LECTURE 8

TAX POLICY

Optimal Income Taxation: Part I

1

1

Income Taxation

- Income taxation is a major source of government revenue
- It is also a major source of contention
  - the income tax is a disincentive to effort and enterprise
    - the rate of tax should be kept as low as possible
  - income taxation is well-suited to the task of redistribution
    - equity requires that high earners pay proportionately more tax on their incomes than low earners
- The determination of the optimal income tax involves the resolution of these contrasting views

2

Personal Income Tax in Greece

- The personal income tax was introduced in Greece in 1955.
- In the UK it was introduced in 1799 for the first time, in order to finance the Napoleonic war. It was levied at 10% on income above £60.
- In 2023, the Greek government plans to raise through the personal income tax about 20% of total tax revenue (excluding social security contributions)
- The personal income tax schedule has been reformed many times.

3

Personal Income Tax in Greece (for incomes earned in 2010)

Κλίμακα φόρου εισοδήματος φυσικών προσώπων για όλους τους φορολογουμένους

Κλιμάκιο εισοδήματος	Φορολογικός συντελεστής	Φόρος κλιμακίου	Συνολικό εισόδημα	Συνολικός φόρος
12.000	0	0	12.000	0
4.000	18	720	16.000	720
6.000	24	1.440	22.000	2.160
4.000	26	1.040	26.000	3.200
6.000	32	1.920	32.000	5.120
8.000	36	2.880	40.000	8.000
20.000	38	7.600	60.000	15.600
40.000	40	16.000	100.000	31.600
Υπερβάλλον	45			

4

Personal Income Tax in Greece (for incomes earned in 2020)

Κλιμάκιο εισοδήματος (ευρώ)	Φορολογικός συντελεστής %	Φόρος κλιμακίου (ευρώ)	Σύνολο	
			Εισοδήματος (ευρώ)	Φόρου (ευρώ)
10000	9%	900	10000	900
10000	22%	2200	20000	3100
10000	28%	2800	30000	5900
10000	36%	3600	40000	9500
Υπερβάλλον	44%			

Φυσικά πρόσωπα με εισόδημα από ακίνητα

Η φορολογική κλίμακα για το φορολογικό έτος 2020

Κλιμάκιο εισοδήματος (ευρώ)	Φορολογικός συντελεστής %	Φόρος κλιμακίου (ευρώ)	Σύνολο	
			Εισοδήματος (ευρώ)	Φόρου (ευρώ)
12.000,00	15%	1.800,00	12.000,00	1.800,00
23.000,00	35%	8.050,00	35.000,00	9.850,00
Υπερβάλλον	45%			

5

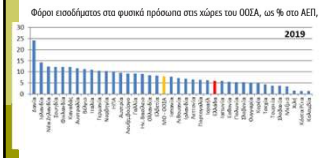
Κατώφλι εισοδήματος σε διαφορετικά σημεία της κατανομής οικογενειακού εισοδήματος

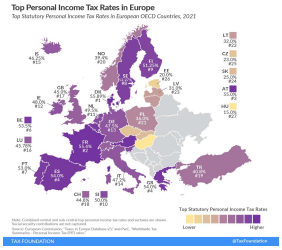
	2008	2014	2019
1ο πεμπτημόριο (φτωχότερο 20%)	< 5.000	< 1.000	< 1.000
2ο πεμπτημόριο	5.000	1.000	1.000
3ο πεμπτημόριο	10.000	6.000	6.000
4ο πεμπτημόριο	15.000	11.000	11.000
5ο πεμπτημόριο (πλουσιότερο 20%)	26.000	19.000	19.000
Πλουσιότερο 10%	39.000	28.000	28.000

6

6

Η Ελλάδα κατατάσσεται 4η ως προς τον ανώτατο οριακό φορολογικό συντελεστή ΦΕΦΠ, αλλά μόλις 25η με βάση το λόγο εσόδων από τον ΦΕΦΠ προς το ΑΕΠ





