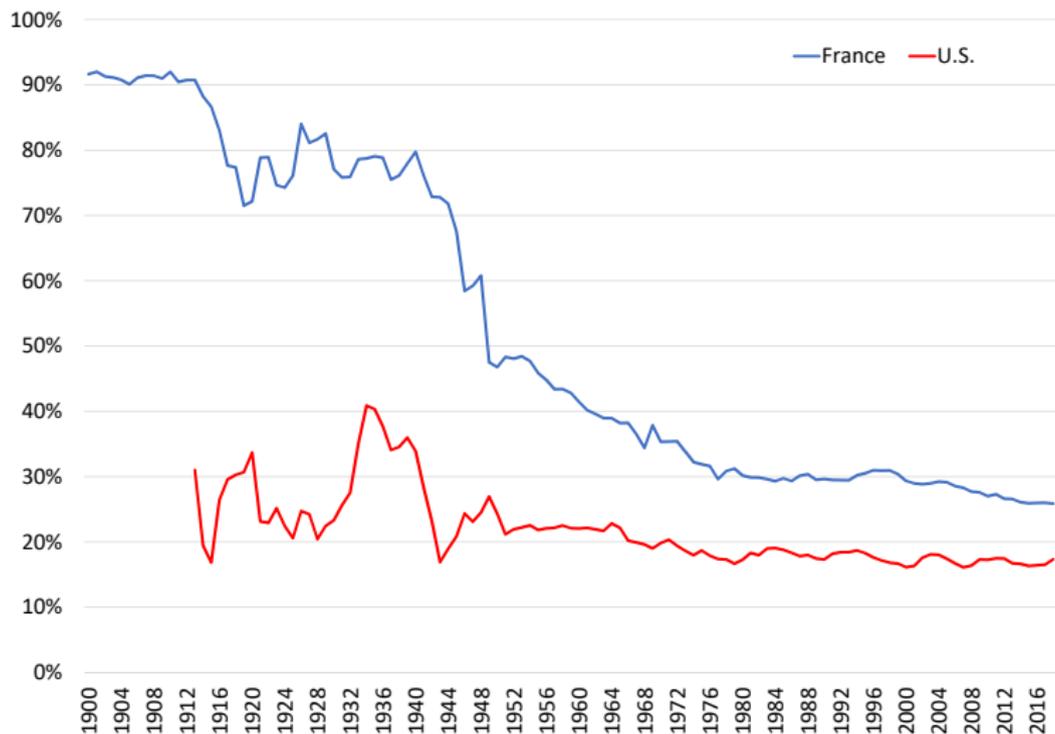
The invention of VAT

- **A French invention**
  - Formal description by Maurice Lauré (1953, 1957), a French civil servant called "*le père de la TVA*"
  - VAT introduced in 1954 (*loi du 10 avril 1954*), then extended in 1968 (*loi du 6 janvier 1966*)

- **The spread of VAT**
  - In the EU : Denmark (1967), Germany (1968), Sweden (1969), the U.K. (1973) ; mandatory in the EU (1977)
  - Goods and Services Tax (GST) : variant of VAT in NZ, Australia, India
  - In 2020, 170 countries had VAT or GST

- **25 countries do not use VAT**
  - the U.S., Pakistan, Afghanistan, Iraq, Syria, Koweit, Caiman Island, Bermuda, Qatar, etc.

Value Added Tax (VAT)

- **Definition**
  - A broad-based tax on commodity sales with systematic offsetting of the tax charged on inputs (Ebrill et al., 2001)

- **Principle**
  - It applies to all sales to private consumers and other businesses (B2C and B2B)
  - Businesses can offset the VAT on their purchases (*input VAT*) against the liability on their sales (*output VAT*)

- **Characteristics**
  - (i) No taxation of intermediate goods
  - (ii) Remittance is 'fractional' (remitted at each stage)
  - (iii) Third party reporting
  - (iv) Tax collection earlier (cash flow benefit)

Value Added Tax (VAT)

Table 1 – VAT at 20% : firm 1 produces intermediate good that firm 2 uses as input

Firm 1		VAT
Sales	€ 1000	€ 200
Inputs	€ 0	
Wages	€ 600	
Profit	€ 200	
net VAT = € 200		

Firm 2		VAT
Sales	€ 3000	€ 600
Inputs	€ 1000	-€ 200
Wages	€ 1200	
Profit	€ 400	
net VAT = € 400		

Total tax remitted = € 600

VAT in the E.U.

- **EU harmonization requirements**
  - Tax base (Sixth Directive 1977)
  - A floor rate at 15% (since 1992)
  - No more than two reduced rate and no new zero-rating goods

- **Zero-rating**
  - The seller charges a VAT rate of zero on its sales but is still entitled to credit for the input VAT paid.

- **Exemptions**
  - Sales are not subject to VAT but the firm does not have the right to reclaim the VAT paid on its inputs
    e.g., in the E.U., medical care, education, social welfare and cultural activities, financial services and letting of property

Retail sales tax (RST)

- **Principle**
  - A tax on the value of sales to final consumers.
  - Sales to other businesses (B2B) are untaxed.

- **Characteristics**
  - (i) No taxation of intermediate goods
  - (ii) Tax remittance at the final sale only
  - (iii) RST requires an "end user" distinction to be made, between sales to businesses (untaxed) and sales to final consumers (taxed)

Retail sales tax (RST)

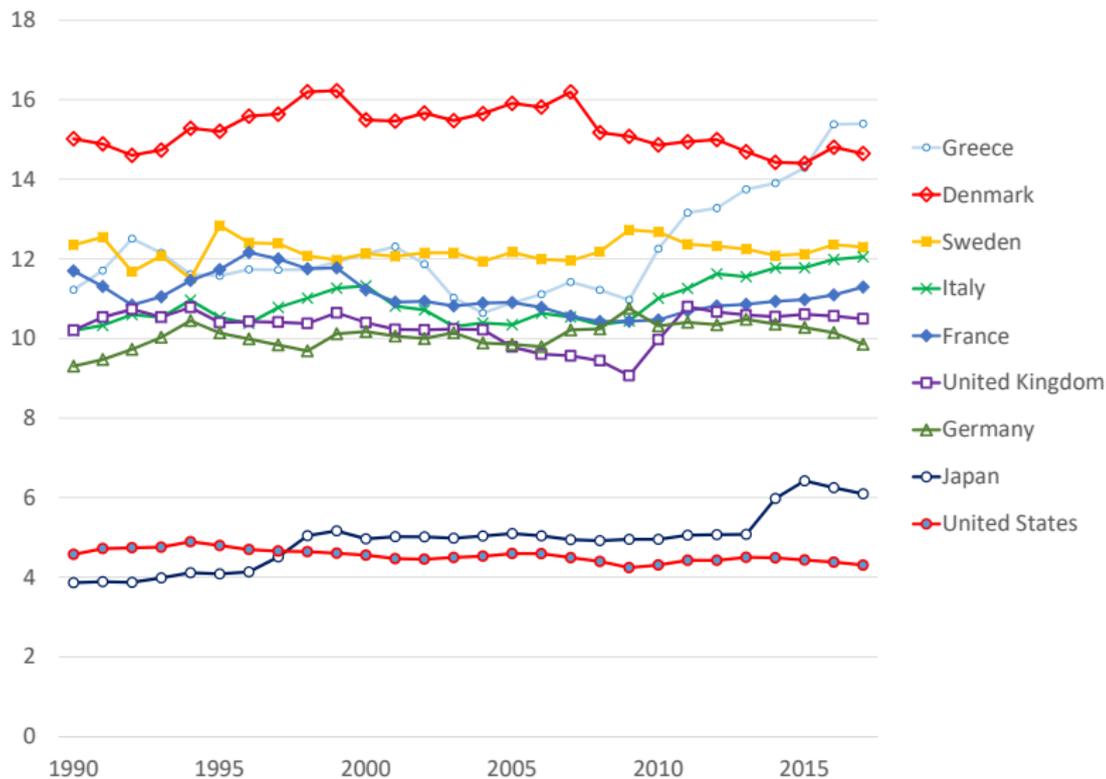Table 2 – RST at 20% : firm 1 produces intermediate good that firm 2 uses as input

Firm 1		RST
Sales	€ 800	€ 0
Inputs	€ 0	
Wages	€ 600	
Profit	€ 200	
net RST paid = € 0		

Firm 2		RST
Sales	€ 3000	€ 600
Inputs	€ 800	
Wages	€ 1200	
Profit	€ 400	
net RST paid = € 600		

Total tax paid = € 600

Figure 3 – Indirect taxation as a share of GDP (OECD)

- Greece
- Denmark
- Sweden
- Italy
- France
- United Kingdom
- Germany
- Japan
- United States

Figure 4 – Indirect taxation as a share of GDP (non OECD)

Legend:
- Argentina
- Senegal
- Brazil
- Cameroon
- Turkey
- Kenya
- South Africa
- Colombia
- Peru
- Philippines
- Egypt
- Indonesia
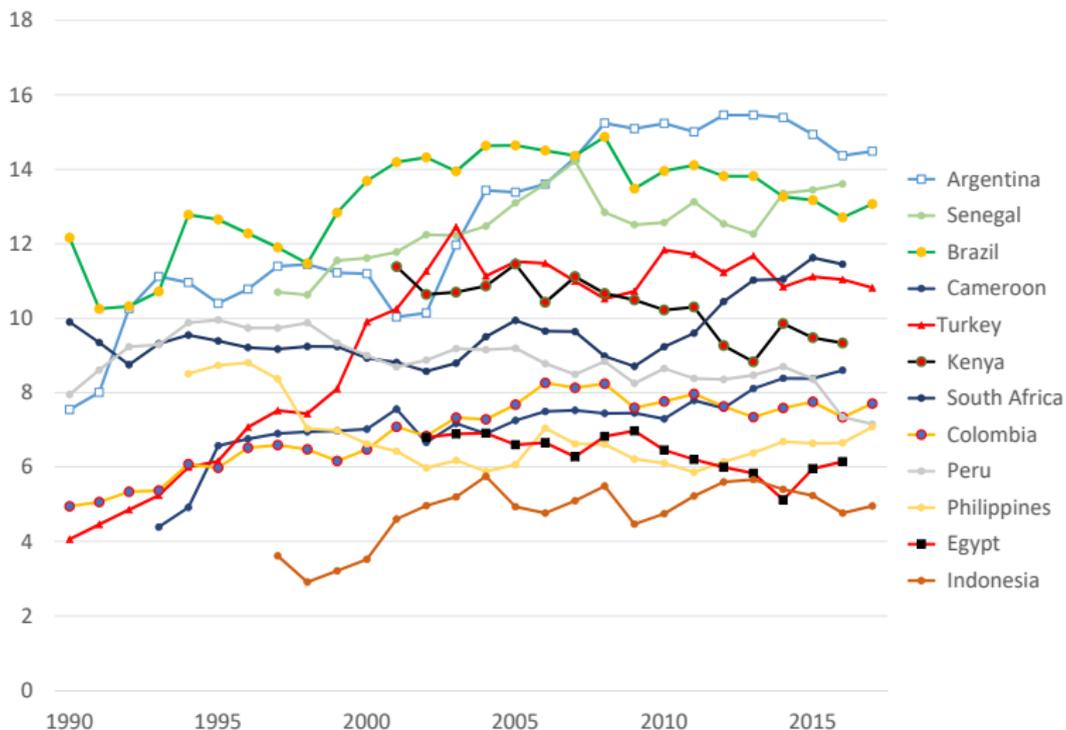
Source : OECD, *Revenues Statistics* (2019) ; OECD.Stat.

II. Incidence : who pays indirect taxes ?

"*One of the most valuable insights that economic analysis has provided in public finance is that the person who effectively* **pays** *a tax is not necessarily the person upon whom the tax is levied.*
To determine the true **incidence** *of a tax or a public project is one of the most difficult, and most important, tasks of public economics.*"

A. Atkinson and J. Stiglitz (1980)

II. Incidence : who pays indirect taxes ?

1. Definition and terminology
2. Textbook incidence of goods and services
3. Empirical evidence on incidence
4. Incidence with salience
5. Is VAT pass-through asymmetric ?
6. Is VAT regressive ?

Tax Incidence : Definition

- Tax incidence is about how taxes affect the **distribution** of the pie : impact on equilibrium prices and distribution of economic welfare

- What happens to market prices when a tax is introduced/changed ?
  - what happens when we impose a 1 euro per pack tax on cigarettes ? Increase the VAT ? Provide a subsidy for food ?
  - these interventions affect prices, and hence have distributional effects on smokers, profits of producers, shareholders, farmers...

- Tax incidence is an important first step when evaluating how policies affect social welfare

Tax Incidence : Terminology

- **Legal liability** : what the law says about who should pay the tax (also called statutory or formal incidence)

  e.g., households should pay the income tax

  e.g., employees should pay employees' payroll tax

- **Remittance responsibility** : who is responsible for remitting the amount of tax to the tax authorities

  e.g., VAT is remitted by producers

  e.g., employees' SSCs are remitted by employers

  e.g., capital income tax can be remitted by banks

- **Economic/effective incidence** : it describes who actually bears the tax burden, i.e., who is worse off (in terms of utility) as a result of the tax

Economic Incidence

- **Who pays taxes ?** The naive answer is that it is obvious
  - e.g., consumers pay the VAT
  - e.g., employers pay employers' SSCs
  - e.g., firms pay the corporation tax

- **Who actually bears the tax burden ?** Taxes can be shifted because they affect prices and factor returns

- **Example : increase in VAT**
  - if after-tax prices increase by the amount of the tax
    $\rightarrow$ consumers pay the tax
  - if after-tax prices stay constant and profits go down
    $\rightarrow$ capital owners pay the tax
  - if after-tax prices stay constant and wages go down
    $\rightarrow$ wage earners pay the tax

Partial Equilibrium Incidence

- Key reference : Kotlikoff and Summers (1987)

- Two good economy : X and Y (numeraire)

- Partial equilibrium model : can be viewed as an approximation of incidence in a multi-good model if
  - the market being taxed is small
  - no close substitutes/complements in the utility function

- Government levies an **excise tax** τ on good X

- Let p denote the pre-tax price of X and $q = p + \tau$ denote the tax-inclusive price of X (statutory incidence is on consumer)

Partial Equilibrium Incidence

- **Demand** for good X is $D(q)$, where $q = p + \tau$

- **Supply** for good X is $S(p)$

- **Equilibrium condition** : $Q = S(p) = D(p + \tau)$

  Defines equation for equilibrium pre-tax price $p(\tau)$

- $\frac{\mathrm{d}p}{\mathrm{d}\tau}$: effect of a tax increase on (pre-tax) price, which determines who bears the effective burden of the tax

- Fully differentiating w.r.t. τ and solving for $\frac{\mathrm{d}p}{\mathrm{d}\tau}$ gives : ▸ Details

$$\frac{\mathrm{d}p}{\mathrm{d}\tau} = \frac{\varepsilon_D}{\varepsilon_S - \varepsilon_D}$$

ε_D : price-elasticity of demand ; ε_S : price-elasticity of supply

The Three Rules of Tax Incidence
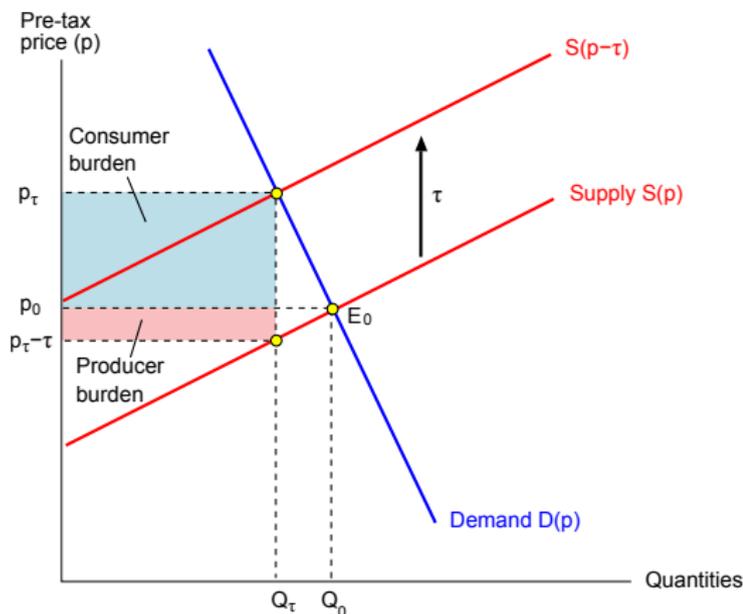
- **Incidence formula :**

$$\frac{\mathrm{d}p}{\mathrm{d}\tau} = \frac{\varepsilon_D}{\varepsilon_S - \varepsilon_D}$$

