

5. Labour supply

- ✓ **Aim** = To study individuals' decisions concerning: (i) whether or not to participate in the labour market, (ii) the extent of this participation.

- ↳ Labour supply is analysed either at the level of the individual or at the level of the household.

- ↳ Labour supply changes over the life cycle. The trade-offs between work and leisure vary notably with the age of the individual.

In what follows :

5.1. The static neoclassical model

5.2. The limits of static theory

5.3. An example of economic policy

5.1. The neoclassical model

The general framework

The individual at the heart of the theory.

Hypothesis: « to hold a job, the individual must have decided to do so ».

Individuals have a limited amount of time which they choose to divide between work and leisure.

Assumptions :

- i) Leisure = time not devoted to work.
- ii) The ultimate purpose of work is the purchase of goods (i.e. to consume).

The trade-off between work and leisure takes the form of a trade-off between consumption and leisure. It is represented through a utility function specific to each individual.

An individual's preferences can be summarised as follows:

- i) The objects of choice
- ii) The marginal rate of substitution.

A. Objects of choice

Individuals can choose between 2 types of goods:

- i) Consumption goods.
- ii) Leisure.

Utility function of each individual :

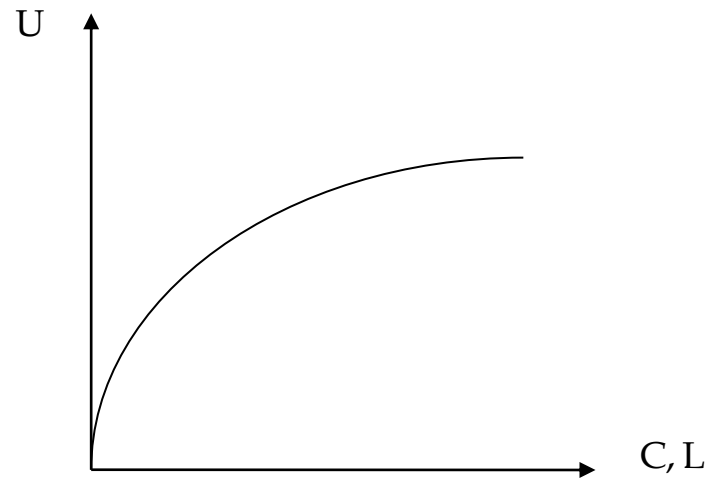
$$U = U(C, L)$$

with $\left\{ \begin{array}{l} C = \text{all consumed goods and services.} \\ L = \text{number of hours of leisure.} \end{array} \right.$

✓ Properties of the utility function

i) $\frac{\partial U}{\partial C} > 0$ and $\frac{\partial U}{\partial L} > 0$

$\frac{\partial^2 U}{\partial^2 C} < 0$ and $\frac{\partial^2 U}{\partial^2 L} < 0$



⇒ An individual can achieve the same level of utility with a lot of L and a little of C, or a little of L and a lot of C.

- i) The parameters of the utility function determine the weight that each individual attributes to consumption and leisure.

Examples : $U = C + L$, $U = C + 2L$

- ii) Leisure has a positive influence on utility \rightarrow work (as such) generates disutility (one hour of work = one hour of leisure lost).

$$\Rightarrow U = U(C, T - H)$$

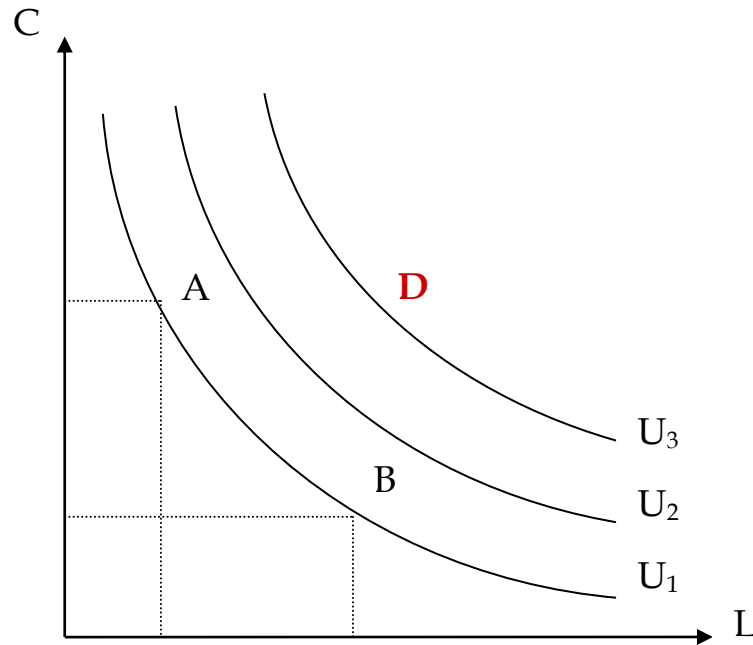
where,

$$\left\{ \begin{array}{l} C = \text{all goods and services consumed,} \\ T = \text{the total number of hours available.} \\ H = \text{the number of hours worked.} \\ T-H = \text{the number of hours of leisure (L).} \end{array} \right.$$

✓ How is a utility function represented ?

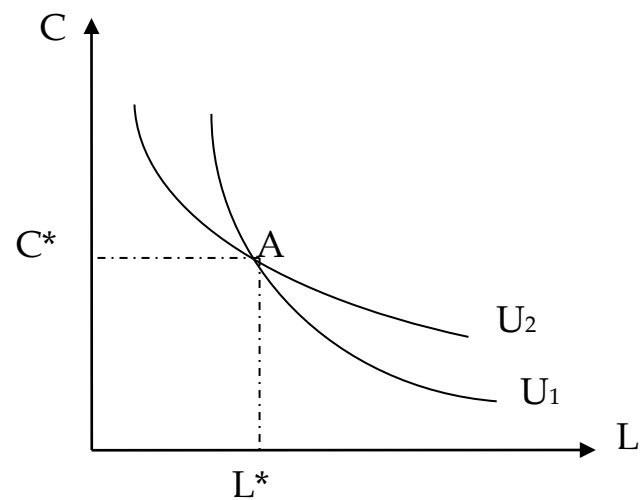
A utility function is represented by indifference curves.

Indifference curve = locus of all combinations of leisure and consumption that provide the same (constant) level of utility, U_i .

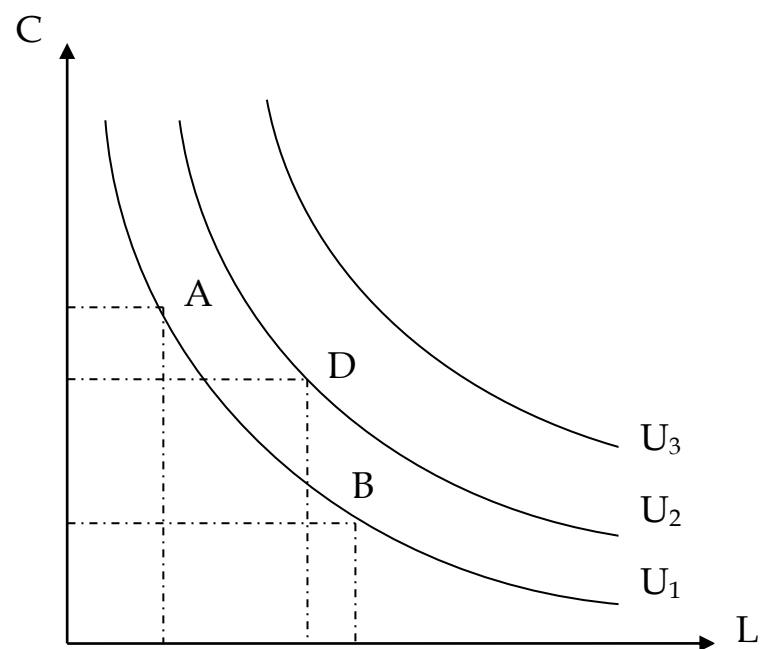


✓ Properties of indifference curves

- i) Convex with respect to the origin (cf. MRS).
- ii) Non-intersecting (i.e. do not cross each other).