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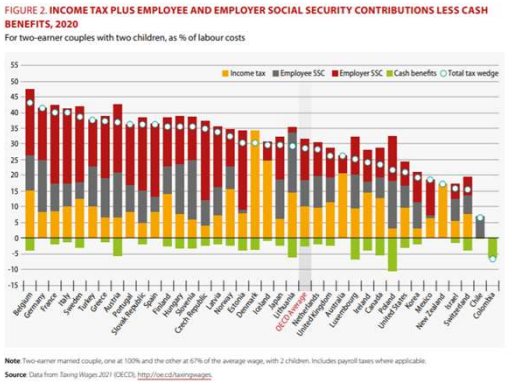

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Measuring tax progressivity

- The **tax schedule** describes the relationship between the taxes and the tax base (in our case, income).
- Tax progressiveness can be measured in a number of ways
  - A tax is often classified as:
    - **Progressive**
    - **Regressive**
    - **Proportional**
  - Proportional taxes are straightforward: ratio of taxes to income is constant regardless of income level.

9

9

Measuring tax progressivity

- Can define progressive (and regressive) taxes in a number of ways.
  - ***Average Tax Rate (ATR)*** is the sum of tax revenue divided by the tax base.
  - ***Marginal Tax Rate(MTR)*** is the additional tax raised if the tax base increases by one unit.
- We can compute progressivity in terms of
  - ***Average*** tax rate (ratio of total taxes total income) or
  - ***Marginal*** tax rate (tax rate on last dollar of income)

10

10

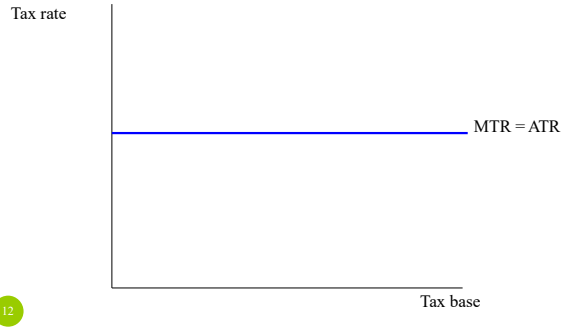
Structure of taxes

- ***Proportional tax*** is a tax where the average tax rate does not change when the tax base changes.
  - For example, an income tax of 20%, would tax all income with 20%. Such a tax is also called a *flat tax*.
- In the case of a proportional tax, the average and the marginal tax rates are equal.

11

11

Proportional tax



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12

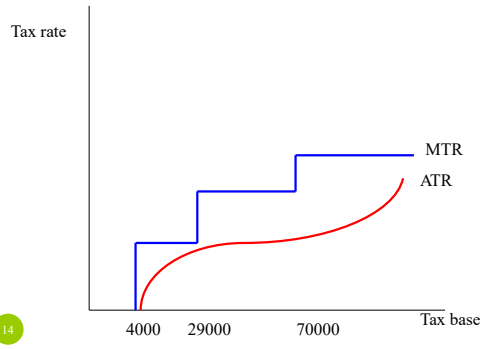
Progressive tax

- ***Progressive tax*** is a tax where the average tax rate increases as the tax base increases. The higher the tax base, the higher the average tax rate.
- In progressive taxation, the marginal tax rate gradually exceeds the average tax rate as the marginal tax rate rises.

13

13

Progressive tax



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14

Regressive tax

- ***Regressive tax*** is a tax where the where the average tax rate decreases as the tax base increases.
- In regressive taxation, the marginal tax rate is lower than the average tax rate as the income rises.

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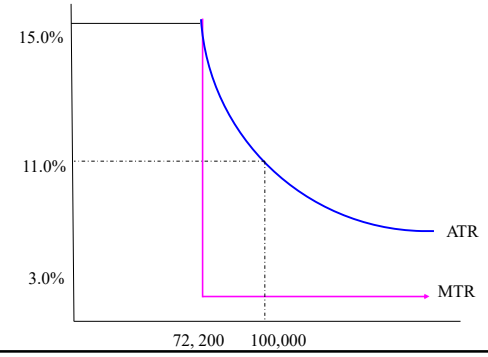
15

Regressive tax



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16

Income taxation: efficiency and equity

- Two major issues in the taxation of income:
  - Effect of taxation on labour supply (so taxes should be kept low for efficiency reasons)
  - Determination of the optimal level of income taxation (address the trade-off between efficiency and equity).
- It is a major mistake to design the income tax structure to meet equity motives without taking into account the impact on work effort.