- **Key implications :**
  1. The legal incidence of a tax does not describe who really bears the tax
  2. The side of the market on which a tax is imposed is irrelevant to the distribution of the tax burdens
  3. More inelastic factor bears more of the tax

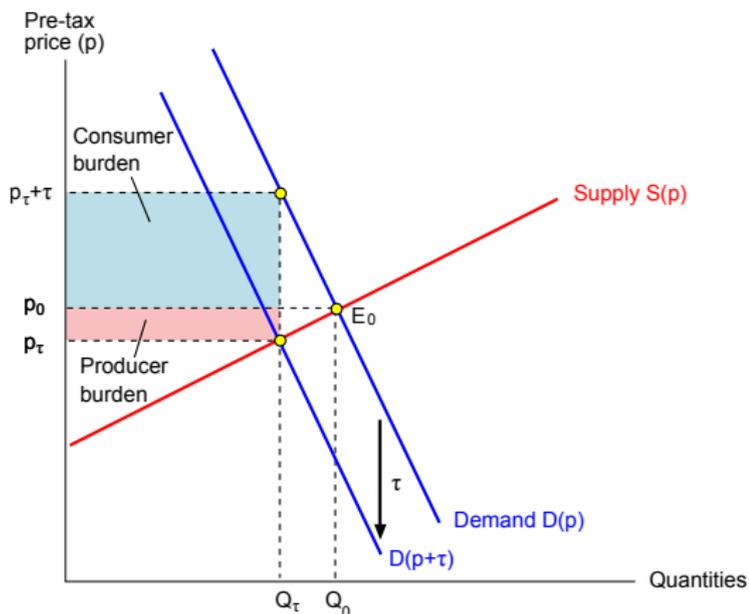# Rule 1 : Legal Incidence is not Economic Incidence

Figure 5 – Example : Tax Levied on Producers

Although the statutory burden of the tax is on producers, the real burden of the tax is borne primarily by consumers

Rule 2 : The Side of the Market is Irrelevant

Figure 6 – Example : Tax Levied on Consumers

Same distribution of the tax burden as when tax is levied on producers
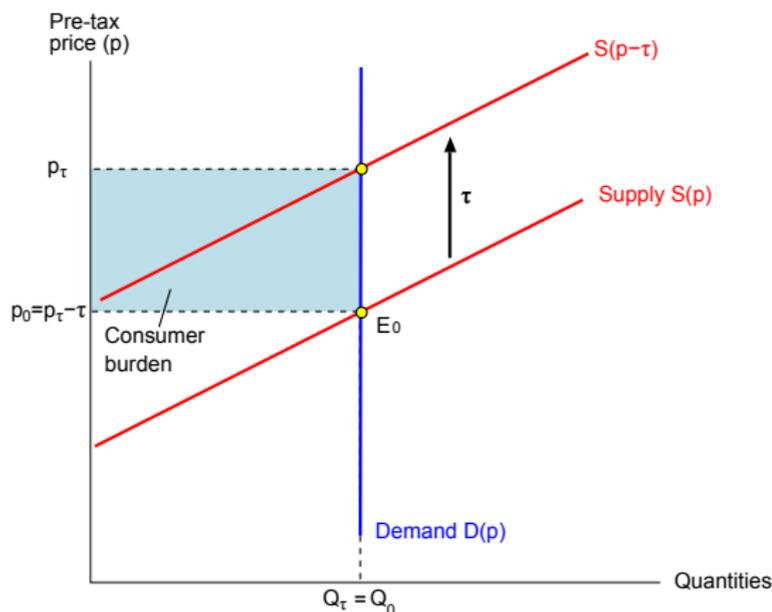
Rule 3 : Inelastic Factor Bears More of the Tax

- Incidence on consumers (ie., on after-tax price q) :

$$\frac{\mathrm{d}q}{\mathrm{d}\tau} = \frac{\mathrm{d}(p+\tau)}{\mathrm{d}\tau} = 1 + \frac{\mathrm{d}p}{\mathrm{d}\tau} = \frac{\varepsilon_S}{\varepsilon_S - \varepsilon_D}$$

- Who bears the burden of the tax ?
    - $\varepsilon_S \gg \varepsilon_D \Rightarrow \frac{\mathrm{d}(p+\tau)}{\mathrm{d}\tau} \approx 1$ (tax fully shifted on consumers)
    - $\varepsilon_D \gg \varepsilon_S \Rightarrow \frac{\mathrm{d}(p+\tau)}{\mathrm{d}\tau} \approx 0$ (tax fully shifted on producers)

- The inelastic factor tends to bear more of the tax :
    e.g., producers with fixed quantity supplied (housing)
    e.g., consumers with no substitute untaxed commodity (gas)

- Tax shifting occurs through pre-tax price changes

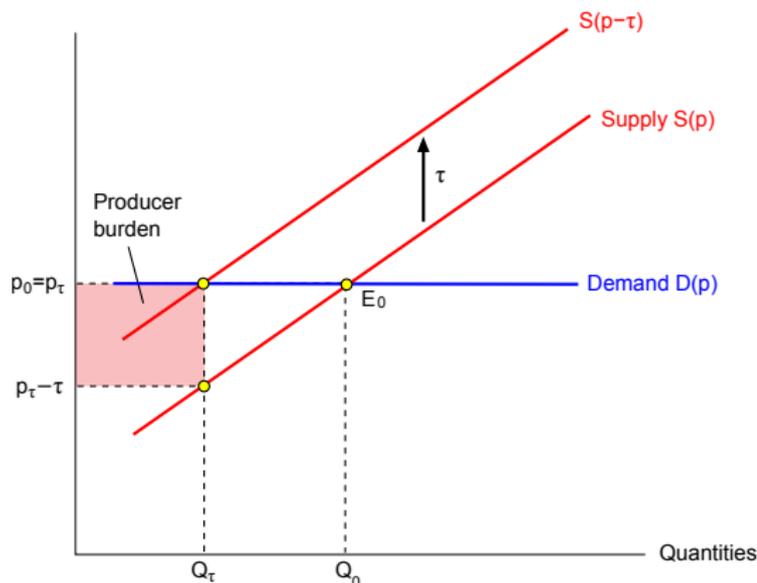# Rule 3 : Inelastic Factor Bears More of the Tax

Figure 7 – Example : Perfectly Inelastic Demand

A tax on producers of a inelastically demanded good is fully reflected in increased prices, so consumers bear the full tax

Rule 3 : Inelastic Factor Bears More of the Tax

Figure 8 – Example : Perfectly Elastic Demand

A tax on producers of a perfectly elastically demanded cannot be passed along to consumer through an increase in price

Standard textbook extensions

- **Extensions to the basic partial equilibrium case**
  1. Market rigidities
  2. Imperfect competition (Delipalla and Keen, JPuBE 1992)
  3. Remittance and compliance cost

- **General equilibrium**
  - Tax shifting will impact other markets
    e.g., tax on butter affects consumers of margarine
  - Factor prices will also be affected
  - Harberger (1962) model is the classic GE incidence model
    $\Rightarrow$ see lecture 9 on corporate tax

Standard textbook canon

- **General consumption tax shifted to consumers**
  - Very little substitution to overall consumption
  - Hence demand elasticities very inelastic
  - Consumer must pay all VAT/GST/sales tax
    $\Rightarrow$ main assumption in tax burden analyses

- **Exceptions**
  - Sales close to borders
  - Specific good taxes with possible substitute
    e.g., tax on Lexington restaurant (Gruber 2007 textbook)

Empirical evidence of incidence

1 **Lab experiments**
- Kerschbamer and Kirchsteiger (ET, 2000)

2 **Incidence of fuel taxes**
- Doyle and Samphantharak (JPubE, 2008), Marion and Muehlegger (JPubE, 2011), Kopcuck et al. (AEJ-EP, 2016)

3 **Incidence of tobacco taxes**
- Evans, Ringel, and Stech (1999), Hanson and Sullivan (NTJ, 2009), Harding et al. (AEJ-EP, 2012)

4 **Incidence of general consumption taxes**
- Earlier work with Poterba (NTJ, 1996), Besley and Rosen (NTJ, 1999), and Carbonnier (JPubE, 2007)
- More recent research with Kosonen (JPubE, 2015), Benedeck et al. (ITPF, 2020), and Benzarti et al. (JPE, 2020)

Prices in U.S. cities

- **Besley and Rosen (NTJ, 1999)**
  - Data on 155 U.S. cities for 12 commodities (bananas, coke, Big Mac, Kleenex, eggs, milk, etc.)
  - Quarterly price and sales tax data from 1982 to 1990

- **Econometric approach**
  - Regressing tax-exclusive prices p_{ijt} of commodity i, in city j, in period t :

$$ln\ p_{ijt} = \beta_{1i}\tau_{ijt} + \beta_{2i}C_{ijt} + CITY_j + TIME_t + \varepsilon_{ijt}$$
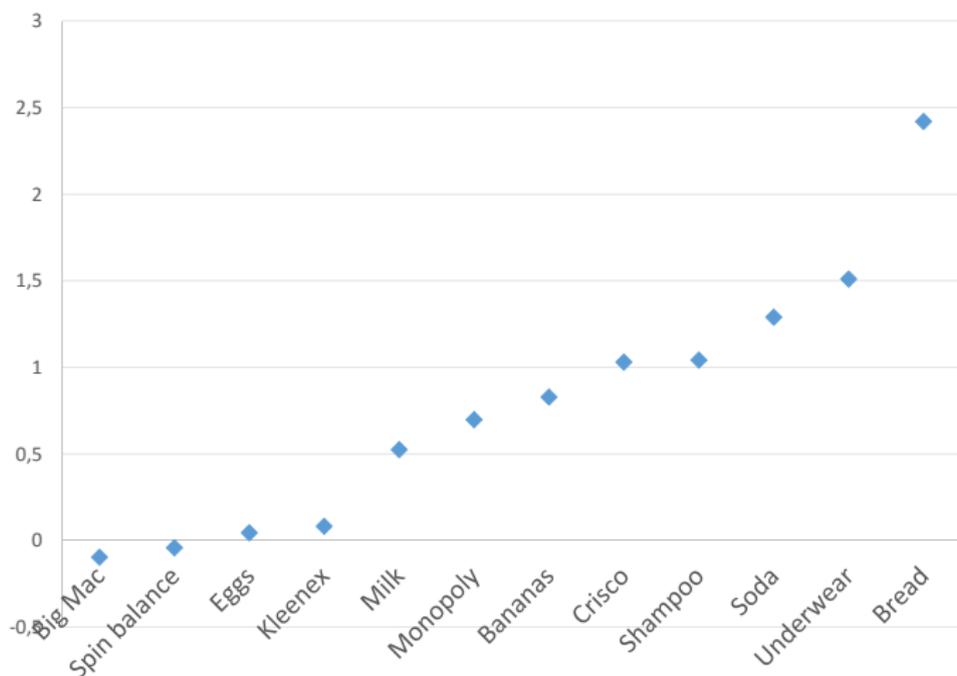
  – with C_{ijt} cost variables (rental, wage and energy costs)
  – $CITY_j$ city effects and $TIME_t$ time effects

- **Interpretation**
  - $\beta_{1i} = 0$ means full-shifting of sales taxes on prices

Prices in U.S. cities

Figure 9 – Estimates of shifting parameter β_{1i}

Prices in U.S. cities

- **Results**
  - Full-shifting for some commodities (Big Mac, Kleenex, spin balance)
  - Over-shifting for many others (bananas, bread, milk, etc.)

- **Interpretation from Besley and Rosen (1999)**
  - Consistent with retail markets being imperfectly competitive
  - Authors cite IO literature suggesting significant market power in retailing

Kosonen (JPubE, 2015)

- **E.U. VAT experiments**
  - E.U. directive allowing reduced VAT rates in labour intensive sectors
  - Aim to experiment whether reduced VAT rates can increase employment and reduce the shadow economy

- **VAT reform in Finland in 2007–2011**
  - 2007 : Cut in VAT rate on hairdressing services from 22% to 8% (-14 ppts)

- **Methodology**
  - DiD comparing beauty salons and hairdressing
  - Restricted price data with firm identifier
  - Corporate income tax data

VAT reform in Finland : prices

Figure 10 – Estimates of impact on prices
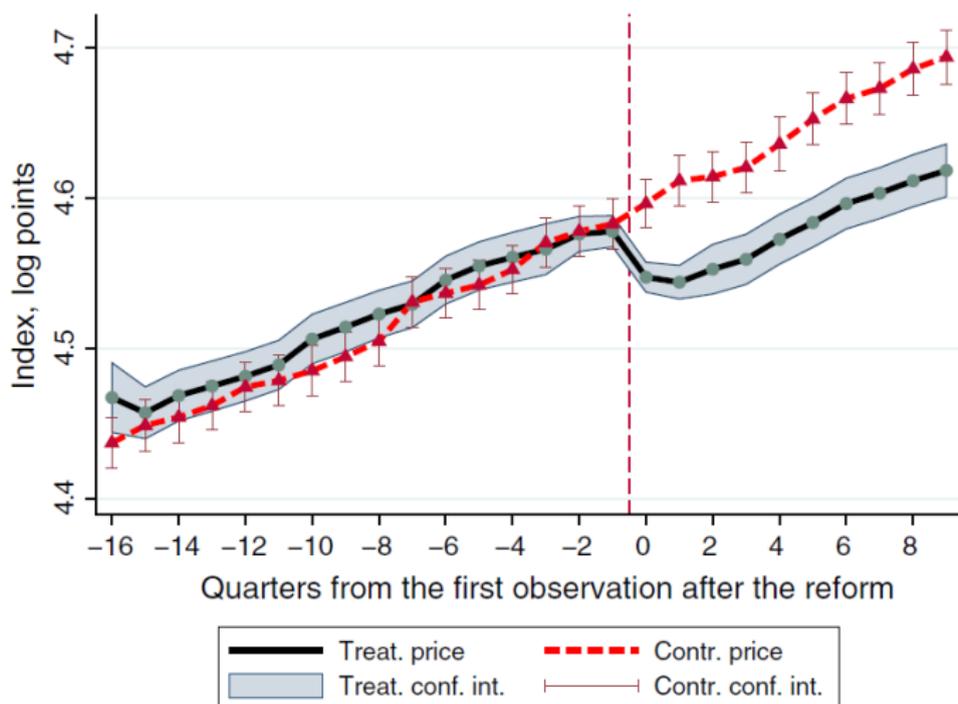
SOURCE : Kosonen (2015), Fig. 2, p. 92.