iii) Ranked with respect to the origin



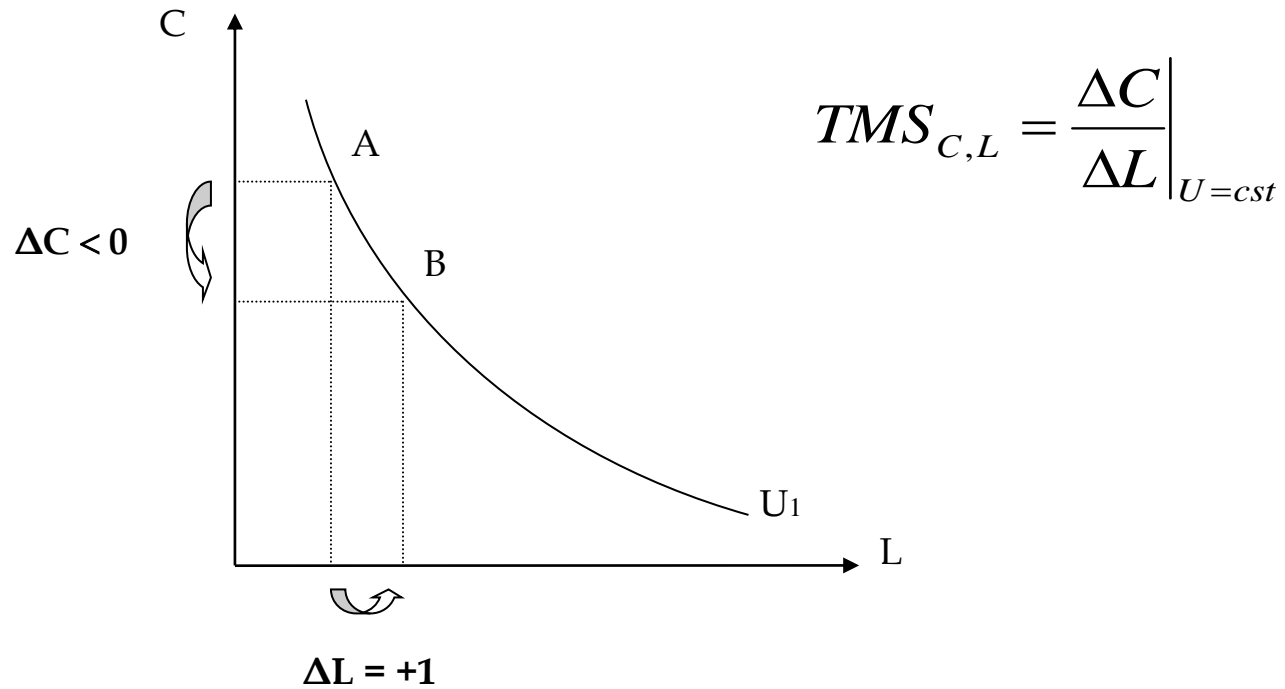
✓ **Marginal rate of substitution (MRS)**

The parameters of the utility function determine the general shape of the indifference curves.

The shape of the indifference curves determines the degree of substitutability between consumption and leisure.

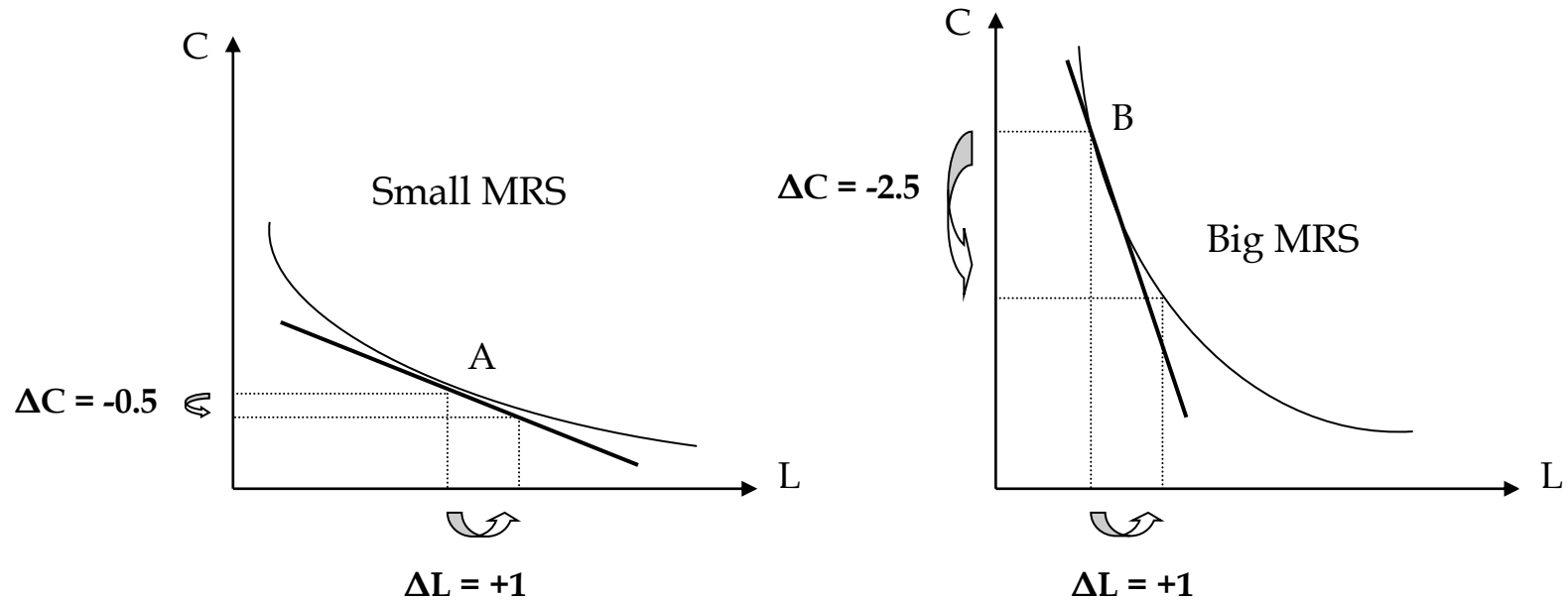
The degree of substitutability between consumption and leisure is measured by the marginal rate of substitution.

Economically: MRS measures the consumption that an individual has to forego for an extra hour of leisure, so that his or her utility remains unchanged.



Mathematically: MRS = derivative at a given point of the indifference curve.