17

Income taxation: extreme example

- Maximum redistribution will be achieved if we set a marginal rate of 100% for all incomes above some threshold z^0 and a rate of zero for all incomes below this threshold. Then give the tax revenues to the poor.
- Problem: taxpayers will respond to the tax structure.
- The 100% tax removes the incentive to earn more than z^0. Everyone previously above this level will choose to earn exactly this level.

18

Income taxation: extreme example

- The government is left with no tax revenue to redistribute.
- Vicious circle: the government must lower the threshold, but the same will happen with the lower threshold, etc.

19

Objective of optimal income taxation

- Find the tax schedule that maximizes the social welfare function, given the adjustment in work effort.
- We will assume that the social welfare function is individualistic (i.e. is entirely based on individual welfare levels).

20

Income Taxation and Labour Supply

- The effect of income taxation on labour supply can be investigated using the standard model of consumer choice
- This highlights the importance of competing income and substitution effects
- Assume
  - the consumer has a given set of preferences over allocations of consumption and leisure
  - the consumer has a fixed stock of time to divide between labour supply and leisure
- The choice is made to maximise utility

21

The labour supply model: a simple example with three individuals

Preferences: $u(x,l)$ $u(x,L-l)$

Constraints: $L = l + leisure$

$$px = (1-\tau)wl + m$$

$$= m + (1-\tau)wL - (1-\tau)w(L-l)$$

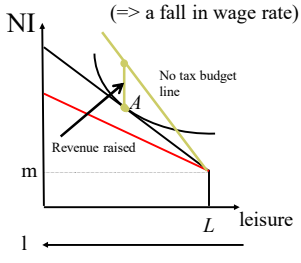
Notation:

- x is consumption
- l is hours worked (labour supply)
- L is total time endowment
- p is price of consumption (=1)
- m is non-labour income
- τ is the labour income tax rate
- NI ($=px$) is net income

22

Labour Supply Choices

Study an increase in (existing) income tax rate (=> a fall in wage rate)

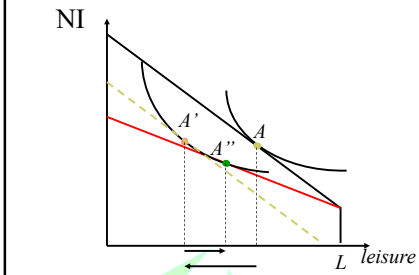


Study 3 different individuals and ask about

- Effect on labour supply
- Deadweight loss
- Revenue effects

23

Individual *A*



Substitution Effect (SE)

Income Effect (IE)

Individual A

- Labour supply: ambiguous
- SE => hours down
- IE => hours up

24

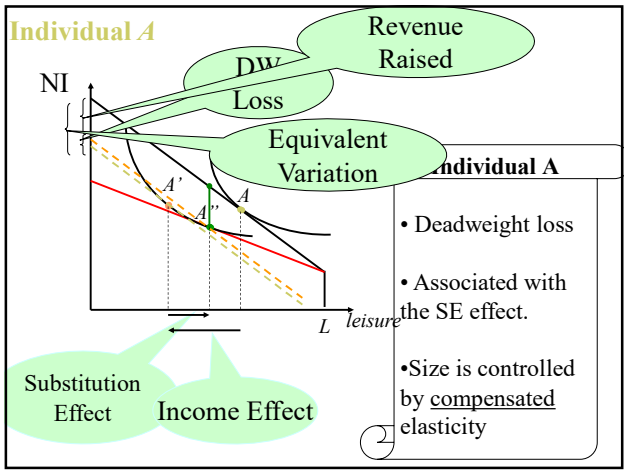
Deadweight cost (DWL)

- Q1: How much would you be willing to pay to avoid the tax increase?
- Q2: How much is the government collecting from the tax rise?
- The difference is the excess burden of the tax or the deadweight loss.