VAT reform in Finland : quantities

Table 3 – Difference-in-differences estimates for log quantity of traded services (i.e., turnover divided by price)

	(1)	(2)	(3)
DiD	0.055	0.004	-0.004
	(0.074)	(0.055)	(0.055)
After	0.014	0.033**	0.035**
	(0.02)	(0.014)	(0.014)
Log cost		1.56e-06***	1.48e-06***
		(4.88e-07)	(4.68e-07)
Log inputs		0.227***	0.227***
		(0.0347)	(0.0351)
Time controls	No	✓	✓
Legal form controls			✓
N	4302	4192	4192
R2	0.002	0.215	0.217
N of firms	482	478	478

VAT reform in Finland : employment

Table 4 – Difference-in-differences estimates for other outcomes

	(1) Net assets	(2) Log all costs	(3) Log wealth	(4) Log revenue	(5) Log wage sum
DiD	-6844 (4832)	-0.021 (0.013)	0.022 (0.020)	0.056*** (0.010)	-0.080 (0.049)
After	1385 (1690)	0.194*** (0.018)	0.019 (0.025)	-0.006 (0.012)	0.117*** (0.036)
N	99,136	96,962	90,408	95,67	7441
R2	0.000	0.035	0.005	0.455	0.095
N of firms	20,440	20,202	18,693	20,146	1163

SOURCE : Kosonen (2015), Tab. 7, p. 97.
NOTE : Column (5) restrict to firms with employees.

VAT reform in Finland : profits

Figure 11 – Estimates of impact on profits
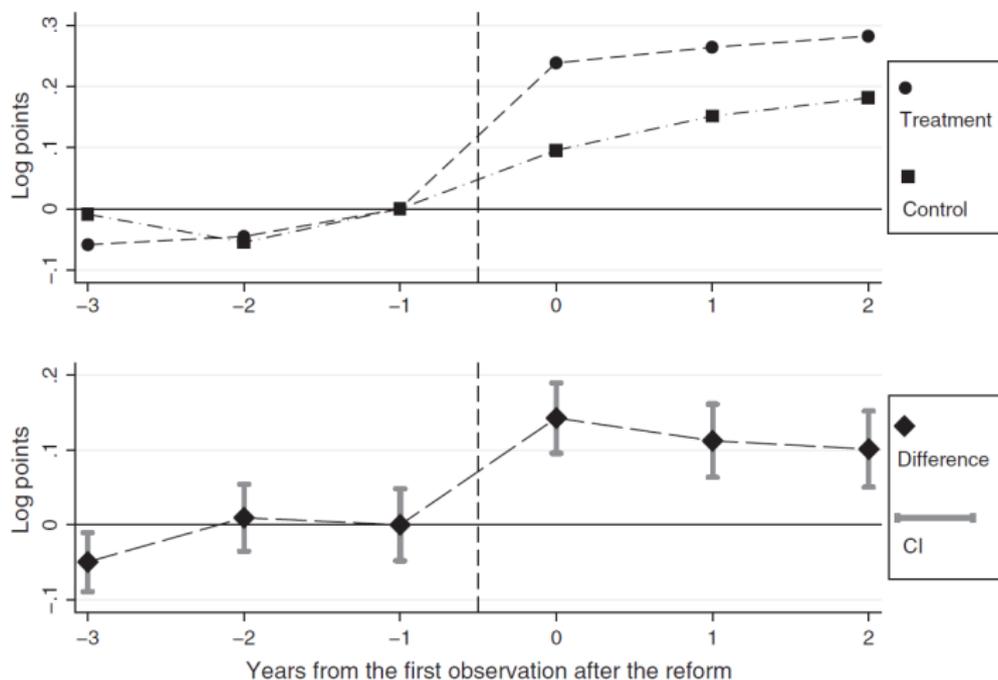
VAT reform in Finland

- **Results**
  - Pass-through estimated at 50% (the consumer prices reduced by -5% to -6%, vs full pass through -11.5%)
  - Higher pass-through for bigger firms
  - No impact on quantities
  - No impact on employment nor wages
  - Increased profits

- **Interpretation**
  - Low demand and supply elasticities, hence no quantity change
 - Reform inefficient in raising welfare

EU VAT changes

- **Benedek, De Mooij, Keen, and Wingender (ITPF, 2020)**
  - Use all VAT change in 17 Eurozone countries (1999-2013)
  - Data on 67 COICOP categories

- **Methodology**
  - Regression design following Besley and Rosen (1999)

  $$\triangle ln(p_{ict}) = \sum_{j=-12}^{12} \gamma_j \triangle ln(1+\tau_{ict+j}) + \Gamma X_{ict} + \alpha_c + \theta_i + \delta_t + \varepsilon_{ict}$$

  – with $\triangle ln(p_{ict})$ log change in consumer price index of consumption category i in country c and month t,
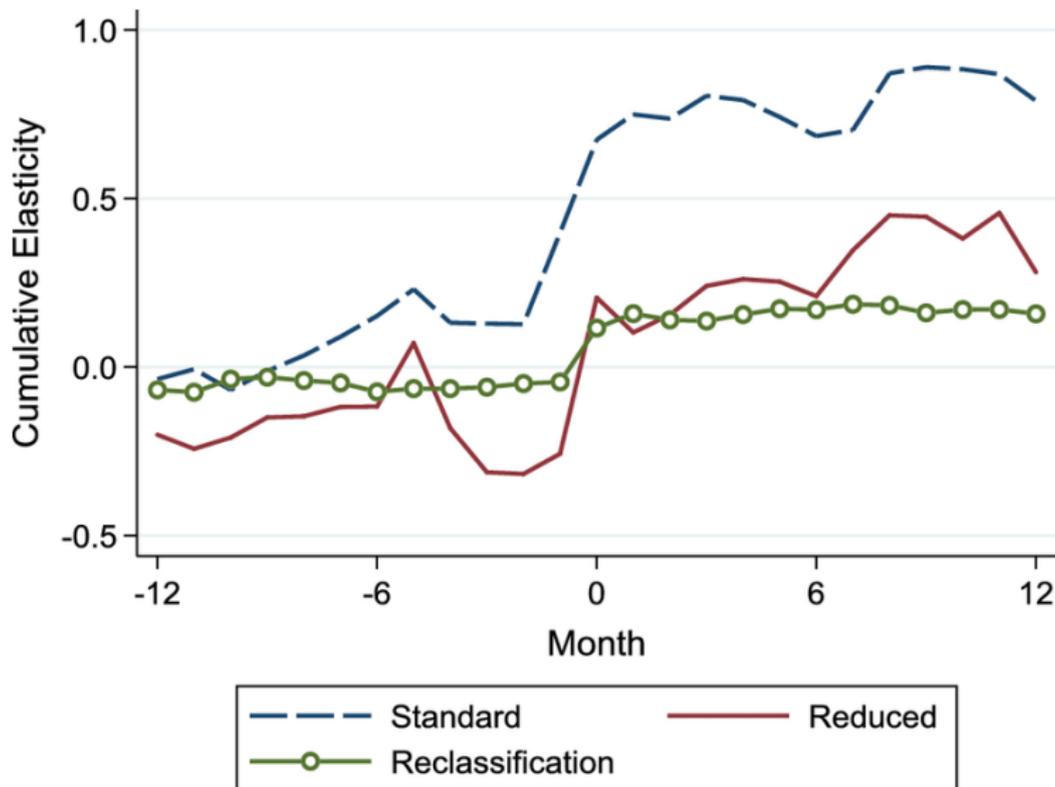 – and X_{ict} controls (unemployment and GDP growth)

EU VAT changes

Figure 12 – Average VAT pass-through (all changes)
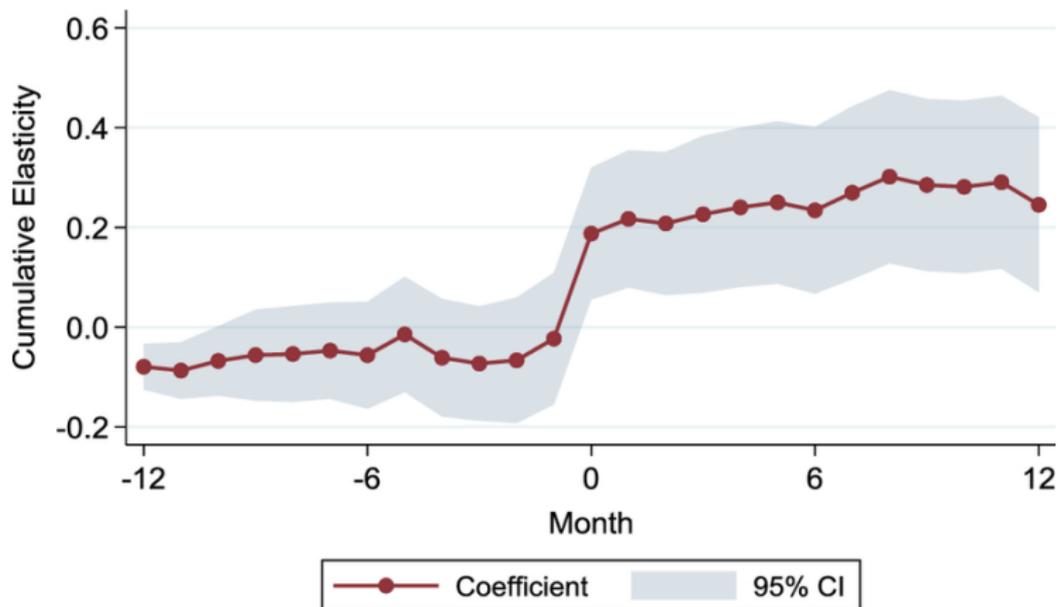
Source : Benedeck et al. (2020), Fig. 1.

Figure 13 – Cumulative Pass Through by Type of VAT Rate Change

Benedeck et al. (2020)

- **Results**
  - Average pass-through of 30-40%
  - Higher pass-through for standard rate : close to full-shifting
  - Lower pass-through for reduced rate

- **Interpretation**
  - Standard rate pass-through consistent with common full-shifting assumption
  - Reduced rate significantly under-shifted
  - Implication for redistribution of low-rate reductions

Incidence with salience

- **Salience**
  - Standard assumption that taxes are equivalent to prices

  $$\frac{dx}{dp} = \frac{dx}{dt}$$

  - Salience is the idea that visibility of taxes might affect behavioural responses

- **Chetty, Looney, and Kroft (AER, 2009)**
  - Part 1 : test of salience effect on consumer behaviour
  - Part 2 : develop theory of incidence with salience effect

Incidence with salience

- **Framework**
  - Pre-tax price p, tax τ not included in posted price q

  $$q = (1 + \tau)p$$

  - Demand for good x : $x(p, \tau)$

- **With full optimization**
  - Demand only depends on the total tax-inclusive price :
    $x(p, \tau) = x(p(1 + \tau), 0)$
  - Price elasticity equals gross-of-tax elasticity : $\varepsilon_{x,p} \equiv \varepsilon_{x,1+\tau}$

  $$-\frac{\partial log(x)}{\partial log(p)} = -\frac{\partial log(x)}{\partial log(1 + \tau)}$$

- **Degree of under-reaction to tax** θ

  $$\theta = \frac{\partial log(x)}{\partial log(1 + \tau)} \bigg/ \frac{\partial log(x)}{\partial log(p)}$$

Estimating salience (Chetty et al., 2009)

- **Empirical strategy 1**
  - Manipulation of tax visibility
  - Compare $x(p, \tau)$ with $x(p(1 + \tau), 0)$
  - Compare the effect of equivalent price increase to estimate degree of under-reaction to tax θ

- **Experimental design**
  - Experiment in one U.S. grocery store (in California)
    - Treatment : price-tag inclusive of tax
    - Control : price-tag exclusive of tax in two other stores (standard U.S. practice for RST)
  - Scanner data on price/quantity for each product
  - Possible concern in experiment is "Hawthorne effect"

Figure 14 – Price-tag experiment

Source : Chetty, Looney, and Kroft (2009), Exhibit 1.

Table 5 – Effect of Posting Tax-Inclusive Prices : DDD Analysis of Mean Quantity Sold

Period	Control categories	Treated categories	Difference
Panel A. Treatment store			
Baseline (2005 :1–2006 :6)	26.48	25.17	-1.31
	(0.22)	(0.37)	(0.43)
	[5,510]	[754]	[6,264]
Experiment (2006 :8–2006 :10)	27.32	23.87	-3.45
	(0.87)	(1.02)	(0.64)
	[285]	[39]	[324]
Difference over time	0.84	-1.30	$DD_{TS} = -2.14$
	(0.75)	(0.92)	(0.68)
	[5,795]	[793]	[6,588]
Panel B. Control stores			
Baseline (2005 :1–2006 :6)	30.57	27.94	-2.63
	(0.24)	(0.30)	(0.32)
	[11,020]	[1,508]	[12,528]
Experiment (2006 :8–2006 :10)	30.76	28.19	-2.57
	(0.72)	(1.06)	(1.09)
	[570]	[78]	[648]
Difference over time	0.019	0.25	$DD_{CS} = 0.06$
	(0.64)	(0.92)	(0.95)
	[11,590]	[1,586]	[13,176]
		DDD Estimate	-2.20
			(0.59)
			[19,764]

SOURCE : Chetty, Looney, and Kroft (2009), Tab. 3, p. 1154.

Estimating salience (Chetty et al., 2009)

- **Empirical strategy 2**
  - Alcohol subject to two state-level taxes in the U.S. :
    - Excise tax τ^E : included in price
    - Sales tax τ^S : added at register, not shown in posted price
  - Exploiting state-level changes in these two taxes to estimate θ
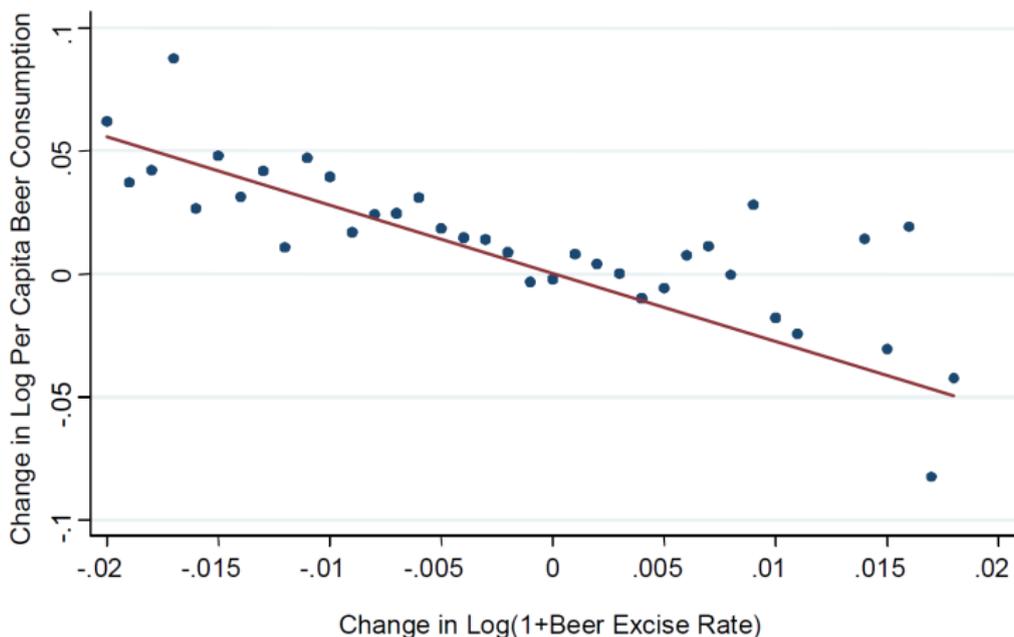
- **Estimation**
  - Aggregate state data on beer consumption
  - Estimate following regression :

  $$\Delta log \ x_{jt} = \alpha + \beta \Delta log(1 + \tau_{jt}^E) + \theta \Delta log(1 + \tau_{jt}^S) + \varepsilon_{jt}$$

  with x_{jt} quantity of beer in state j, and time t

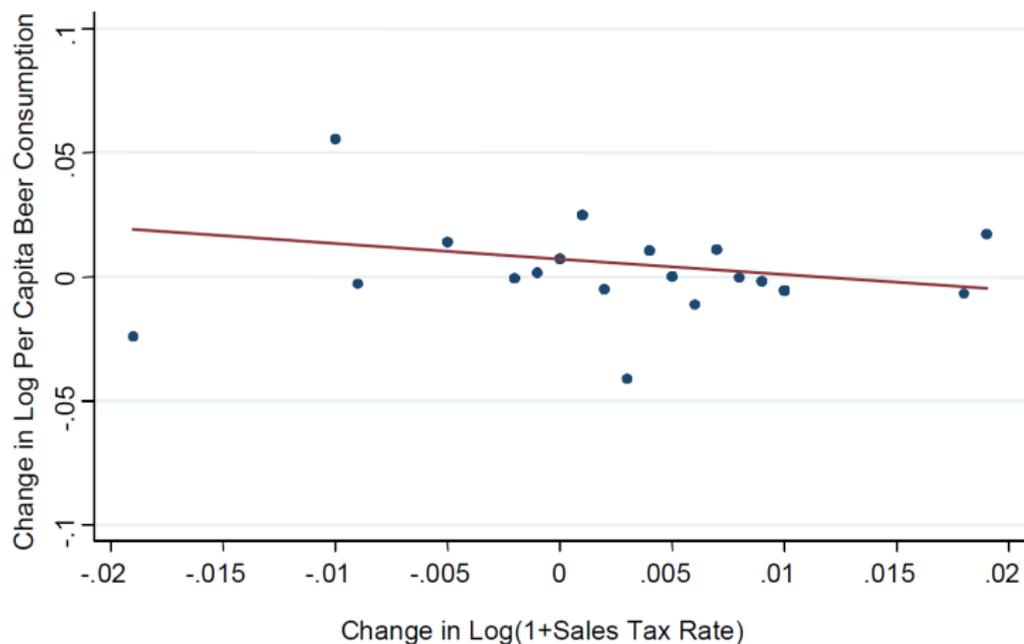# Estimating salience (Chetty et al., 2009)

Figure 15 – Per capita beer consumption and state beer excise taxes

SOURCE : Chetty, Looney, and Kroft (2009), Fig. 2.A.