Graphically: MRS = slope at a given point of the indifference curve.



$$|TMS_A| = \left| \frac{-0.5}{+1} \right| = 0.5$$

$$|TMS_B| = \left| \frac{-2.5}{+1} \right| = 2.5$$

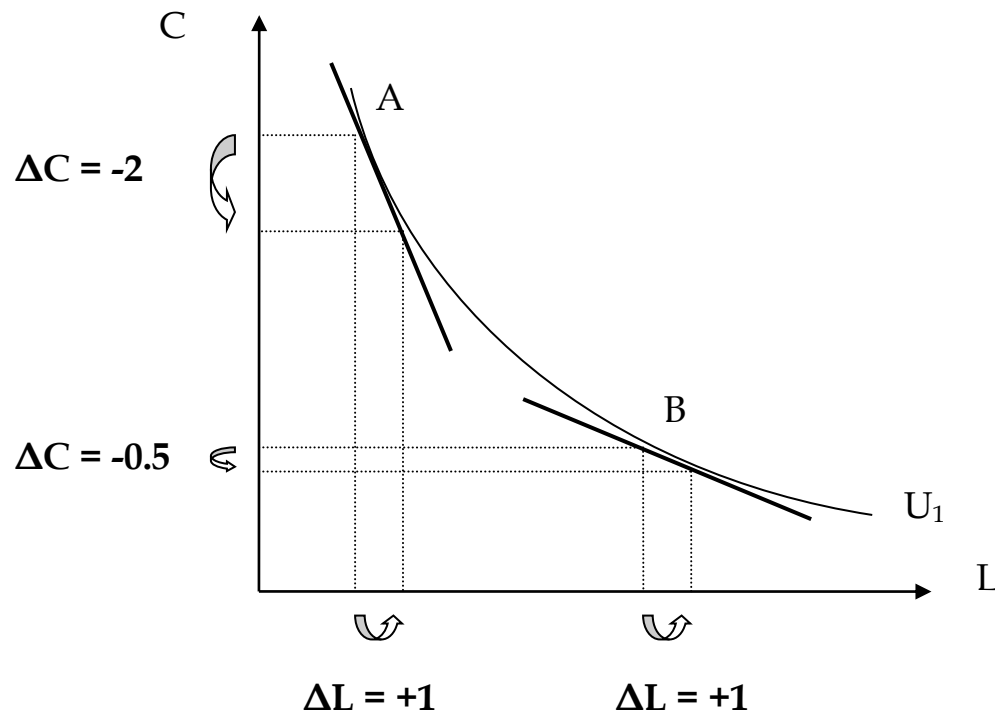
✓ Properties of the MRS

- i) The MRS is not constant along indifference curve (unless it is a straight line).
- ii) The $MRS_{C,L}$ (in absolute value) generally decreases with the amount of leisure.

Intuition :

The more you have of one good (C), the more you are willing to exchange a significant portion of it for the other good (L).

If you want to maintain your utility at a constant level and increase the quantity of L by one unit, you will be willing to exchange more C if you have a lot of it.



Remark :

$$\begin{aligned} \Delta U &= 0 \\ \Delta U &= \Delta C \cdot \frac{\partial U}{\partial C} + \Delta L \cdot \frac{\partial U}{\partial L} \\ \Rightarrow \Delta C \cdot \frac{\partial U}{\partial C} + \Delta L \cdot \frac{\partial U}{\partial L} &= 0 \\ \Rightarrow \frac{\Delta C}{\Delta L} &= -\frac{\partial U / \partial L}{\partial U / \partial C} \text{ or } TMS_{C,L} = \left. \frac{\Delta C}{\Delta L} \right|_{U=const} \\ \Rightarrow TMS_{C,L} &= \frac{\Delta C}{\Delta L} = -\frac{U'_L}{U'_C} \end{aligned}$$

$$|TMS_A| = \left| \frac{\Delta C}{\Delta L} \right| = \left| \frac{-2}{+1} \right| = 2, \quad |TMS_B| = \left| \frac{\Delta C}{\Delta L} \right| = \left| \frac{-0.5}{+1} \right| = 0.5 \quad \Rightarrow \text{MRS}_{C,L} \downarrow \text{ when } L \uparrow$$

Why ? Because the marginal utility of L and C is decreasing.

B. Constraints

"To consume, you need income".

The choice of a utility level and the position on the indifference curve are determined by the existence of a budget constraint.

Wage and non-wage income.

Budget constraint : $RT = Y_{non\ sal} + W.H$

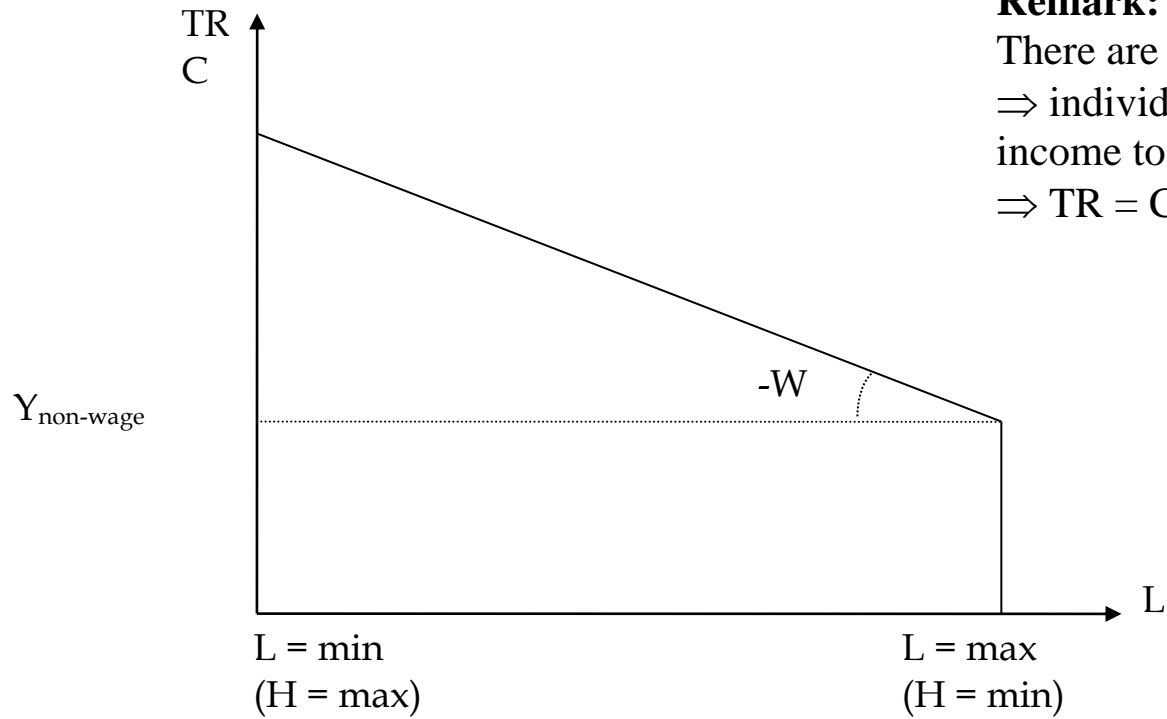
where,

$$\left\{ \begin{array}{l} TR = \text{total income,} \\ Y_{\text{non-wage}} = \text{non-wage income,} \\ W = \text{hourly wage,} \\ H = \text{number of hours worked.} \end{array} \right.$$

W = absolute value of the slope of the budget constraint.

If W increases, the slope of the budget constraint becomes steeper.

Graphically ?



Remark:

There are no savings

\Rightarrow individual spends all his/her income to buy consumption goods

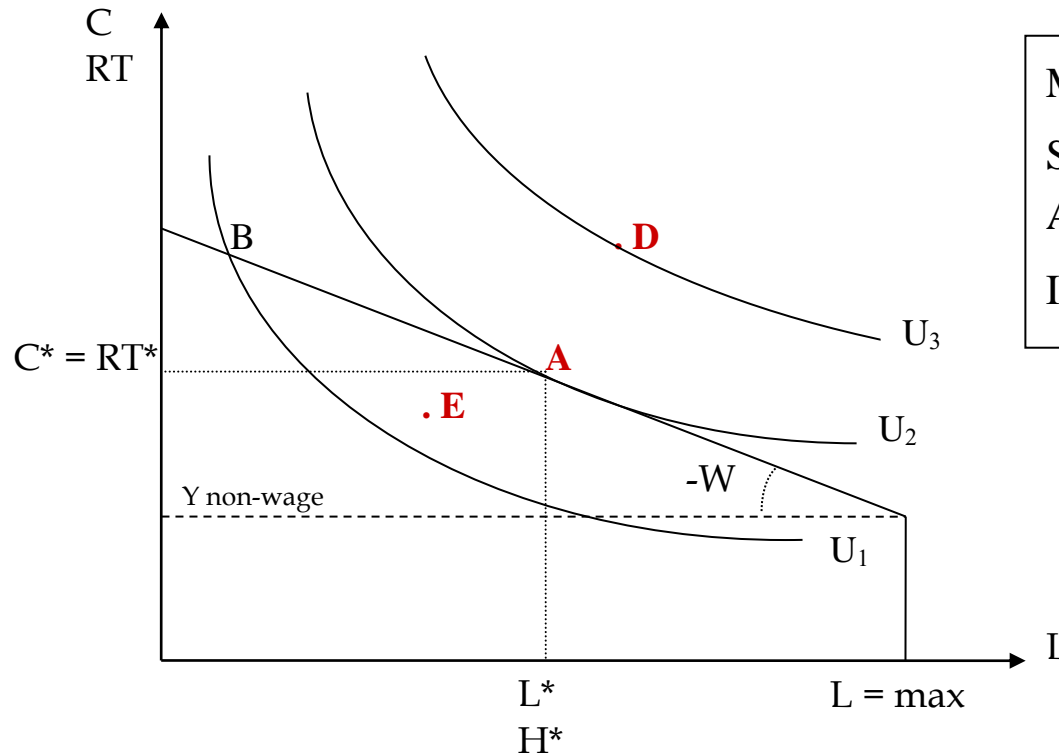
$\Rightarrow TR = C$

If $L = 0h$, $H = 24h \Rightarrow RT = Y_{\text{non-wage}} + W * 24h = \max$

Si $L = 24h$, $H = 0h \Rightarrow RT = Y_{\text{non-wage}}$.

C. The optimum

The point of tangency between the budget constraint and the highest indifference curve. The MRS is equal to the hourly wage. The loss of income that the individual is prepared to accept for an extra hour of leisure is equal to the hourly wage.



$$\text{MRS}_{C,L} = \frac{\Delta C}{\Delta L} < 0$$

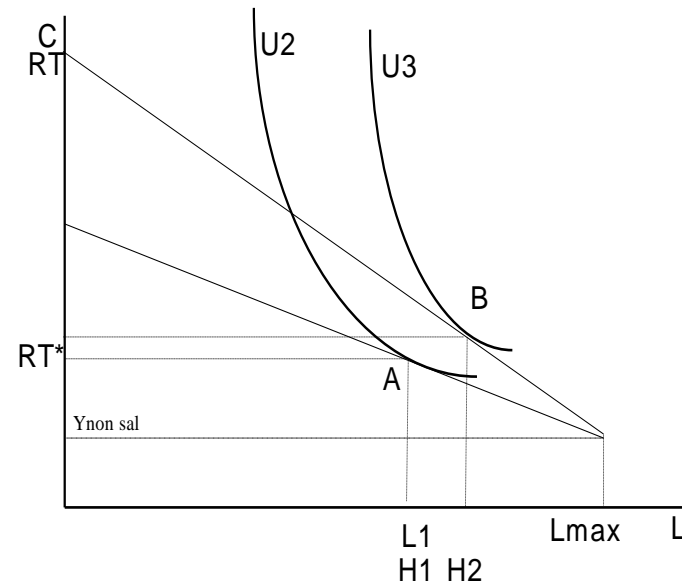
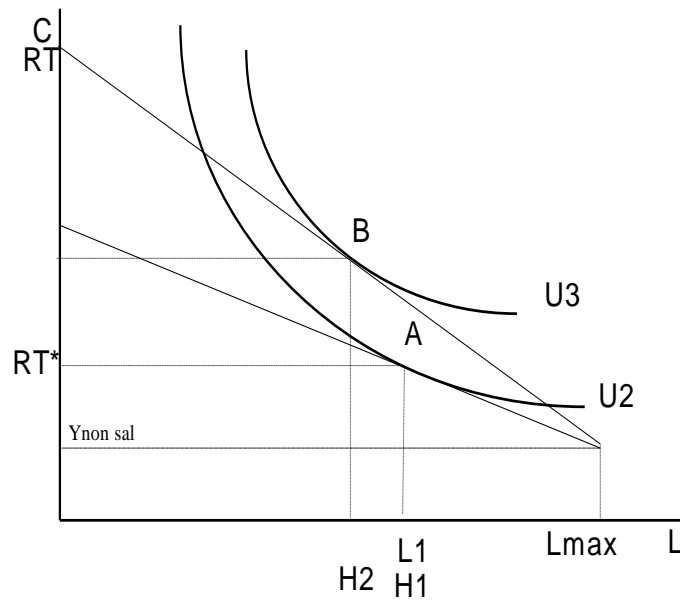
Slope of budget constraint = $-W$

At the optimum : $\frac{\Delta C}{\Delta L} = -W$

If $\Delta L = +1 \Rightarrow \Delta C = -W$

D. Impact of an increase in salary

Two effects are possible. The number of hours worked may increase or decrease. This depends on the shape of the indifference curves.

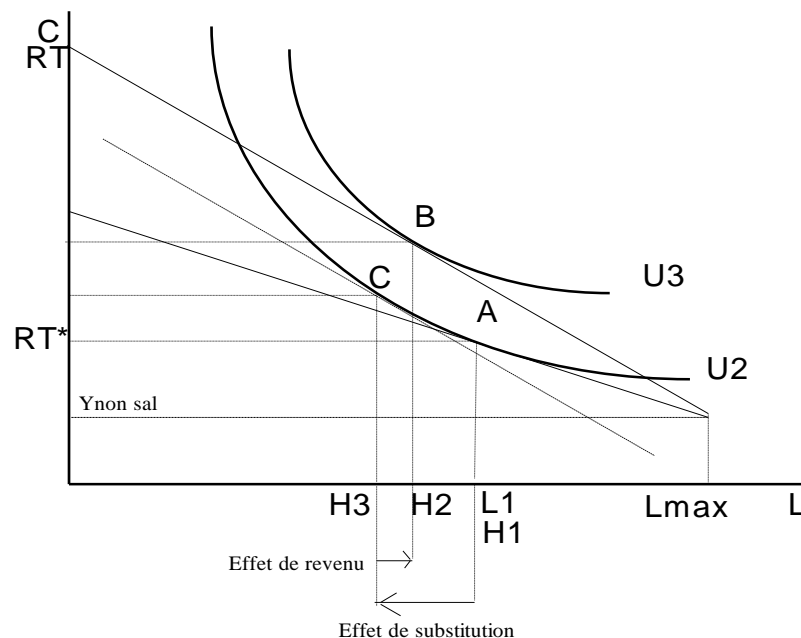


The total effect of a wage increase on labour supply can be broken down into two sub-effects:

- i) **The substitution effect** measures, on the same indifference curve, the substitution between C and L following the increase in W. **Shift from A to C.**

When $W \uparrow$, the opportunity cost of L $\uparrow \rightarrow L \downarrow$ et H \uparrow . (As W is higher, it becomes more attractive to work)

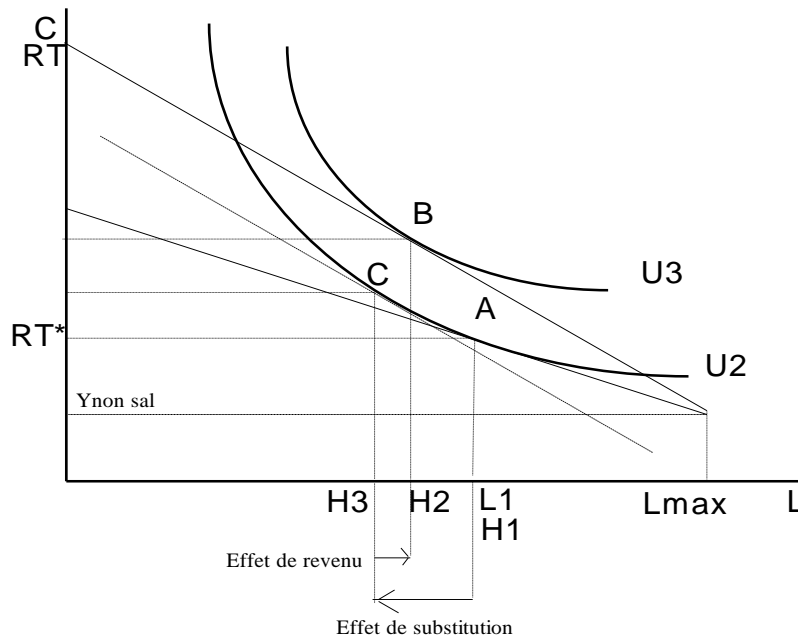
Graphically, it is obtained by plotting the tangent, whose slope is equal to the new hourly wage, to the (initial) indifference curve U_2 .