$DWL = EV - R$ ← Tax revenues

Equivalent variation

25



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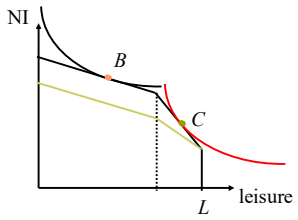
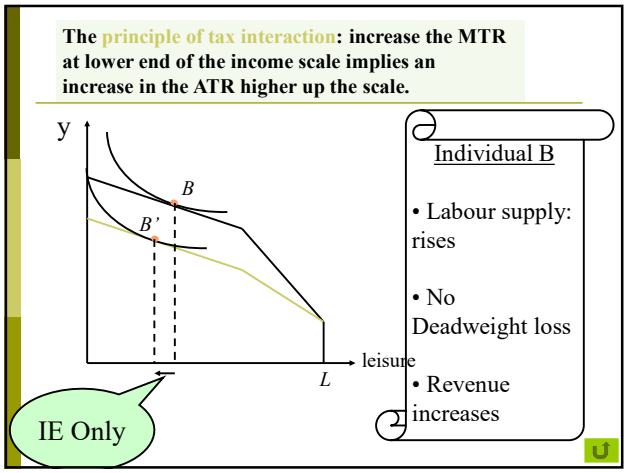
Individuals *B* and *C*

Increase in marginal tax at the "bottom"



27

The principle of tax interaction: increase the MTR at lower end of the income scale implies an increase in the ATR higher up the scale.



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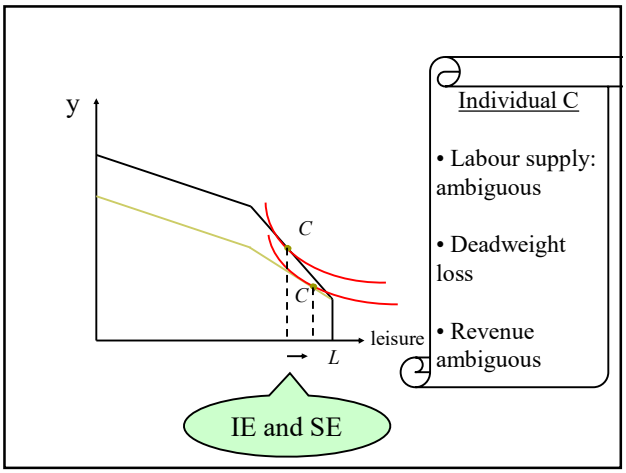


29

- When effect on labour supply is ambiguous, it is determined by the size of uncompensated wage elasticity.
- Deadweight loss is determined by the compensated elasticity.
- Difference between marginal tax rates (MTRs) and average tax rates (ATRs):
  - Marginal taxes cause SE and DW losses
  - Average taxes cause IE only

30

Marginal Tax Rates

Amount of tax that is paid on an extra unit of income $\frac{\partial T}{\partial y}$

Average Tax Rates

Proportion of all income that is paid as tax $\frac{T}{y}$

Answers show:

↑ marginal tax rate has a SE and ↓ labour supply

↑ average tax rate has an IE and ↑ labour supply

Person B: increase average tax, marginal tax unchanged

31

Summary so far

- Minimise deadweight loss by minimising marginal tax rates *(SE)*.
- Maximise revenue by increasing average tax rate *(IE)*
- The principle of tax interaction: Trade-off between individuals:
  - an increase in C's marginal tax means an increase in B's average tax.