Estimating salience (Chetty et al., 2009)

Figure 16 – Per capita beer consumption and state sales taxes

Estimating salience (Chetty et al., 2009)

Figure 17 – Effect of excise and sales taxes on beer consumption

	Baseline (1)	Business cycle (2)	Alcohol regulations (3)	Region trends (4)
Dependent variable: Change in log (per capita beer consumption)				
$\Delta \log (1 + \text{excise tax rate})$	−0.88 (0.17)	−0.91 (0.17)	−0.89 (0.17)	−0.71 (0.18)
$\Delta \log (1 + \text{sales tax rate})$	−0.20 (0.30)	−0.01 (0.30)	−0.02 (0.30)	−0.05 (0.30)
$\Delta \log (\text{population})$	0.03 (0.06)	−0.07 (0.07)	−0.07 (0.07)	−0.09 (0.08)
$\Delta \log (\text{income per capita})$		0.22 (0.05)	0.22 (0.05)	0.22 (0.05)
$\Delta \log (\text{unemployment rate})$		−0.01 (0.01)	−0.01 (0.01)	−0.01 (0.01)
Alcohol regulation controls			x	x
Year fixed effects	x	x	x	x
Region fixed effects				x
F-test for equality of tax elasticities (prob $> F$)	0.05	0.01	0.01	0.06
Sample size	1,607	1,487	1,487	1,487

Notes: Standard errors, clustered by state, in parentheses. All specifications are estimated on full sample for which data are available (state unemployment rate data are unavailable in early years). Column 3 includes three indicators for whether the state implemented per se drunk driving standards, administrative license revocation laws, or zero tolerance youth drunk driving laws, and the change in the minimum drinking age (measured in years). Column 4 includes fixed effects for each of nine census regions. F-test tests null hypothesis that coefficients on excise and sales tax rate variables are equal.

SOURCE : Chetty, Looney, and Kroft (2009), Tab. 6.

Estimating salience (Chetty et al., 2009)

- **Results**
  - Posting tax-inclusive price tags reduces demand by 8 percent
  - Using sales tax/excise difference leads to $\theta = 0.06$ (very far from 1!)

- **Incidence formula with salience**

$$\frac{dp}{d\tau} = \theta \frac{\varepsilon_D}{\varepsilon_S - \varepsilon_D}$$

  - Incidence on producers attenuated by θ (i.e., demand curve becomes more inelastic when consumers are inattentive)
  - Statutory incidence matter (producers have to include in the price the tax that they bear nominally)

Asymmetry of VAT pass-through

- **Asymmetry of pass-through**
  - Whether pass-through is higher when tax increase than tax decrease
  - Standard incidence theory rejects asymmetry : only ε^S and ε^D matter

- **Small literature with mixed results**
  - Carbonnier (2005, 2008) : evidence of short-term asymmetry on French data
  - Politi and Matteos (2011) : evidence of asymmetry in 10 goods in Brazil
  - Benedeck et al. (2020) : no asymmetry for EU VAT changes, except anticipation effect for tax increases (hence difference of timing)

Benzarti, Carloni, Harju and Kosonen (JPE, 2020)

❶ Finnish hairdressing VAT reform
- Follow-up from Kosonen (2015)
- Decrease of VAT rate in Jan. 2007 (-14 ppts)
- Increase of VAT rate in Jan. 2012 (+14 ppts)

❷ French restaurant VAT reform
- Decrease of VAT rate in July 2009 (-14.1 ppts)
- Increase of VAT rate in Jan. 2012 (+1.5 ppts)
- Increase of VAT rate in Jan. 2014 (+3 ppts)

❸ EU VAT rate changes
- From 1996 to 2015
- Eurostat price data (follow-up from Benzarti and Carloni, 2016)
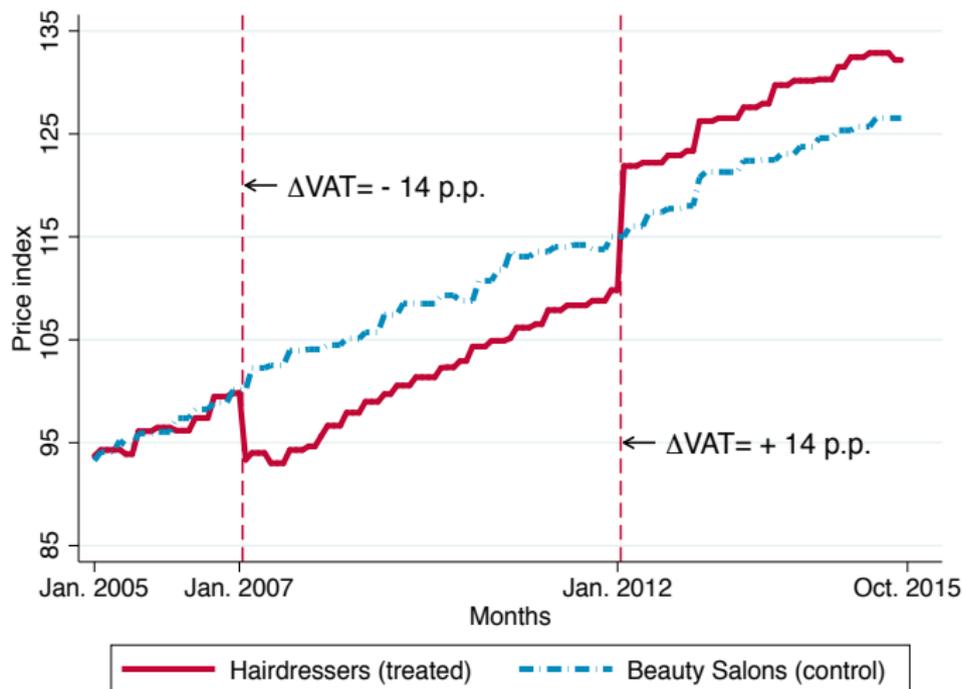
Finnish Hairdressing VAT Reforms

Figure 18 – Prices of beauty salons (controls)

← ΔVAT= - 14 p.p.

← ΔVAT= + 14 p.p.

Beauty Salons (control)
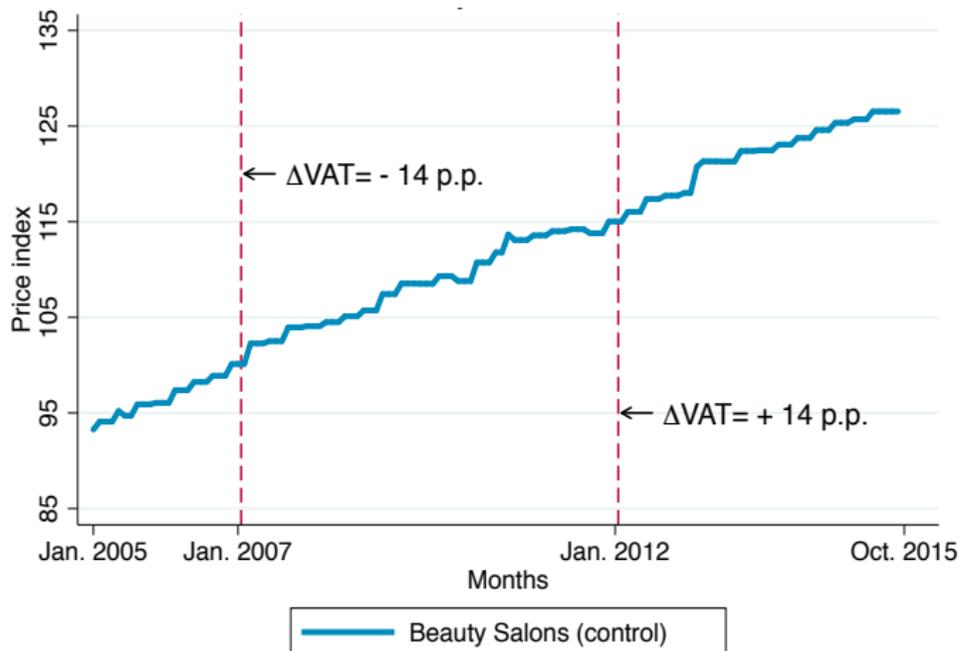
Finnish Hairdressing VAT Reforms

Figure 19 – Prices of hairdressers vs beauty salons

ΔVAT= - 14 p.p.

ΔVAT= + 14 p.p.

Hairdressers (treated) — — Beauty Salons (control)

Finnish Hairdressing VAT Reforms

Figure 20 – Prices of hairdressers vs beauty salons

Source : Benzarti, et al. (2020), Fig. 5.
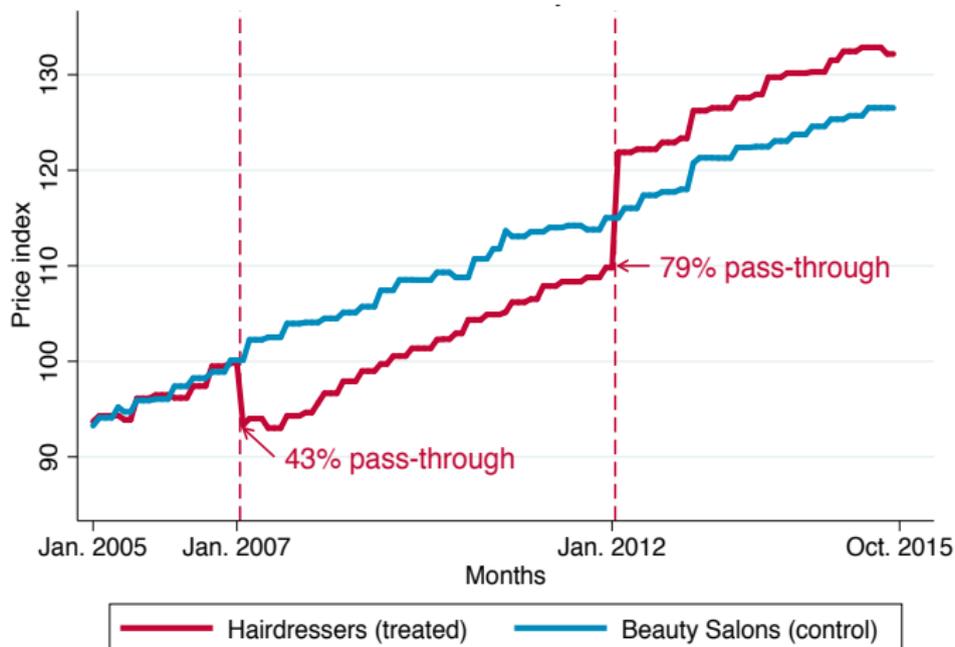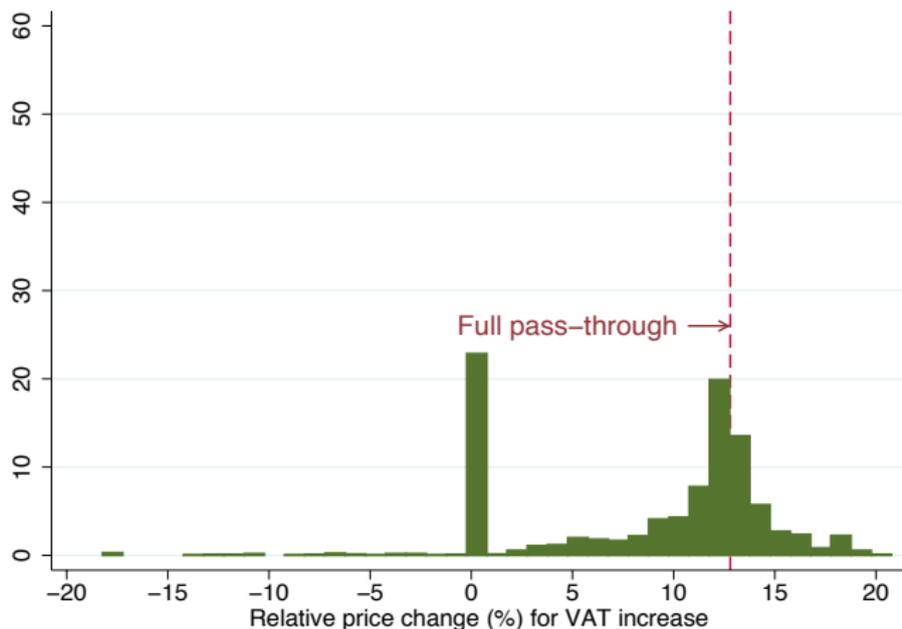
Finnish Hairdressing VAT Reforms