Intuition :

Incentive to increase labour supply as this factor is better rewarded

- ii) **The income effect** measures, given the new hourly wage, the impact on labour supply of the fact that a given number of hours of work provides a higher income. (You have to work less to achieve a given level of income).
Shift from C to B.



Intuition :

Incentive to reduce labour supply because it is possible to consume just as much while working less

To sum up :

Substitution effect always (+) in terms of hours worked (H ↑ et L ↓).

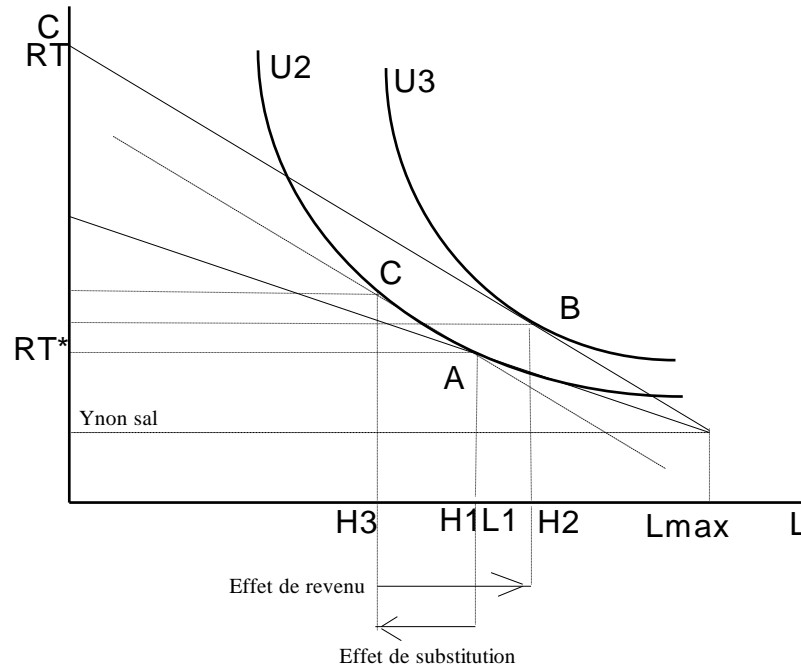
Income effect generally (-) in terms of hours worked (H ↓ et L ↑).

Total effect = substitution effect + income effect. (+) or (-) (+) usually (-)

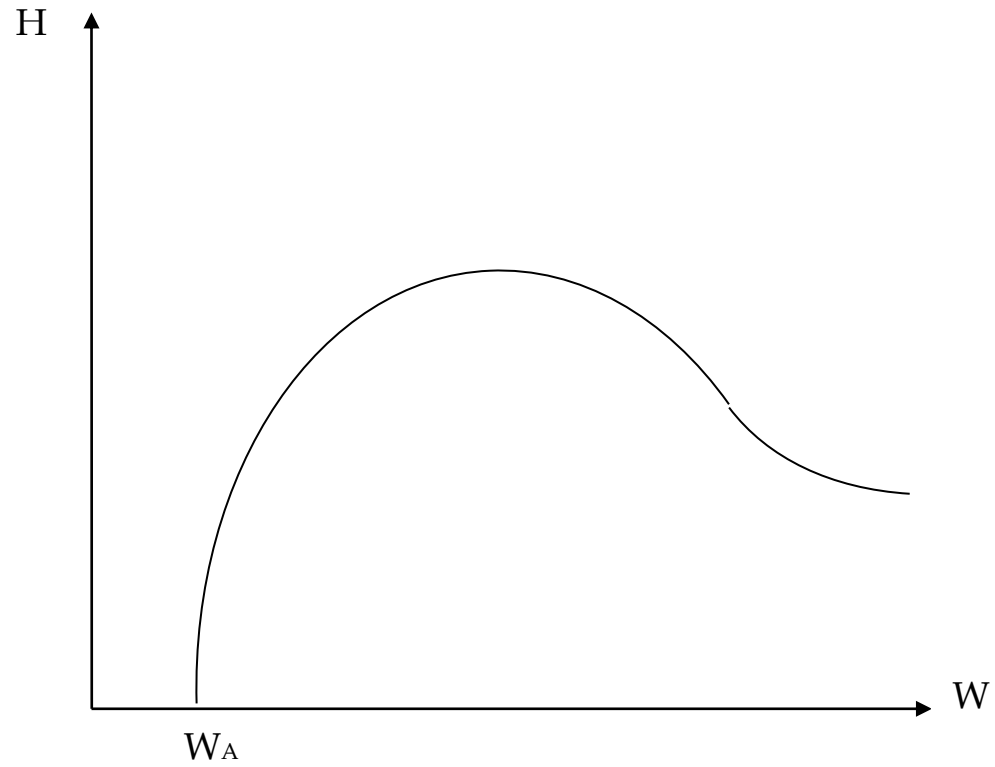
Incentive to increase labour supply because this factor is better paid (substitution effect).

Incentive to reduce labour supply because it is possible to consume just as much while working less (income effect).

The income effect may outweigh the substitution effect. In this case, the total effect is negative. The supply of labour is reduced when wages increase.



E. Individual labour supply



Is this bell-shaped relationship verified empirically?