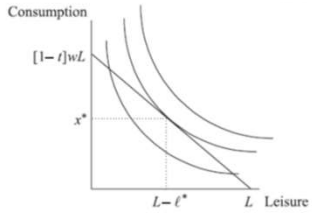
32

Taxation and Labour Supply: a formal approach

- Preferences are represented by
$$U = U(x, L - \ell) = U(x, \ell)$$
  - L the stock of time, divided between labour and leisure
  - ℓ is labour supply and x is consumption
  - leisure time is $L - \ell$
- Labour is assumed unpleasant so $\partial U / \partial \ell < 0$
- Each hour of labour earns wage w
- Income before taxation is $w\ell$
- If the rate of tax is t the budget constraint is $px = (1 - t)w\ell$ where p is the price of consumption

33

Taxation and Labour Supply: a formal approach



a. Leisure

Figure 15.1
Labor supply decision

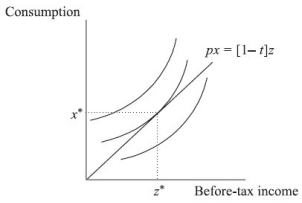
34

Taxation and Labour Supply: a formal approach

- The choice problem for the consumer can be also be written in terms of income
- Let $z = w\ell$ denote income before tax
- Utility in terms of income is
$$U = U\left(x, \frac{z}{w}\right)$$
- Utility is increasing in x and w and decreasing in z. Why?
- The budget constraint becomes $px = (1 - t)z$

35

Taxation and Labour Supply: a formal approach



b. Before-tax income

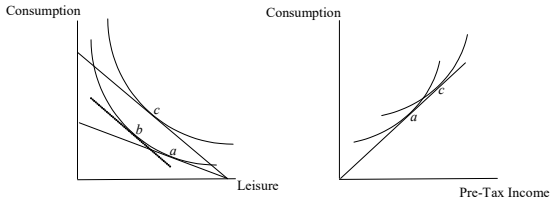
The optimal choice is where the budget constraint is tangent to the highest possible indifference curve (at x^*, z^*).

The budget constraint does not change as w changes (so all consumers face the same budget constraint regardless of their wage rate).

The indifference curves of consumers with different wage rates do change, since z/w enters the utility function.

36

Taxation and Labour Supply: effect of an increase in *w*



a. Leisure

b. Pre-Tax Income

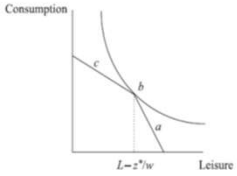
- The optimal choice is at point *a*
- *w* increases (or *t*ax falls)
- The budget constraint shifts
- The choice moves to *c*
- *a* to *b* is the substitution effect (-)
- *b* to *c* is the income effect (+ or -)
- Total effect can raise or lower labor supply

- The optimal choice is at point *a*
- *w* increases
- The indifference curve shifts (pivots and becomes flatter), less additional labour is required to achieve a given increase in *x*
- The choice moves to *c*
- The move from *a* to *c* raises income
- The effect on working hours is ambiguous

37

Taxation and Labour Supply: more complex tax systems

- Many tax systems have a threshold level of income below which income is untaxed
- The threshold level of income is z^*
- At wage rate *w*, this threshold arises at z^*/w hours of work.
- A kink is placed in the budget constraint
  - at point *a* no tax is paid
  - at point *c* tax is paid
  - Consumers bunch at the kink *b*
- To the right of *b* an extra hour of labour receives *w*, while at the left of *b* it receives (1-*t*)*w*.



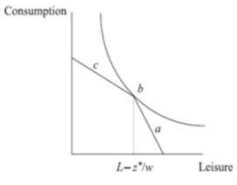
a. Leisure

Figure 15.3
A tax threshold

38

Taxation and Labour Supply: more complex tax systems

- Points *a* and *c* are interior solutions
- Point *b* is a corner solution
- A consumer at a corner may be unaffected by a tax change (such a change will alter the slope of the budget constraint to the left of *b*
  - choice only changes if the tax effect allows a utility level higher than at the kink