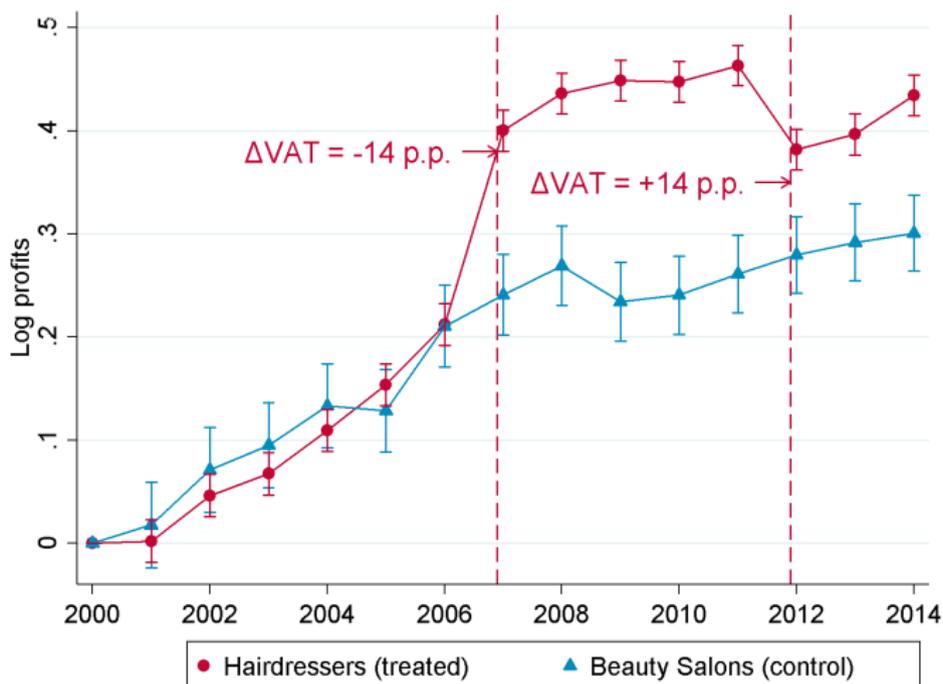## Figure 21 – Distribution of pass-through (VAT decrease)
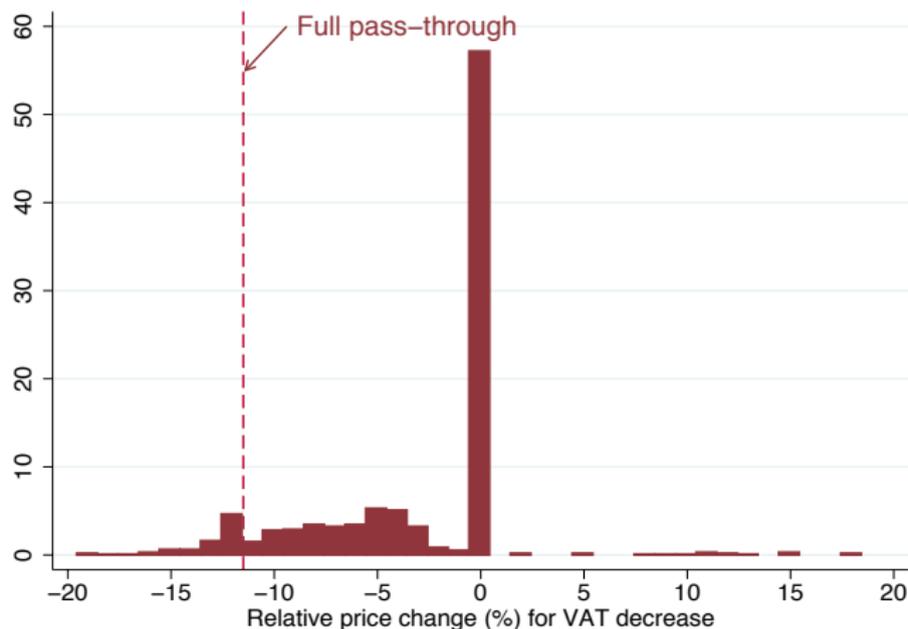
Finnish Hairdressing VAT Reforms

Figure 22 – Distribution of pass-through (VAT increase)

Finnish Hairdressing VAT Reforms

Figure 23 – Impact on profits

ΔVAT = -14 p.p.

ΔVAT = +14 p.p.

● Hairdressers (treated)   ▲ Beauty Salons (control)

French restaurant VAT reform

Figure 24 – Decrease in VAT (from 19.6% to 5.5%)

Pass-through = 9.7 percent

VAT decreased from 19.6 to 5.5 percent

Price

Price if Full Pass-Through

Price Index (June 2009 = 100)

Time

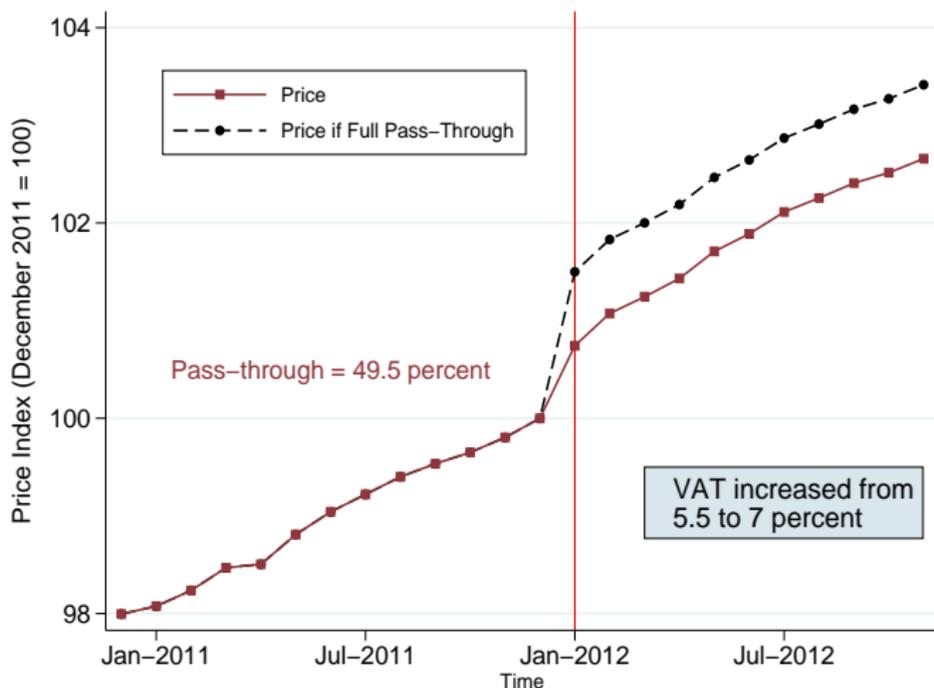SOURCE : Benzarti, et al. (2020), Fig. 10.
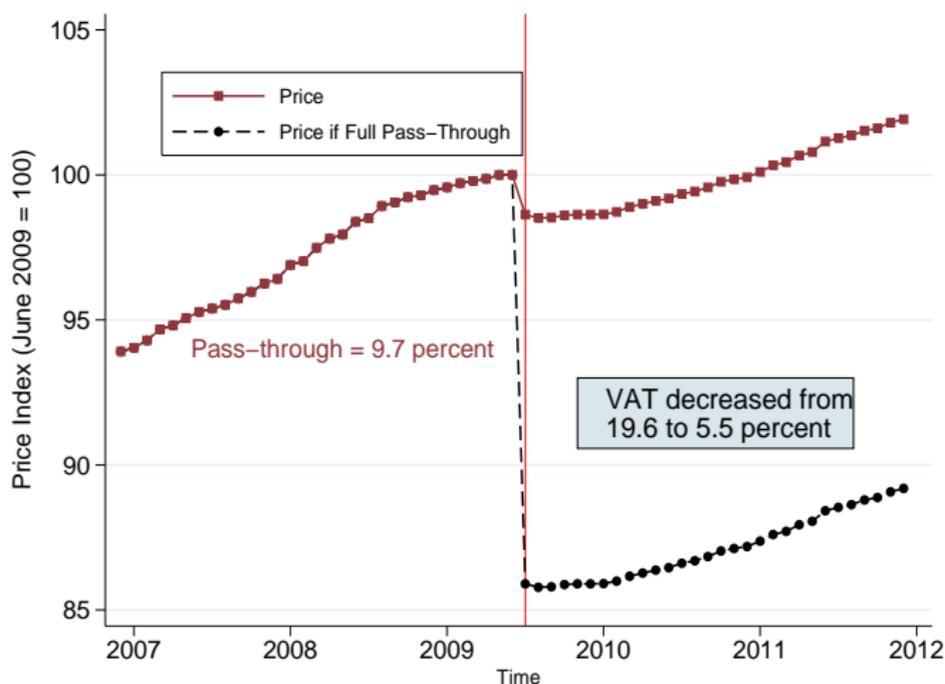
French restaurant VAT reform

Figure 25 – Increase in VAT (from 5.5% to 7%)
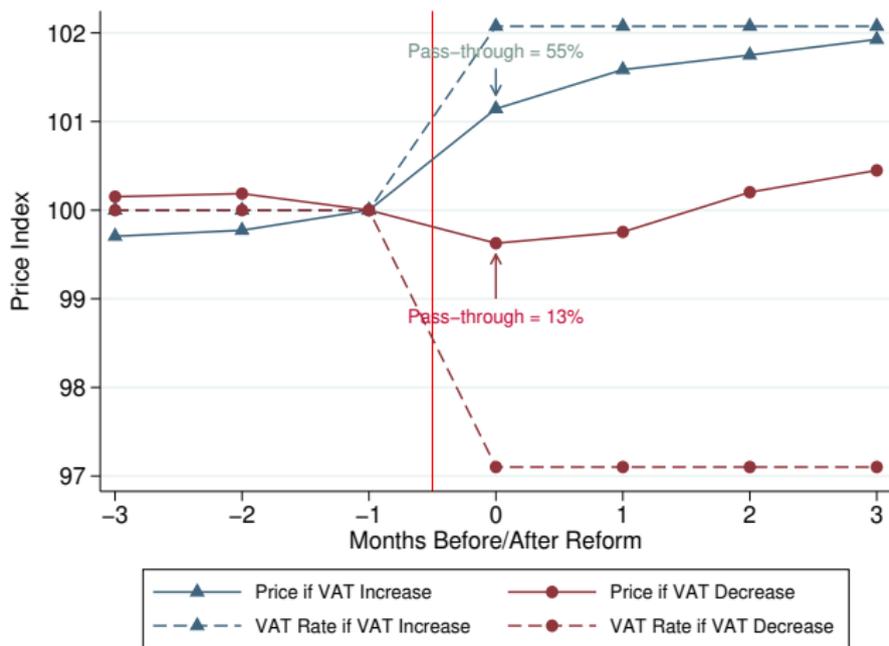
French restaurant VAT reform

Figure 26 – Increase in VAT (from 7% to 10%)
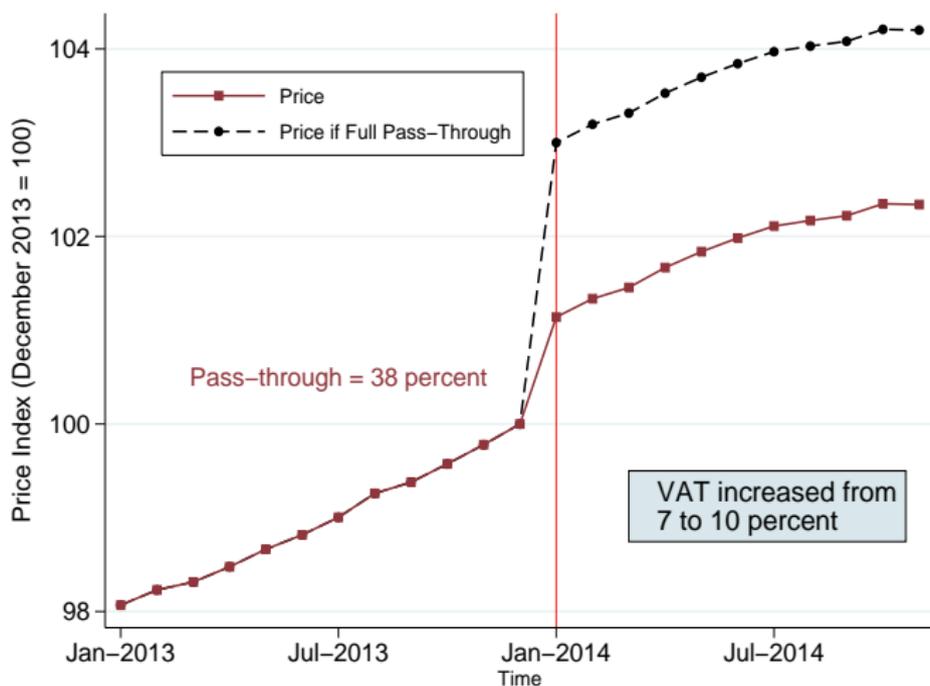
EU VAT data (1996-2015)

Figure 27 – VAT pass-through (increases vs decreases)

Asymmetry of VAT pass-through

Figure 28 – EU VAT increases and decreases

c. Combined Effect if Reduced Rate
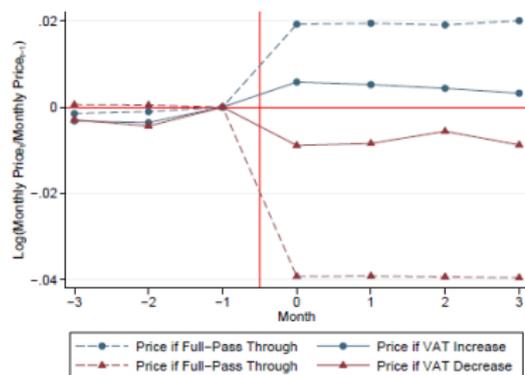
d. Combined Effect if Standard Rate
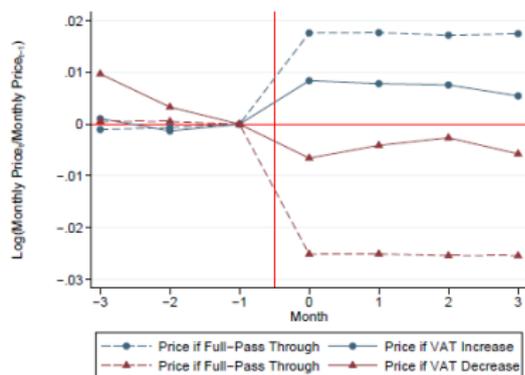
SOURCE : Benzarti and Carloni (2015), Fig. 10-C and 10.D.

Benzarti et al. (2020) : which mechanisms ?

- **Suggested explanation : fear of consumer antagonism**
    - Fairness considerations
    - Behavioural evidence of asymmetric feelings from consumers

- **Suggested model**
    - Adjustment shock to increasing prices
    - No adjustment shocks to decreasing prices
    - Firms accumulate stock of shocks not transmitted to posted prices

- **Empirical test**
    - Firms with eroded margins more likely to exhibit asymmetric pricing behaviour

Asymmetry of VAT pass-through

Figure 29 – Asymmetry in pass-through according to operating margin

SOURCE : Benzarti, et al. (2020), Fig. from slides.

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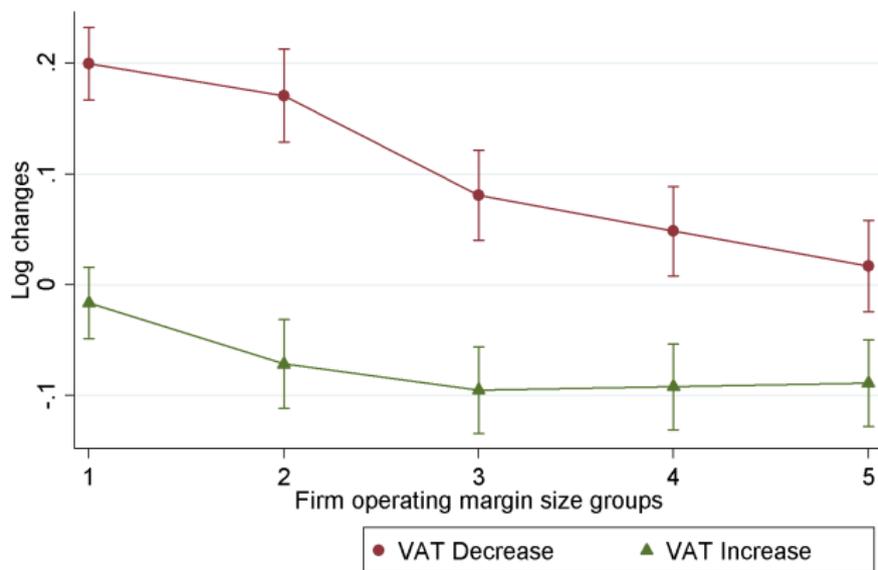
Incidence : a tentative summary

- **Known facts**
  - Standard assumption of 100% pass-through largely incorrect
  - Pass-through varies according to commodities affected
  - Pass-through is asymmetric

- **Uncertain facts and mechanisms**
  - Reduced rates vs standard rates (Benzarti et al., 2020 vs Benedeck et al., 2020)
  - Mechanisms : market structure, share of consumption affected, salience, specific pricing mechanisms

- **Undergraduate textbook vs research**
  - Econ 101 presents market mechanism of incidence
  - Recent research tends to show how reality might be much more complex

Is indirect taxation regressive ?