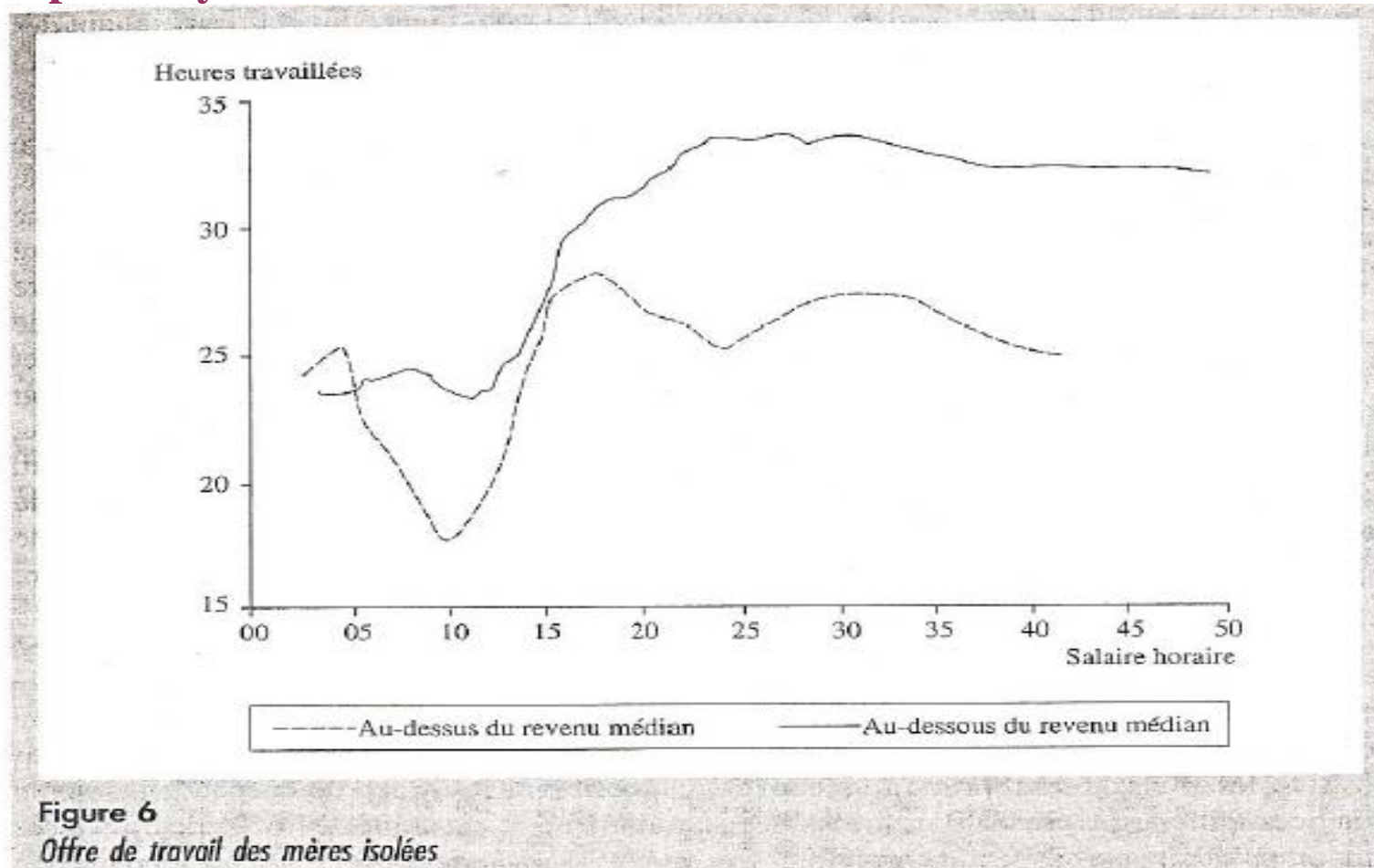


Figure 6
Offre de travail des mères isolées

Source : Blundell et al. (1992), d'après Cahuc et Zylberberg (2001, p.39).

F. Labour supply elasticity

$$\varepsilon_{H,W} = \frac{\Delta H / H}{\Delta W / W}$$

Measures the sensitivity of labour supply to wages.

Shows by how many % labour supply changes when the wage changes by 1%.

Suppose $\varepsilon_{H,W} = 0.5$, if $W \uparrow$ by 1% $\rightarrow H \uparrow$ by 0.5%.

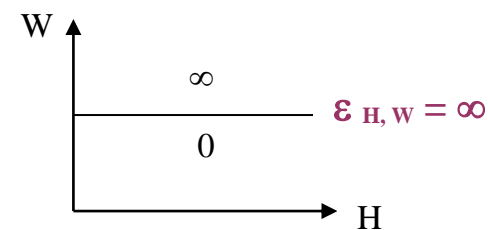
$\varepsilon_{H,W} = \infty$: perfectly elastic labour supply.

$\varepsilon_{H,W} > 1$: elastic labour supply.

$\varepsilon_{H,W} = 1$: unitary labour supply.

$0 < \varepsilon_{H,W} < 1$: inelastic labour supply.

$\varepsilon_{H,W} = 0$: perfectly inelastic labour supply.



Elasticity of labour supply = elasticity of substitution + income elasticity

The elasticity of substitution measures the impact on the labour supply of a variation in wages, offset by a variation in income that allows a constant level of utility to be maintained. It measures the movement along the same indifference curve.

The income elasticity assesses the impact of a variation in income on the supply of labour. It measures the impact on labour supply of the increase in income generated by the fact that at the new wage, for the same volume of work, more money is earned.

Empirical results

- ✓ Wide range of results.
- ✓ Changes in participation rates predominate over changes in hours: for a given group, changes in the participation rate of that group explain most of the elasticity of that group's labour supply.

- ✓ The labour supply elasticity of married women is positive and greater than that of their spouses.

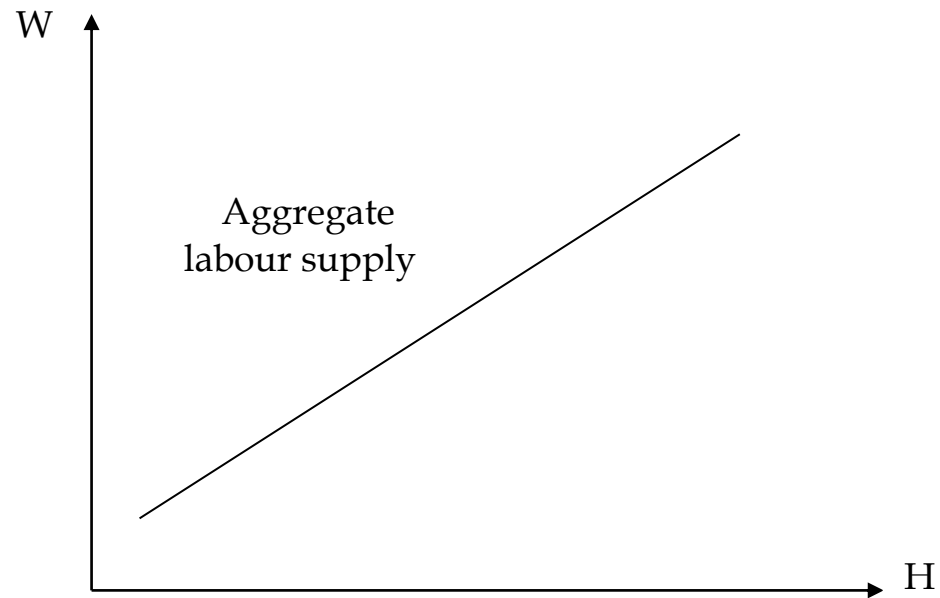
Tab. : Elasticity of labour supply for married women and men

Authors	Sample	Elasticity :		
		Total	Substitution	Income
Femmes mariées				
Cogan (1981)	USA	0.65	0.68	-0.03
Hausman (1981)	USA	0.45	0.495	-0.045
Arrufat et Zabalza (1986)	UK	0.62	0.68	-0.06
Blundell et Walker (1982)	UK (1 child)	0.10	0.32	-0.22
Arellano et Meghir (1992)	UK (young children)	0.29	0.69	-0.40
Hommes mariés				
Ashenfelter (1978)	USA	+0.17	0.18	-0.01
Johnson et Pencavel (1984)	USA	+0.02	0.19	-0.17
Hausman (1981)	USA	+0.03	1.01	-0.98
Ashworth et Ulph (1981)	UK	-0.33	0.29	-0.62
Blundell et Walker (1982)	UK	-0.23	0.13	-0.36

Source : Blundell (1993) d'après Cahuc et Zylberberg (2001).

G. Aggregate labour supply

Aggregation of individual labour supply curves.
Positive slope in relation to wages.



5.2. The limits of static theory

A. The life cycle

The theory does not account for the fact that the choice between consumption and leisure has an intertemporal dimension.