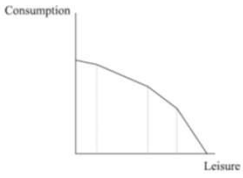
a. Leisure

Figure 15.3
A tax threshold

39

Taxation and Labour Supply: more complex tax systems

- An income tax system in reality has a number of thresholds with the marginal tax rate rising at each.
- See Figure 15.4, the budget constraint has many kinks.
- If consumers have varying preferences, we expect collection of consumers at each kink point



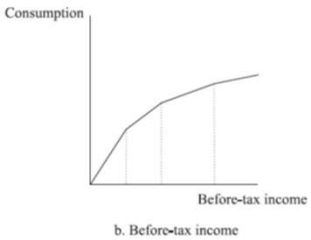
a. Leisure

Figure 15.4
Several thresholds

40

Taxation and Labour Supply: more complex tax systems

- In the (x, z) space:

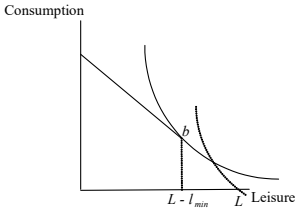


b. Before-tax income

41

Taxation and Labour Supply: participation choice

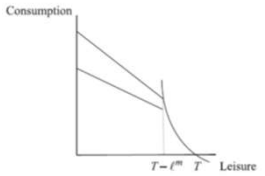
- So far we have assumed that the individual can vary his/her working hours
- Hours of work are often fixed or there is a minimum (ℓ_{min})
- The budget constraint is discontinuous at ℓ_{min}
- A consumer undertakes no work (L) or works at least ℓ_{min} (point *b*)
- The choice between these is the participation decision
- A tax change that alters the participation decision will cause a discrete change in working hours



42

Taxation and Labour Supply: participation choice

- An increase in taxation lowers the budget constraint.
- The consumer was previously indifferent between working and not (both points are on the same indifference curve)
- After the tax increase, the consumer now strictly prefers not to work.
- At this margin, no conflict between income and substitution effects.
- An increase in taxation strictly reduces participation in the labour force.



a. Leisure

Figure 15.5
Taxation and the participation decision

43

Income taxation and labour supply: empirical evidence

- Three major points
  - resolution of income and substitution effects. Which ones dominate for consumers at an interior solution?
  - kinks in the budget constraint make behaviour insensitive to taxes
  - the participation decision which can be sensitive to taxation
- Empirical evidence is required
- Evidence on the effect of income taxes can be found in
  - the results of surveys
  - econometric estimates of labour supply functions
- Labour supply is insensitive to taxation if working hours are determined by the firm or by union/firm agreement. In this case, only the participation decision is of real interest.
- The effect of taxation can only be judged when workers who have the freedom to vary hours of labour (e.g. self-employed, choice to work overtime)

44

Income taxation and labour supply: empirical evidence

- The nature of labour supply may be different between males and females, especially married females.
- Males continue to be dominant income earners in most families.
- Married females are typically secondary income earners, some of whom have no necessity to work.
- For them, the participation decision is most important.
- Most males consider work as a necessity, so the participation decision is irrelevant.
- Therefore, the labour supply of males and females is expected to show different degrees of sensitivity to taxation.

45

Summary of empirical evidence on labour supply elasticities

Labour supply elasticities

- **Intensive margin**
  - Primary earners (used to be usually men) have low elasticities (around 0.1).
  - Secondary earners of the household (typically married women) have much higher elasticities (between 0.5 and 1).
- **Extensive margin**
  - Highly educated men have very low participation elasticities
  - Low educated men have modest participation elasticities
  - Married women have much higher elasticities
  - Lone mothers have very high participation elasticities

46

Income taxation and labour supply: empirical evidence

- Surveys usually conclude that changes in the tax rate have little effect on the labour supply decision. Two examples:
  - Survey of solicitors and accountants in the UK (63% of whom were subject to marginal tax rates over 50%) concluded that half of the respondents were working harder because of the tax rates and the other half were working less hard.
  - Survey of weekly paid workers showed that income taxation had little net effect on overtime working hours.
- If correct the labour supply function is approximately vertical
  - the income effect almost entirely offsets the substitution effect
- However different groups in the population may have different reactions to changes in the tax system
- This is now considered by reviewing some econometric analysis