Figure 30 – VAT as a share of current income, by decile of disposable income (France)
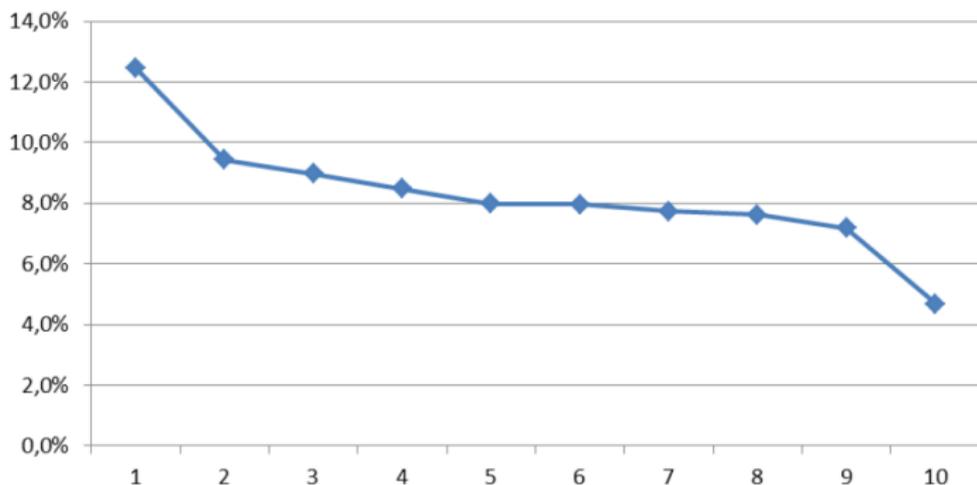
Source : Boutchenik, B. (2015) "Les effets redistributifs de la taxe sur la valeur ajoutée", rapport particulier no 2 au rapport *La taxe sur la valeur ajoutée* du Conseil des prélèvements obligatoires, Fig. 1, p. 11.

Is indirect taxation regressive ?

Figure 31 – VAT as a share of current income (EU countries)
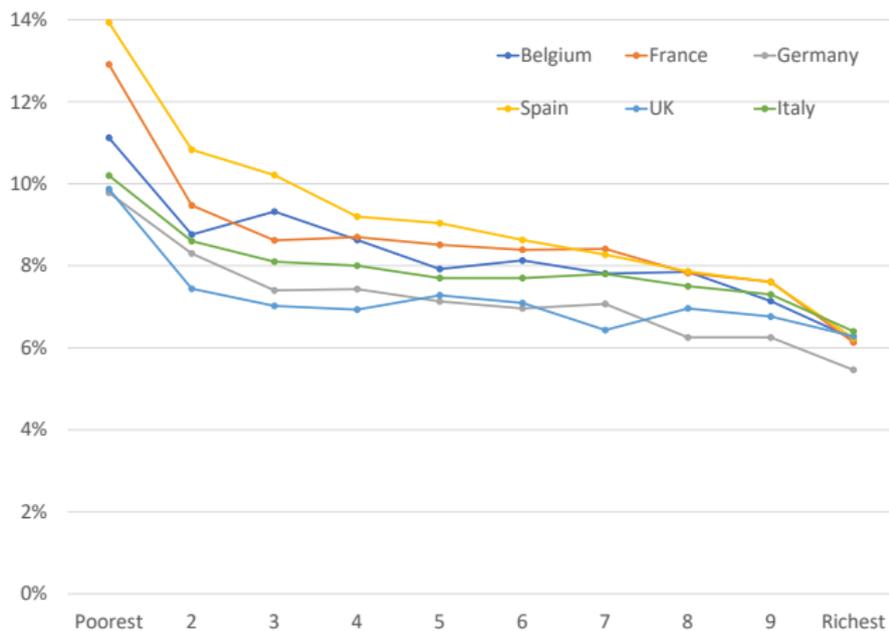
SOURCE : Institute for Fiscal Studies (2011), "A retrospective evaluation of elements of the EU VAT system", chap. 9, "Quantitative analysis of VAT rate structures", Tab. 9.2B, p. 370.

Is indirect taxation regressive ?

- **Terms of the debate**
  - No debate about the fact that consumption is a higher share of income for the poor in cross-section
  - Question whether consumption is a higher share of income for the poor over the life-time

- **How to measure contributive faculty ?**
  - Current income not ideal because consumption smoothing
  - Ideal would be to look at lifetime consumption (but not available)

- **Current non durable expenditure as proxy**
  - Current expenditure good proxy in basic life-cycle model
  - But current expenditure is not lifetime consumption

Is indirect taxation regressive ?

Figure 32 – Indirect taxes as a share of income or consumption (France)

Source : Bozio et al. (2012), Fig. 6.1.

Is indirect taxation regressive ?

Figure 33 – VAT as a share of expenditures (EU countries)

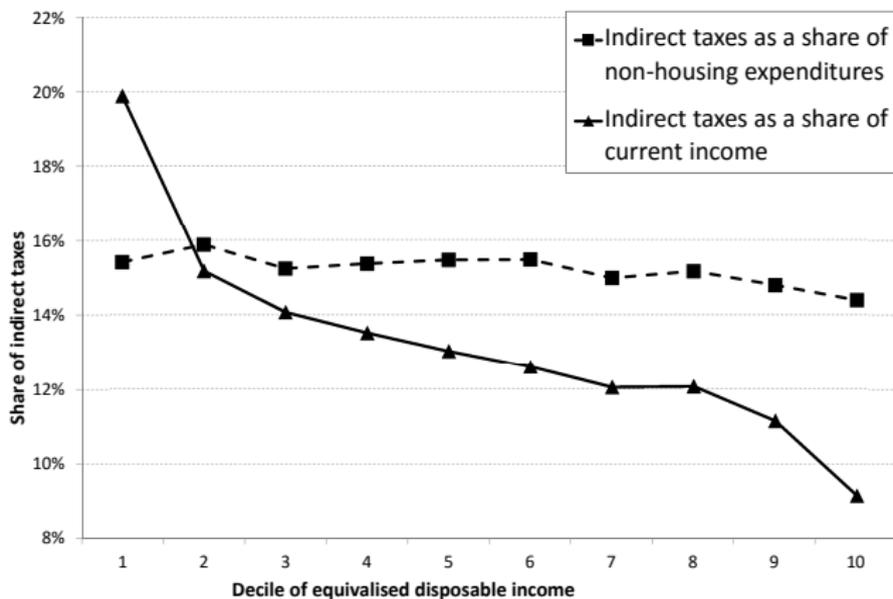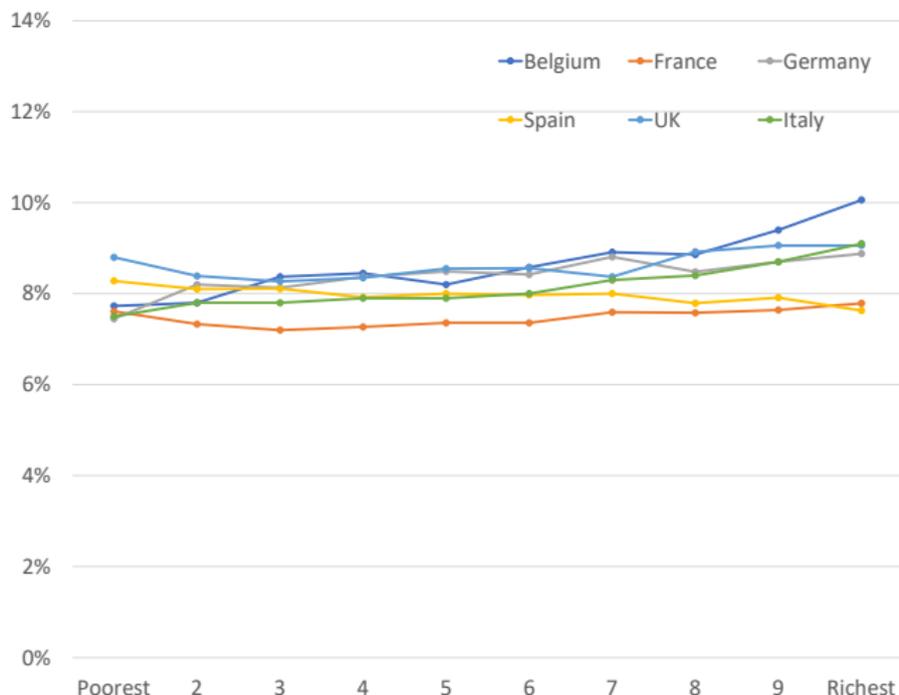SOURCE : Institute for Fiscal Studies (2011), "A retrospective evaluation of elements of the EU VAT system", chap. 9, "Quantitative analysis of VAT rate structures", Tab. 9.2C, p. 371.

Recap : Is indirect taxation regressive ?

- **Clear regressivity by current income**
    - In France and other EU countries
    - But misleading measure of regressivity of indirect taxes because consumption smoothing over the life-time

- **Moderate regressivity by expenditures**
    - In the EU, VAT slightly progressive or proportional as a share of consumption
    - Excises (e.g., tobacco) generally regressive
    - Total indirect taxation moderately regressive as a share of consumption

- **Broader views**
    - No account of incidence effects (reduced rates less redistributive ?)
    - Expenditure is a much smaller fraction of total lifetime income at the very top (e.g., bequest)

III. Optimal commodity taxation

❶ First best vs second best

- No lump-sum tax
- Distortions necessary to raise revenues

❷ Optimal commodity tax problem with partial equilibrium

- Inverse elasticity rule

❸ Only commodity taxation available

- No redistribution motives (Ramsey, 1927)
- With equity motives (Diamond and Mirrlees, 1971)

❹ Tax differentiation in practice

- Is tax differentiation useless ? (Atkinson-Stiglitz, 1976)
- The argument of tax administration

First best vs second best

- **Basic model**
  - Utility $u(x_1, x_2, L)$, where x_1 and x_2 are market goods and L is leisure.
  - $T = h + L$ denotes the endowment of time, h hours worked
  - Prices are q_1 and q_2 and the wage rate is w

- **Budget constraint**

$$q_1 x_1 + q_2 x_2 = wh$$

$$q_1 x_1 + q_2 x_2 + wL = wT$$

where wT is the market value of the time endowment (full income)

First best vs second best

- Consider a uniform tax on all consumption goods including leisure at rate τ

$$(1 + \tau)q_1 x_1 + (1 + \tau)q_2 x_2 + (1 + \tau)wL = wT$$

$$q_1 x_1 + q_2 x_2 + wL = \frac{wT}{1 + \tau}$$

- A uniform tax on all consumption goods is equivalent to a tax on full income (which is exogenous)
- This is a lump-sum tax which is non-distortionary : **first-best solution**

First best vs second best

- The government does not observe leisure, but hours worked
- Consider therefore a uniform rate τ on goods x_1, x_2 and leisure, measured as $-h$:

$$(1 + \tau)q_1 x_1 + (1 + \tau)q_2 x_2 = (1 + \tau)wh$$

  But then $1 + \tau$ cancels out : this tax system does not collect any revenue ! The tax on goods is offset exactly by a subsidy on labor.

- If leisure cannot be taxed, then, in order to collect any revenue, the tax system has to distort relative prices : **second-best problem**.

Optimal commodity tax problem

- **Choosing optimal commodity tax rates**
  - Choose n taxes (τ_i) of goods and services x_i in order to minimize their deadweight loss (DWL_i)
  - Constraint is to raise the amount of revenues R

$$\min_{t_1,\ldots,t_n} \sum_i^n DWL_i \quad \text{s.t.} \quad \sum_i R_i = R$$

- **Classical constrained optimization problem**

$$\mathcal{L} = \sum_i^n DWL_i - \lambda \left[\sum_i R_i - R \right]$$

$$\frac{\partial \mathcal{L}}{\partial t_i} = \frac{\partial DWL_i}{\partial \tau_i} - \lambda \frac{\partial R_i}{\partial \tau_i} = 0$$

Partial equilibrium

- We get

$$\frac{\partial DWL_i}{\partial \tau_i} \bigg/ \frac{\partial R_i}{\partial \tau_i} = \lambda$$

  - The ratio of the marginal deadweight loss to marginal revenue is equal to the value of additional government revenues.
  - The *marginal cost* of taxation is equal to its *marginal benefit*.

- Using the expression of the deadweight loss

$$DWL_i = \frac{1}{2} \frac{\varepsilon_S^i \varepsilon_D^i}{\varepsilon_S^i + \varepsilon_D^i} \times \tau_i^2 \times \frac{Q}{P}$$

- We get

$$\frac{\varepsilon_S^i \varepsilon_D^i}{\varepsilon_S^i + \varepsilon_D^i} \frac{\tau_i}{P} = \lambda$$

The inverse elasticity rule

- Hence we get an expression for the tax rates τ_i :

$$\boxed{\frac{\tau_i}{P} = \lambda\left(\frac{1}{\varepsilon_S^i} + \frac{1}{\varepsilon_D^i}\right)}$$

- **Famous inverse elasticity rule**
  - Each commodity should have a different tax rate
  - Tax rates depend on the elasticity of demand and supply
  - Elastically demanded goods should be taxed less than inelastically demanded goods

- **But partial equilibrium**
  - assumes no cross-price effects
  - relevant income derivatives are zero

Ramsey taxation

Frank RAMSEY (1903–1930),
British mathematician, philosopher and
economist

First derivation of optimal commodity
taxation (EJ, 1927)

- Results forgotten for a long time
- Simultaneous rediscoveries
  - Marcel Boiteux (*Econometrica*, 1956) "Sur la gestion des
    Monopoles Publics astreints à l'équilibre budgétaire"
  - Paul Samuelson (JPuBE, 1986), reprinted from a note to
    the US Treasury (1951)

The Ramsey problem

- Problem set by Pigou to his 24 year-old student
- *"A given revenue is to be raised by proportionate taxes on some or all uses of income, the taxes on different uses being possibly at different rates; how should these rates be adjusted in order that the decrement of utility may be a minimum?*
- *I propose to neglect altogether questions of distribution and considerations arising from the differences in the marginal utility of money to different people; and I shall deal only with a purely competitive system with no foreign trade."*
  Ramsey (1927)

The Ramsey problem

- **The key assumptions**
    - Identical households.
    - Only commodity taxes.
    - Competitive economy.
    - Pre-tax prices p_i are fixed and tax-included prices
      $q_i = p_i + t_i$
    - Government needs to raise revenue R
    - Representative household has an indirect utility function
      $V(q_1...q_n, w, I)$ where w is the fixed wage and I is
      lump-sum income.

- **The maximization problem**

$$\max_{t_1,...,t_n} V(q_1...q_n, w, I) \;\; s.t. \;\; R = \sum_{i=1}^{n} t_i x_i \qquad (1)$$

The Ramsey problem

- We get the Ramsey-Boiteux rule (▸ Derivation details)

$$\sum_{i=1}^{n} t_i S_{ik} = -\left[1 - \frac{\alpha}{\lambda} - \sum_{i=1}^{n} t_i \frac{\partial x_i}{\partial I}\right] x_k = -\theta x_k \qquad (2)$$

  S_{ik} is the derivative of the compensated demand curve
  $\frac{\partial x_i}{\partial I}$ is the income effect

- Optimal tax system should have
  - same reduction in the compensated demand for each good
  - limited distortions in terms of *quantities* (not prices)

- Not clear which taxes should be higher/lower

Which policy implications ?