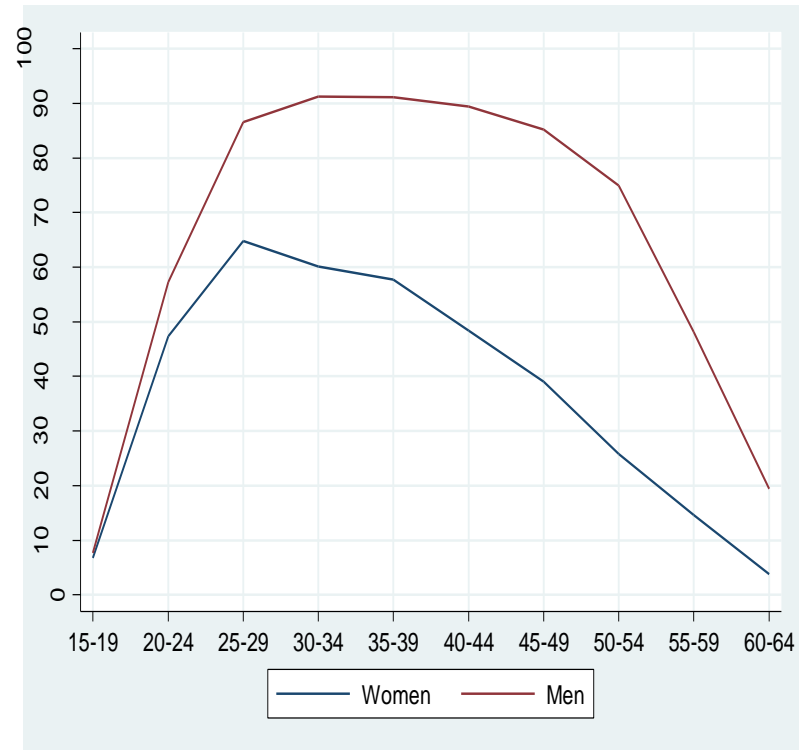
Individuals may choose different working hours over the course of their working lives.

By taking the life cycle into account, it is possible to analyse long-term labour supply.

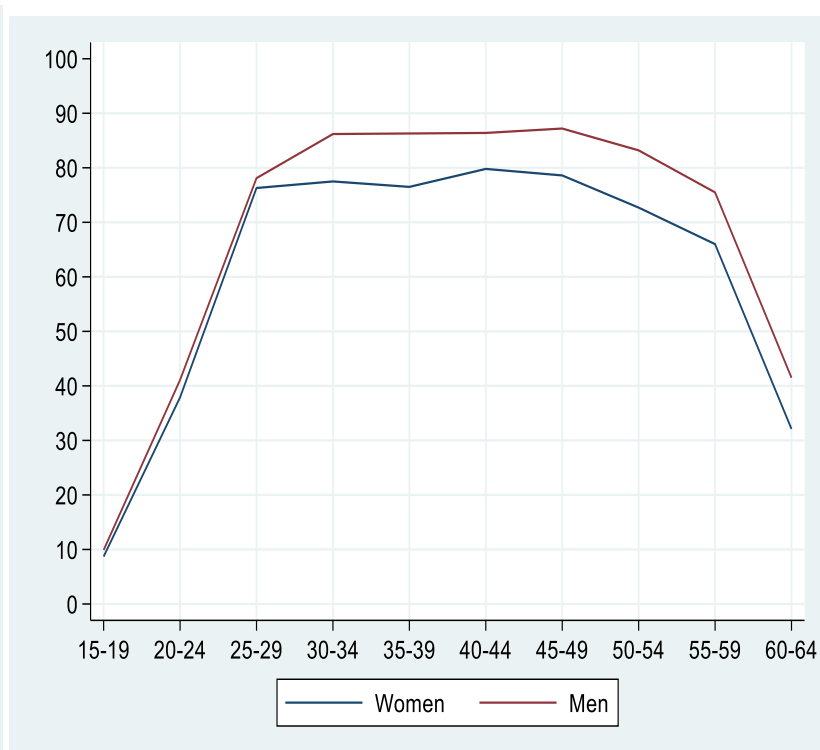
What about the participation of men and women over the life cycle?

Tab 1 : Life-cycle employment rates in Belgium

1988

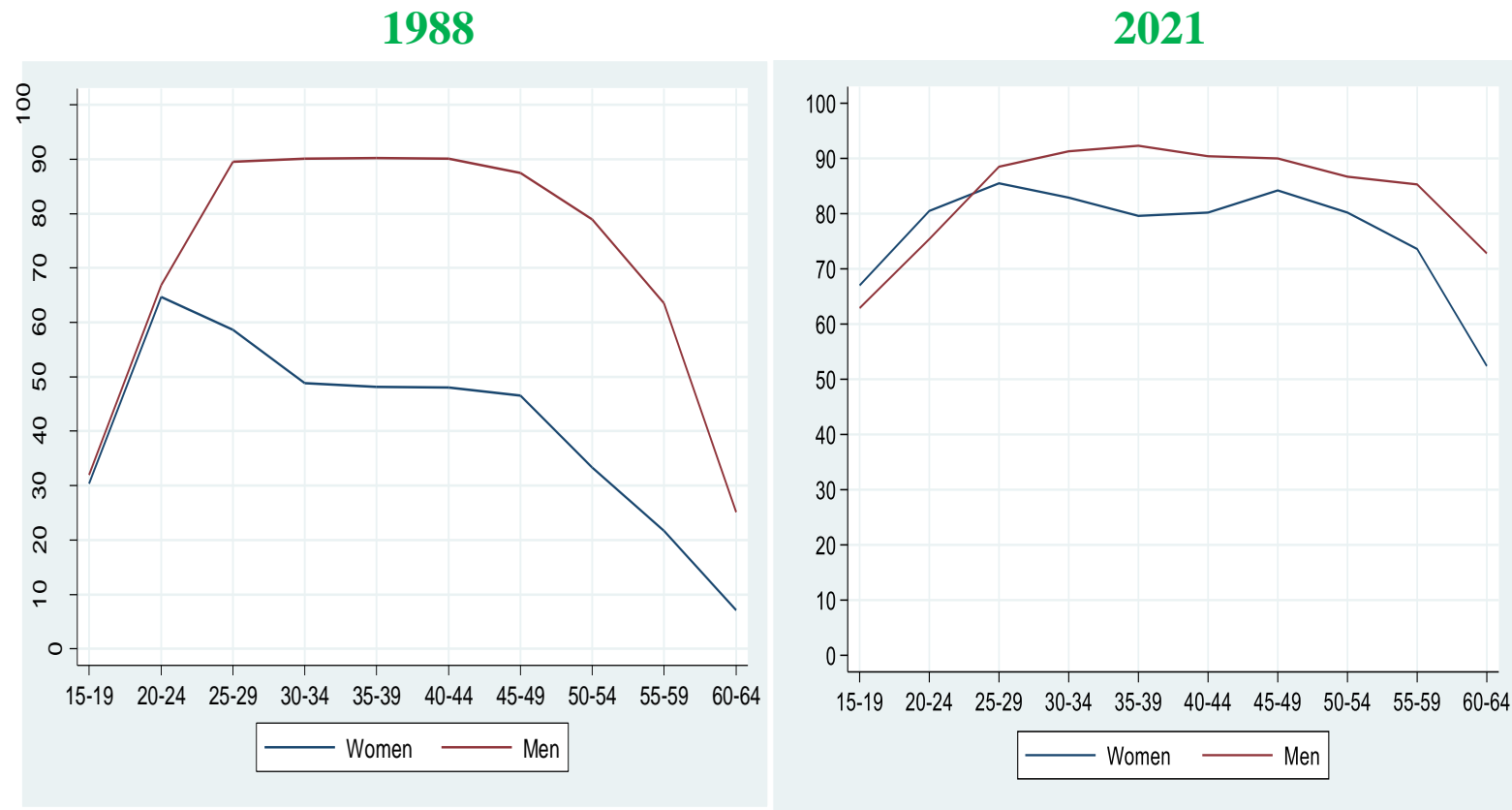


2021



Source : Eurostat.