47

Empirical Evidence: effect of a wage increase

	Married women		Married men		Lone mothers	
	US	UK	US	UK	US	UK
Uncompensated wage	0.45	0.43	0.03	-0.23	0.53	0.76
Compensated wage	0.90	0.65	0.95	0.13	0.65	1.28
Income	-0.45	-0.22	-0.98	-0.36	-0.18	-0.52

Labour supply elasticities

- The substitution effect (compensated wage) is positive, as expected by theory
- The income effect is always negative
- The elasticity for married men is the lowest
  - labour supply curve is close to vertical

48

Empirical Evidence: effect of a wage increase

	Married women		Married men		Lone mothers	
	US	UK	US	UK	US	UK
Uncompensated wage	0.45	0.43	0.03	-0.23	0.53	0.76
Compensated wage	0.90	0.65	0.95	0.13	0.65	1.28
Income	-0.45	-0.22	-0.98	-0.36	-0.18	-0.52

- The elasticity for unmarried women is the largest
  - probably a consequence of the participation effect. For single women part-time work is usually an unattractive option, since it usually implies the loss of state benefits.
- Married women are an intermediate case. For them part-time work is quite common (some flexibility). Thus, their labour supply elasticity is greater than that of married man and lower than that of unmarried women.

49

Effect of increasing the wage per hour worked

Labour Supply Elasticities: more on women

	Uncompensated Wage	Compensated Wage	Income
Female, No children	0.14 (0.075)	0.14 (0.09)	0.00 (0.04)
Female, child 0-2	0.21 (0.13)	0.3 (0.14)	-0.19 (0.10)
Female, child 11+	0.13 (0.11)	0.16 (0.12)	-0.06 (0.08)

Standard errors in brackets

Source: Blundell et al. (1998) Econometrica

50

Women with young children: big SE and big IE

	Uncompensated Wage	Compensated Wage	Income
Female, No children	0.14 (0.075)	0.14 (0.09)	0.00 (0.04)
Female, child 0-2	0.21 (0.13)	0.3 (0.14)	-0.19 (0.10)
Female, child 11+	0.13 (0.11)	0.16 (0.12)	-0.06 (0.08)

Standard errors in brackets

Source: Blundell et al. (1998) Econometrica

51

Women with children over 11: low substitution effect

	Uncompensated Wage	Compensated Wage	Income
Female, No children	0.14 (0.075)	0.14 (0.09)	0.00 (0.04)
Female, child 0-2	**0.21** (0.13)	0.3 (0.14)	**-0.19** (0.10)
Female, child 11+	0.13 (0.11)	0.16 (0.12)	-0.06 (0.08)

Standard errors in brackets

Source: Blundell et al. (1998) Econometrica

52

Women with no children and women with children over 11: low income effect.

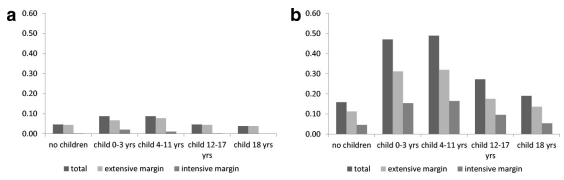
	Uncompensated Wage	Compensated Wage	Income
Female, No children	0.14 (0.075)	0.14 (0.09)	0.00 (0.04)
Female, child 0-2	**0.21** (0.13)	0.3 (0.14)	**-0.19** (0.10)
Female, child 11+	0.13 (0.11)	0.16 (0.12)	-0.06 (0.08)

Standard errors in brackets

Source: Blundell et al. (1998) Econometrica

53

Analysing tax-benefit reforms in the Netherlands using structural models and natural experiments
Henk-Wim de Boer & Egbert L. W. Jongen
Journal of Population Economics (2021)



Couples where both partners have a labour supply choice. **a** Men. **b** Women

54