❶ Inverse elasticity rule

- Assume cross-effects to be zero
- Optimal taxes inversely proportional to elasticities

❷ Corlett and Hague (ReStud, 1953)

- Assume homogeneity of degree zero of compensated demands
- Then goods that are complementary with leisure should be taxed at higher rate

❸ Conditions for uniformity (Deaton, 1981)

- Assume that taxed goods equally complementary with leisure
- Then uniform taxation is optimal

Rates differentiation policy

- **Motivations for rates differentiation**
  - Redistribution : low rates for necessities
  - Externalities : low/high rates for positive/negative externalities
  - Optimal taxation : higher/lower rates on goods complement with leisure/work ; lower rates on goods and services than can be substitute for home production

- **Historically, redistribution is the main rationale**
  - In the U.K., the purchase tax rates went from 12% on clothing to 50% on jewellery in 1970s
  - In France, *taxe sur les paiements* went from 0,2% to 10% for luxury goods (e.g., camera)
  - In France, in 1970, VAT rate on luxury goods (e.g., cars) reached 33.33%

Reduced rates in France

- **Reduced rate at 0%**
  - Covid 19 vaccines

- **Super-reduced rate at 2.1%**
  - Drugs (reimbursed by Social Security)
  - Media outlets
  - Live animals for butcher's shops

- **Reduced rate at 5.5%**
  - Food
  - Books and art
  - Condoms and feminine hygiene products
  - Cultural or sport events

- **Reduced rate at 10%**
  - Restaurant and hotels
  - Home improvement works

Impact of reduced rate of VAT

Figure 34 – Redistributive impact of reduced rate of VAT (France, as a share of income)

Gains from VAT reduced rate at 5.5%

Gains from VAT reduced rate at 10%
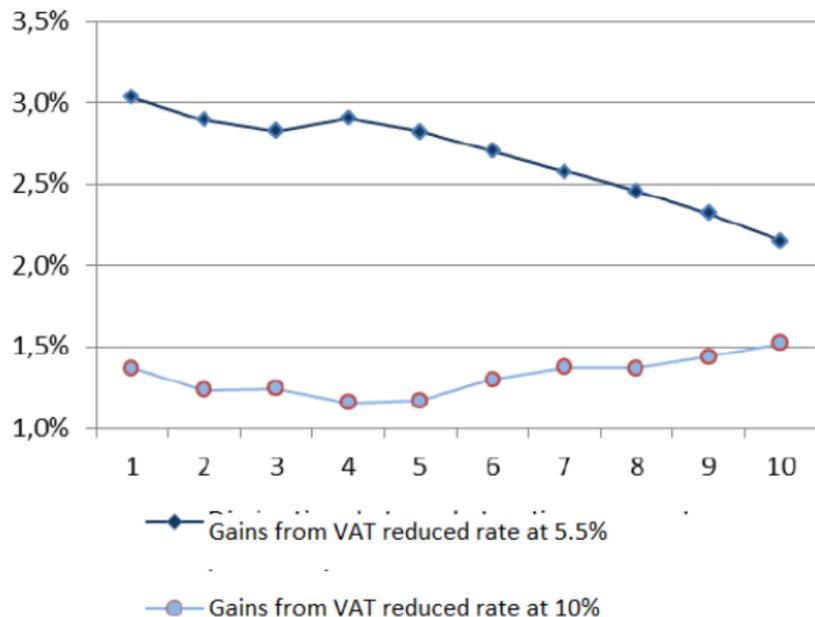
Rates differentiation policy

Figure 35 – Total absolute gain from French reduced rate of VAT (in billion euros)
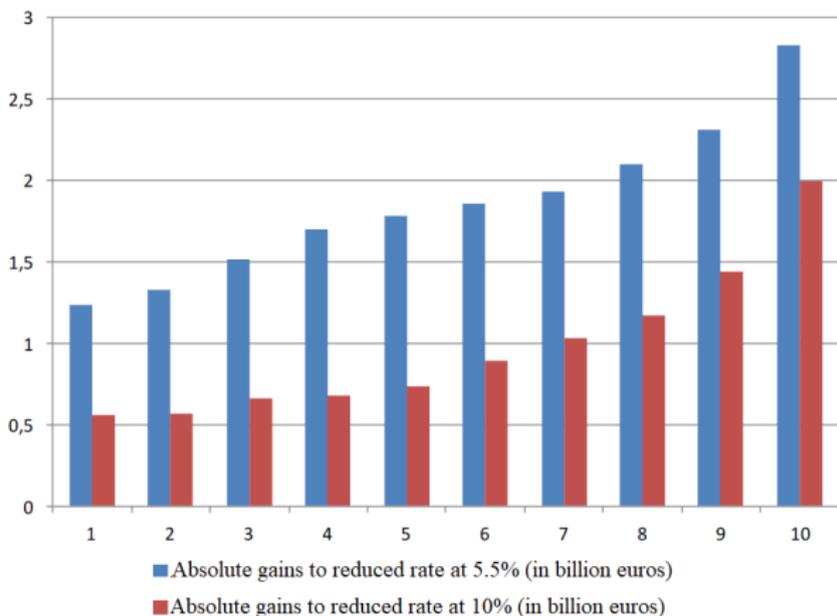
Source : Boutchenik (2015), Fig. 6, p. 34.

Rates differentiation policy

- **Reduced rates are poorly targeted**
    - Rich do spend on food too (and they spend more than the poor)
    - Total gain (in billion euros) from reduced rate captured by the richest households

- **Direct taxation could do a much better job**
    - With benefit/income tax changes, easier to redistribute
    - Reform proposal in the U.K. by IFS (Crawford, et al. 2010)
        - Removing zero-rating and reduced rates can raise £23 billion
        - Compensating package for the less well off cost £12 billion (+15% of all benefits and credits)
        - The reform package can raise £11 billion net that can finance any other objectives

Tony and Joe

Sir Anthony B. ATKINSON
(1944–2017)
British economist, specialist of
income distribution
and public economics

Joseph STIGLITZ
American economist, Nobel
prize winner in 2001.
His contributions include
asymmetric information
efficiency wages
public economics.

Atkinson-Stiglitz (JPuBE, 1976)

- **The problem**
  - Government maximizes SWF subject to a revenue constraint
  - Redistribution objective : individuals differ in w
  - Tax instruments : commodity taxation *and* income taxation

- **Main assumptions**
  - Optimal linear income tax available
  - No taste heterogeneity

- **General result**
  - Differentiation of commodity taxation depends on the relationship between labour and the marginal rate of substitution between commodities

The Atkinson-Stiglitz theorem

- Assuming 'weak separability'
    - 'weak separability' between labour and all goods taken together

$$U^h(x_1, ..., x_n, L) = u_h(v(x_1, ..., x_n), L)$$

- The 'weak separability' theorem
    - THEOREM : *if there is a non linear (optimal) income tax and weak separability, then optimal set of commodity taxes is zero ; there is no need for indirect taxation*
- Recent reformulations (Laroque 2005, Kaplow 2006)

Policy implications

- **Atkinson-Stiglitz (1976)**
  - If weak separability rejected, then optimal differentiated commodity taxation
  - Complement with leisure : foodstuff, children's clothing, tobacco, public transport
  - Complement with work : alcohol, food eaten out, motor fuel
    $\Rightarrow$ Differentiated rates for efficiency reasons (not equity)

- **Testing weak separability**
  - Browning and Meghir (ECA, 1991) firmly reject weak separability
  - Crawford Keen and Smith (2008) also rejects it, but small effects
  - Close to a conclusion of uselessness of differentiated commodity taxation ?

Rates differentiation

- **Administration issues**
  - Classification problems (e.g., France)
    - Sandwich is taxed at 10% (food ready to eat) but pain au chocolat at 5.5% (food to be eaten later)
    - Margarine is taxed at 20% but butter at 5.5%
    - Black chocolate is taxed at 5.5% but white chocolate at 20%
  - Classification problems (e.g., UK)
    - Chocolate covered biscuits are liable to 20%, but cakes are zero-rated
    - Tortilla chips are zero-rated, but potato crisps are liable to 20% rate

- **Political economy issues**
  - The possibility of reduced rate opens the door for lobbying e.g., restaurant owners' lobby for reduced rate with J. Chirac, and then N. Sarkozy
  - The more reduced rates there are the more difficult it is to resist lobbying pressures

The New Zealand VAT model

- **Goods and Services Tax (GST)**
  - Introduced in New Zealand in 1986
  - A comprehensive base
  - A single rate (currently 15%)
  - A low threshold registration

  $\Rightarrow$ The VAT ratio is therefore close to 100%

- **Low administration costs ?**
  - No debate about goods classification
  - Compliance costs are hard to measure but likely to be low
  - Tax advisory profession has few resources dedicated to GST
  - Low registration threshold increase compliance cost for SME

- General public acceptance of the 'general rule'

V. Direct vs indirect taxation

1. Debate within public finance since 19th c.
2. Atkinson-Stiglitz (1976) : indirect taxation useless
3. Condition for equivalence result
4. Economics of remittance : is VAT harder to fraud ?

Terms of the debate

- **Traditional views in public finance**
  - Ⓐ Desirable balance
  - Ⓑ Superiority of direct taxes
  - Ⓒ The expenditure tax

- **Recent dominant view with policymakers**
  - Early 20th c. : in favour of (B)
  - Late 20th c. : switch in favour of (A)

- **Optimal taxation vs policy advices**
  - Atkinson and Stiglitz (1976)
  - Atkinson (CJE/RCE 1977) ; Auerbach (2009)

(A) Desirable balance
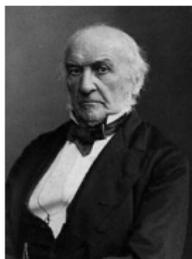
"*I never can think of direct and indirect taxation except as I should think of two attractive sisters (...) I have always thought it not only allowable, but even an act of duty, to pay my addresses to them both.*"

William GLADSTONE, British PM, House of Commons 1861

- Two instruments for two objectives (equity and efficiency)
- Direct taxation is better for redistribution
- Indirect taxation more efficient to raise revenues
- Compliance is higher with VAT third party reporting
- Lower disincentives effect on labour supply

(B) Superiority of direct taxes

- **The Schanz-Haig-Simons comprehensive income tax tradition**
  - Definition of income as consumption + change in assets
  - Henry Simons *Personal Income Taxation* (1938)
  - Defended by many economists (Vickrey, Musgrave, etc.) and by the Carter Report (1966)

- **Comprehensive income tax is the modern par excellence**
  - Indirect taxation is historical remnant from a time with insufficient administration/information
  - Income tax can achieve both equity and efficiency

(C) Progressive expenditure tax

- **The expenditure tax**
  - Ideal tax base should be consumption (i.e., no taxation of savings)
  - Fischer and Fischer *Constructive Income Taxation* (1942)
  - N. Kaldor *An Expenditure tax* (1955)
  - Meade Report (1978) in the U.K. (cf. Head, 1979)

- **Progressive consumption tax as the optimal tax**
  - Progressive consumption tax is a form of direct taxation

Back to balanced view ?

- **Large debate in the U.K. at the end of the 1970s**
  - It was argued that a shift from income tax to commodity taxation would lead to higher work incentives
  - In 1979, standard VAT rate increased from 8% to 15% to pay for reductions in income tax rates.

- **Recent debate in France**
  - Discussion of a shift from payroll taxation to VAT in order to increase employment (*TVA sociale* or CICE tax credit)
  - Idea that VAT taxes import as well as local production (akin to competitive devaluation)

The indirect vs direct taxation debate

Ⓐ Balanced view
- Two instruments for two objectives (equity and efficiency)
- Direct taxation is better for redistribution
- Indirect taxation more efficient to raise revenues
- Compliance is higher with VAT third party reporting
- Lower disincentives effect on labour supply

Ⓑ Superiority of direct taxation
- Indirect taxation is historical remnant from a time with insufficient administration/information
- Direct taxation is better for all objectives

Equivalence result

- **Uniform commodity taxation**
  - Uniform rate τ on goods x_1, x_2, with before-tax prices q_1 and q_2, and labour income wh :

  $$(1+\tau)q_1x_1 + (1+\tau)q_2x_2 = wh$$

- **Proportional income tax**
  - Uniform tax T on wage and profit income (i.e., expenditure tax) :

  $$(1-T)wh = q_1x_1 + q_2x_2$$

- **Equivalence result**
  - Uniform commodity taxation is equivalent to linear income tax

  $$q_1x_1 + q_2x_2 = \frac{wh}{1+\tau} = \left(1 - \frac{\tau}{1+\tau}\right)wh = (1-T)wh$$

Conditions for the equivalence results

❶ Constant rate over time
- If tax rate is increasing, a commodity tax implies a positive rate on capital income

❷ No savings, no inheritance
- If savings and inheritance, a uniform consumption tax is equivalent to a proportional tax on wage and profit and a tax on initial assets and subsidy to bequests

❸ No fiscal illusion
- Same behavioural response to net real income

❹ Same tax compliance
- If tax compliance differ between direct taxes and indirect taxes, equivalence result does not hold

Tax compliance

- **Tax compliance and information**
  - Information from the government key to design of tax policy (Slemrod, 2008)
  - Third party reporting creates paper trail
  - It creates incentives for information gathering

- **VAT and third party reporting**
  - Important advantage of VAT over RST in theory
  - Third party reporting should limit fraud
  - Little evidence of the impact of third party reporting
  - Notorious carousel fraud for EU VAT

Tax compliance

- **Pomeranz (AER, 2015)**
  - Two randomised experiments with 445,000 firms in Chile on VAT compliance
  - First evidence on self-enforcement of VAT

- **Experiment 1 : deterrence letter**
  - Threat of VAT audit letters to sub-sample of businesses (+100,000 firms)
  - Assessment of VAT reporting from firms for final sales or intermediate sales

- **Experiment 2 : spillover effect**
  - Sample of firms suspected of tax evasion randomly told about an upcoming audit
  - The whole sample later audited and information about their pretreatment trading partners was collected

Self-enforcement of VAT

Figure 36 – Impact of deterrence letter vs control

Panel A. Deterrence versus control (median)
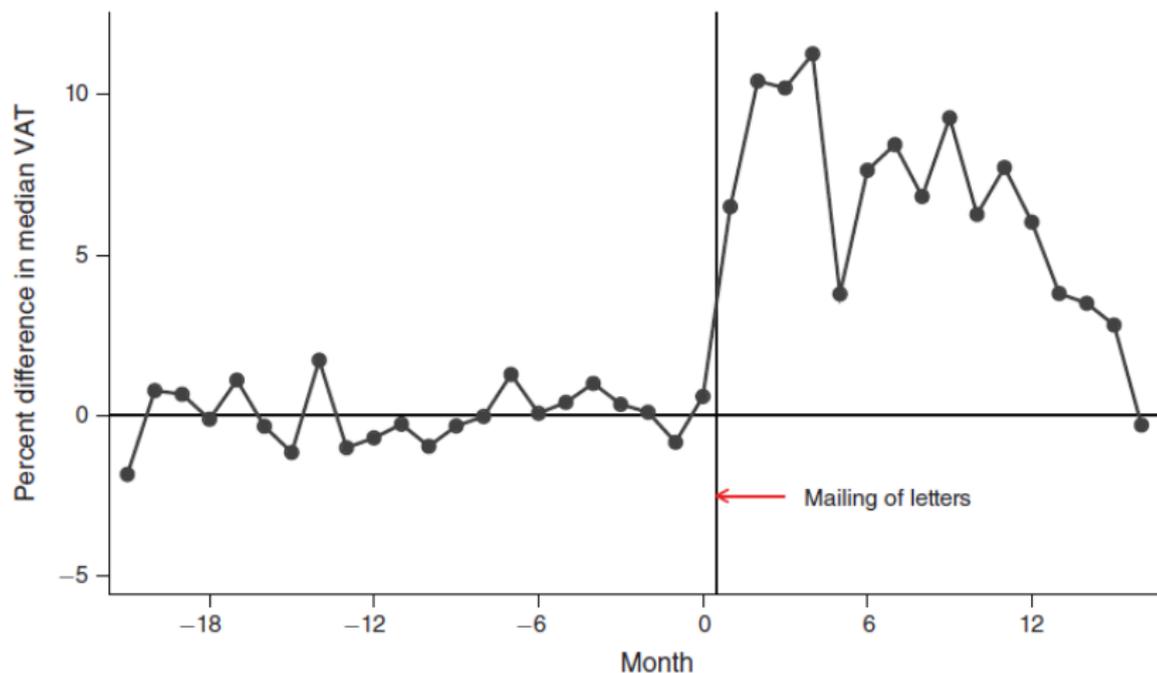
Self-enforcement of VAT

Figure 37 – Intent-to-treat effects on VAT payments by type of letter

	Mean VAT (1)	Median VAT (2)	Percent VAT > previous year (3)	Percent VAT > predicted (4)	Percent VAT > zero (5)
Deterrence letter × post	−1,114	1,326***	1.40***	1.42***	0.53***
	(2,804)	(316)	(0.12)	(0.10)	(0.09)
Tax morale letter × post	−1,840	262	0.40	0.30	0.44**
	(6,082)	(666)	(0.25)	(0.22)	(0.20)
Placebo letter × post	835	383	−0.11	−0.19	−0.14
	(6,243)	(687)	(0.26)	(0.23)	(0.20)
Constant	268,810***	17,518***	47.50***	48.27***	67.30***
	(1,799)	(112)	(0.07)	(0.07)	(0.06)
Month fixed effects	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	No	Yes	Yes	Yes
Treatment assignment	No	Yes	No	No	No
Observations	7,892,076	1,221,828	7,892,076	7,892,076	7,892,076
Number of firms	445,734	445,734	445,734	445,734	445,734
Adjusted R^2	0.40	0.14	0.28	0.47

SOURCE : Pomeranz (2015), Table 4.

Deterrence effect of paper trail

- **Direct impact on VAT receipt**
  - Marked increase in VAT payments after receiving the deterrence letter

- **Testing the deterrence effect of the paper trail**
  - Distinction between final consumer (no paper trail) and intermediate sales
  - All the impact on final sales, not on input sales

Self-enforcement of VAT

Figure 38 – Impact of deterrence letter on different types of transactions

	Percent sales > previous year (1)	Percent input costs > previous year (2)	Percent intermediary sales > previous year (3)	Percent final sales > previous year (4)
Deterrence letter × post	1.17***	0.16	0.12	1.33***
	(0.22)	(0.21)	(0.19)	(0.21)
Constant	55.39***	53.25***	38.37***	45.04***
	(0.13)	(0.13)	(0.12)	(0.12)
Month fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Observations	2,392,529	2,392,529	2,392,529	2,392,529
Number of firms	133,156	133,156	133,156	133,156
Adjusted R^2	0.25	0.22	0.30	0.32

SOURCE : Pomeranz (2015), Table 5.

Self-enforcement of VAT

Figure 39 – Spillover effects on trading partners' VAT payments

	Percent VAT > previous year (1)	Percent VAT > predicted (2)	Percent VAT > previous year (3)	Percent VAT > predicted (4)	Percent VAT > previous year (5)	Percent VAT > predicted (6)
Audit announcement × post	2.41** (1.14)	2.03* (1.11)				
Audit announcement × supplier × post			4.28*** (1.54)	3.92*** (1.50)	4.14*** (1.52)	3.83*** (1.52)
Audit announcement × client × post			−0.26 (1.64)	−0.28 (1.51)	−0.14 (1.67)	−0.28 (1.55)
Supplier × post			−0.64 (1.62)	0.34 (1.59)	−1.11 (1.67)	0.60 (1.64)
Constant	52.07*** (0.95)	49.06*** (0.94)	52.07*** (0.95)	49.06*** (0.94)	52.75*** (0.96)	50.11*** (0.96)
Controls × post	No	No	No	No	Yes	Yes
Controls × audit announcement × post	No	No	No	No	Yes	Yes
Month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	45,264	45,264	45,264	45,264	44,288	44,288
Number of firms	2,829	2,829	2,829	2,829	2,768	2,768
Adjusted R^2	0.05	0.11	0.05	0.11	0.05	0.10

SOURCE : Pomeranz (2015), Table 7.

Carousel fraud

- **Imports, exports and VAT**
 - VAT is destination-based (taxing consumption)
  - Exports are zero-rated
  - Imports are taxed by VAT

- **Carousel fraud**
  - Within the EU, gangs have used VAT refund without paying VAT claims
  - VAT gap in the EU estimated at 160 billion euros (in 2014)
    e.g., 24 billion euros for France
    e.g., 23 billion euros for Germany
  - Cross-border fraud estimated at 50 billion euros

Carousel fraud

Figure 40 – Missing trader fraud

1. **Business A delivers goods** to **B** in the Netherlands. Because this is a cross-border sale within the EU, A does **not** charge B **any VAT**.

2. **B** sells the goods to **C** and charges him 21 % VAT. He has to remit this to the taxing authority, but **fails** to do so. He commits **fraud**.

3. **C** has payed 21 % worth of VAT to **B**, which he can deduct on his VAT return. **C** delivers the goods to **D** and charging VAT.
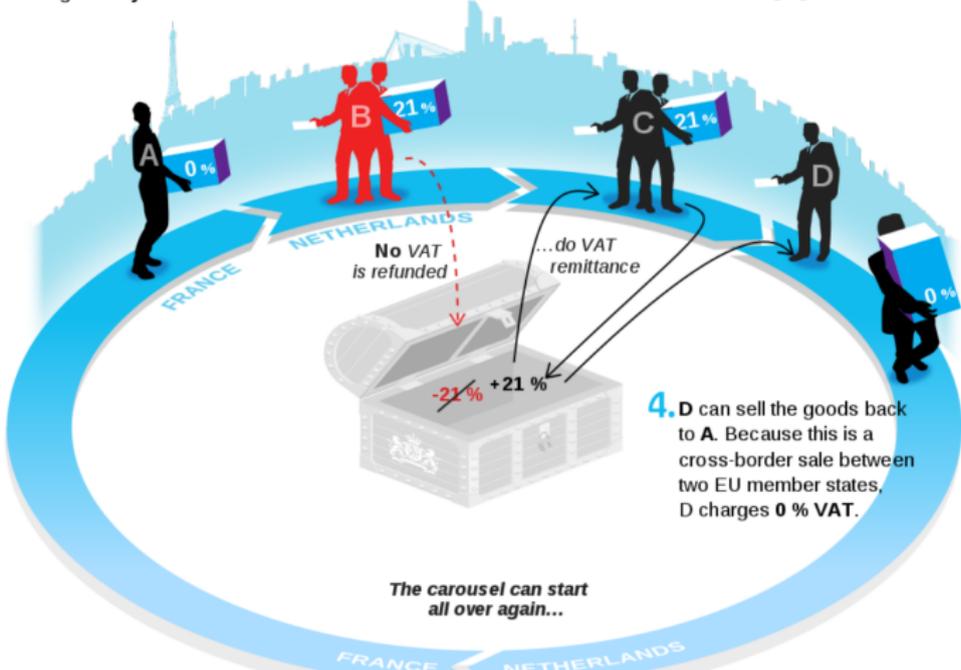
4. **D** can sell the goods back to **A**. Because this is a cross-border sale between two EU member states, D charges 0 % VAT.

…do VAT remittance

No *VAT is refunded*

-21 % +21 %

*The carousel can start all over again…*

Carousel fraud : solutions

1. Improved audits
   - More controls and exchange of information
2. Extend reverse charging
   - VAT liability to the buyer instead of the seller
   - Transforms VAT into RST
3. Set-up VAT accounts
   - Sellers would transfer VAT charged to their customer :
   - Higher compliance costs
4. CVAT of Varsano (2000)
   - Exports still zero-rated but liable to a compensating tax creditable to the importer
5. VIVAT of Keen and Smith (1996, 2000)
   - all B2B, including those EU, subject to a common VAT rate

Carousel fraud : solutions

- **EU Action plan (April 2016)**
  - EU Commission announced legislative plan for 2017 for a cross-border EU VAT
  - Application of VAT principle at EU borders
  - VAT remitted to export country would be transferred to import country

Carousel fraud : solutions

Figure 41 – EU plan for cross-border VAT

Source : EU Commission
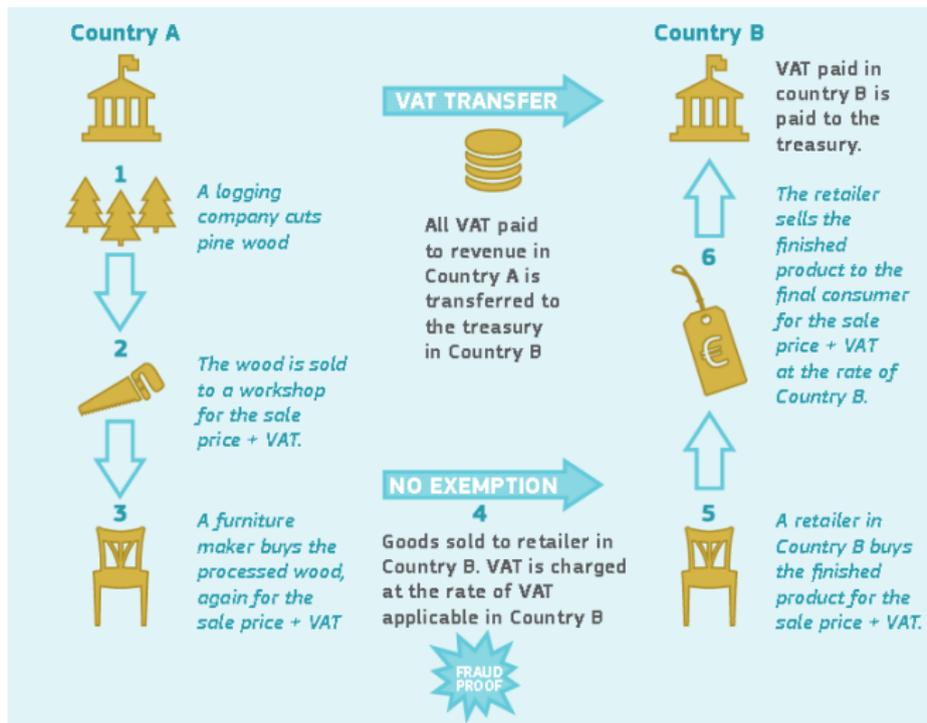
Naritomi (AER, 2019) : the last mile of VAT enforcement

- **Program Nota Fiscal Paulista**
  - Anti-tax evasion program in São Paulo (Brazil)
  - The program provides tax rebates and monthly lottery prizes for consumers who ask for receipts
  - Direct communication channel between the tax authority and consumers through an online account system

- **Methods**
  1. DiD comparing retail (treated) vs wholesale firms (control)
  2. Test whistle-blower by comparing firms which received complaints vs no complaints

Figure 42 – Effect of the policy on reported revenue

a. Raw data: reported revenue changes

b. Difference coefficients for 6-month time bins
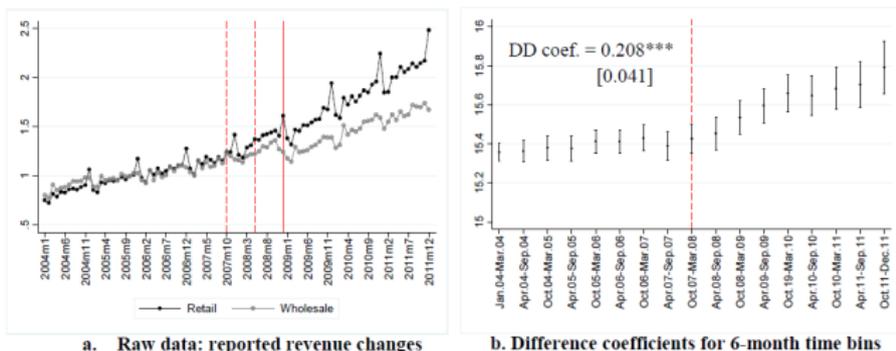
Source : Naritomi (2019), Fig. 2, p. 3051.

- **Results**
  - Reported revenue in retail increased on average by 21% over 4 years
  - Firms subject to higher whistle-blower threats more affected
  - Program increased tax revenues net of incentives to consumers

The indirect vs direct taxation debate

- **Compliance and administrative costs**
  - Withholding makes direct taxation more efficient
  - Compliance issues also with VAT

- **Salience impact**
  - We know now that salience matter
  - Is the "superiority" of indirect taxation because less salient taxation ?
  - Incidence different albeit equivalence result ?

Lack of salience of commodity taxation ?

"*On dépense avec plaisir mais c'est un effort de payer une dette (...). En attachant l'impôt à la chose consommable, (...) on fait en sorte participer l'impôt à l'attrait que porte avec soi la consommation, et l'on fait naître dans l'esprit du consommateur le désir d'acquitter l'impôt.*"

[One spends with pleasure but it is an effort to pay off a debt (...). By attaching tax to consumption goods, (...) one makes taxes share the attraction of consumption, and one creates in the mind of the consumer the desire to pay tax.]

Germain Garnier, introduction to the French translation of *The Wealth of Nations* (1822 ; 1859, p. L)

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Appendix A. Tax Incidence Formula

- Equilibrium condition : $S(p) = D(p + \tau)$
- Implicitly defines equilibrium price $p(\tau)$
- Differentiate both sides w.r.t. τ :

$$\frac{dS(p + \tau)}{d\tau} = \frac{dD(p)}{d\tau}$$

$$\Rightarrow S'(p)\left(\frac{dp}{d\tau} + 1\right) = D'(p)\frac{dp}{d\tau}$$

$$\Rightarrow \frac{dp}{d\tau} = \frac{D'(p)}{S'(p) - D'(p)}$$

$$\Rightarrow \frac{dp}{d\tau} = \frac{\varepsilon_D}{\varepsilon_S - \varepsilon_D}$$

(using $\varepsilon_D = \frac{qD'(q)}{D(q)}$ and $\varepsilon_S = \frac{pS'(p)}{S(p)}$, evaluated at $\tau = 0$)

Appendix B. Deriving the Ramsey problem (1/2)

- Lagrangean

$$\mathcal{L} = V(q_1 ... q_n, w, I) + \lambda \left[\sum_{i=1}^{n} t_i x_i - R \right] \qquad (3)$$

- Derive F.O.C.

$$\frac{\partial \mathcal{L}}{\partial t_k} = \frac{\partial V}{\partial t_k} + \lambda \left[x_k + \sum_{i=1}^{n} t_i \frac{\partial x_i}{\partial t_k} \right] = 0 \qquad (4)$$

- Rearrange

$$\frac{\partial V}{\partial q_k} = -\lambda \left[x_k + \sum_{i=1}^{n} t_i \frac{\partial x_i}{\partial q_k} \right] \qquad (5)$$

  - The utility cost of raising the tax rate on good k should be in the same proportion to the marginal revenue raised by the tax

Appendix B. Deriving the Ramsey problem (2/2)

- Using Roy's identity

$$\frac{\partial V}{\partial q_k} = -\frac{\partial V}{\partial I} x_k = -\alpha x_k \qquad (6)$$

  - α is the marginal utility of income
- We get

$$\alpha x_k = \lambda \left[x_k + \sum_{i=1}^{n} t_i \frac{\partial x_i}{\partial q_k} \right] \qquad (7)$$

- Using Slutsky equation

$$\frac{\partial x_i}{\partial q_k} = S_{ik} - x_k \frac{\partial x_i}{\partial I} \qquad (8)$$

  - S_{ik} is the derivative of the compensated demand curve
  - $\frac{\partial x_i}{\partial I}$ is the income effect

History of indirect taxation : excise taxes

- **Definition**
  - Excise, in French *accise* , in Dutch *accijns*
  - Tax defined as a function of **quantities** of a given commodity

    e.g., alcool duty as a function of amount of alcool

    e.g., fuel tax as a function of fuel quantity

  - Tax τ is additive (after tax price q, before tax p) :

  $$q = p + \tau$$

- **Excise vs ad valorem**
  - *Ad valorem* tax is defined as a function of the **price** (in Latin, according to value)

    e.g., VAT is an *ad valorem* tax

    $$q = p(1 + \tau)$$

◂ back