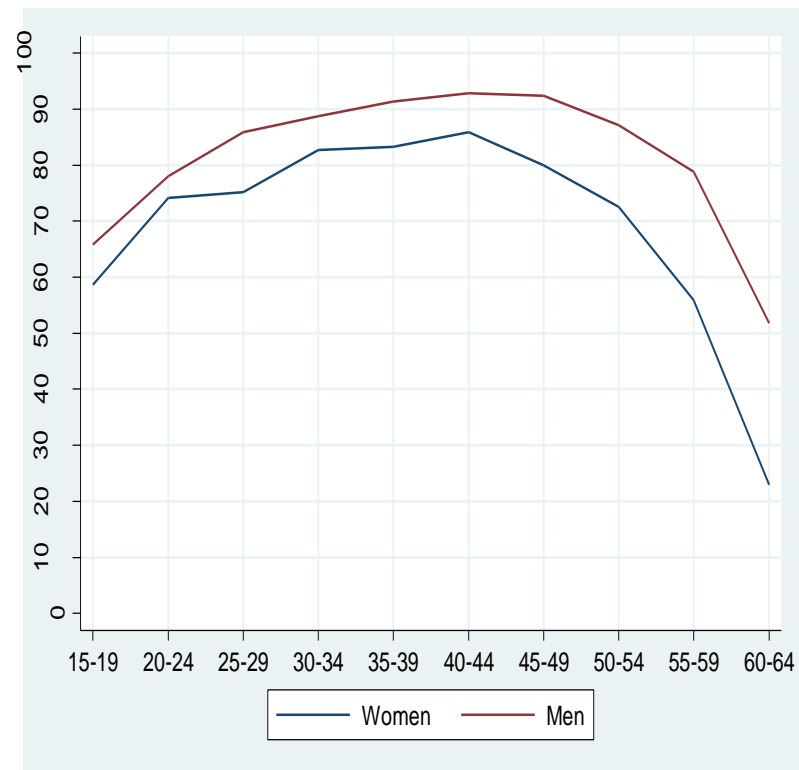
Tab. 2 : Life-cycle employment rates in the Netherlands



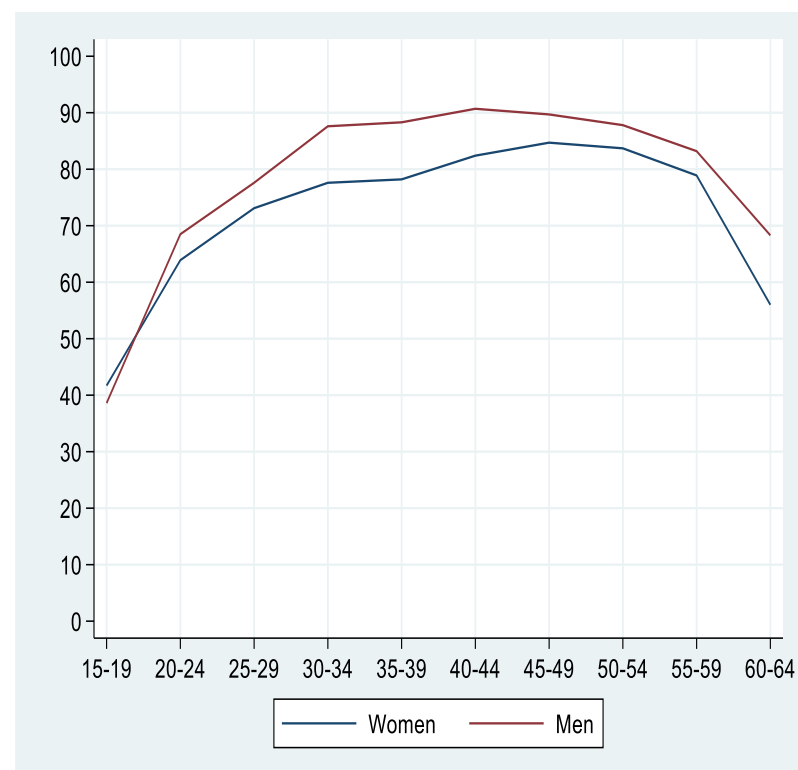
Source : Eurostat.

Tab. 3 : Life-cycle employment rates in Denmark

1988



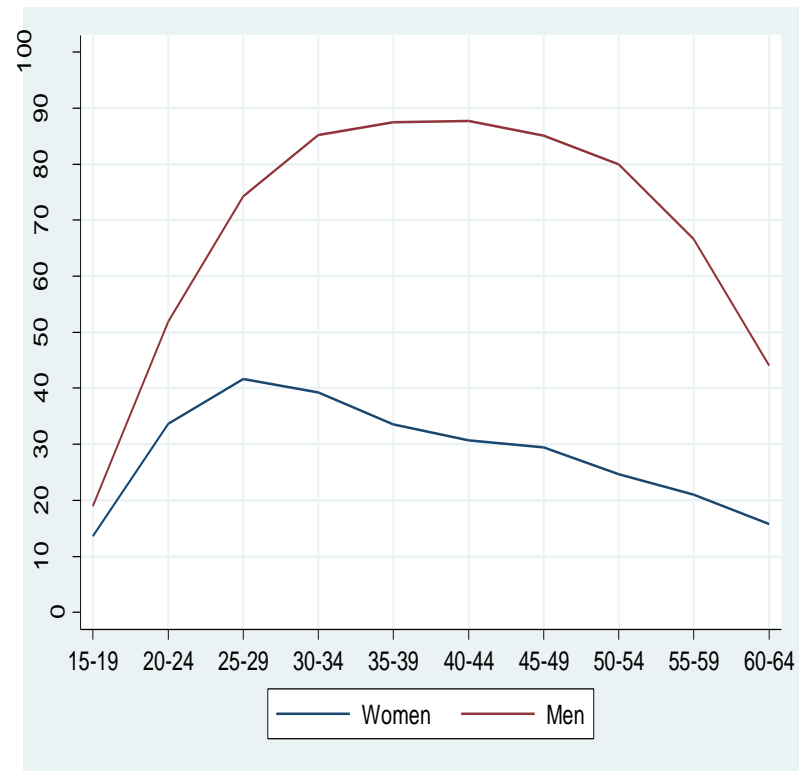
2021



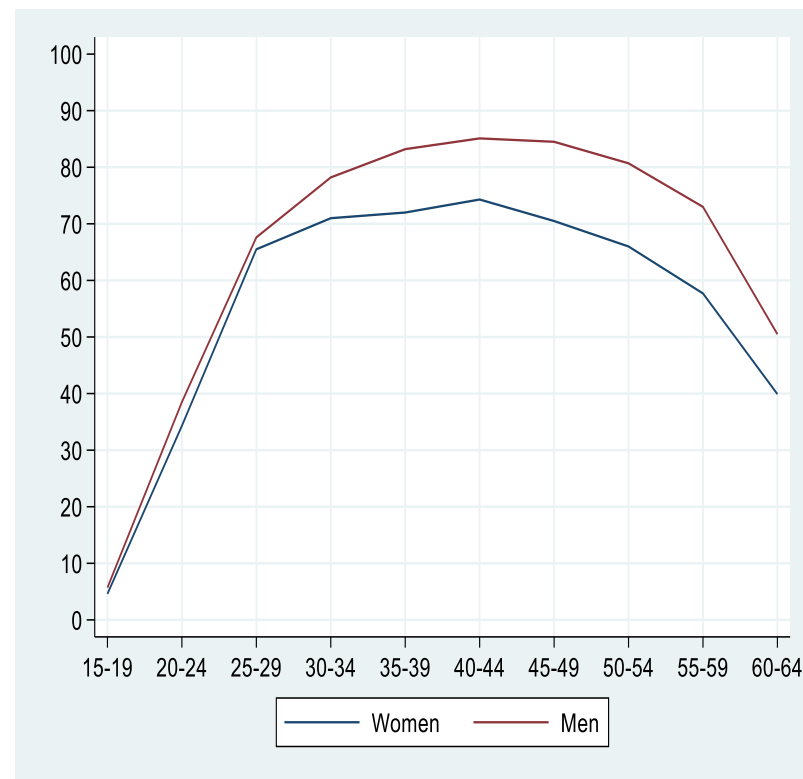
Source : Eurostat.

Tab. 4 : Life-cycle employment rates in Spain

1988



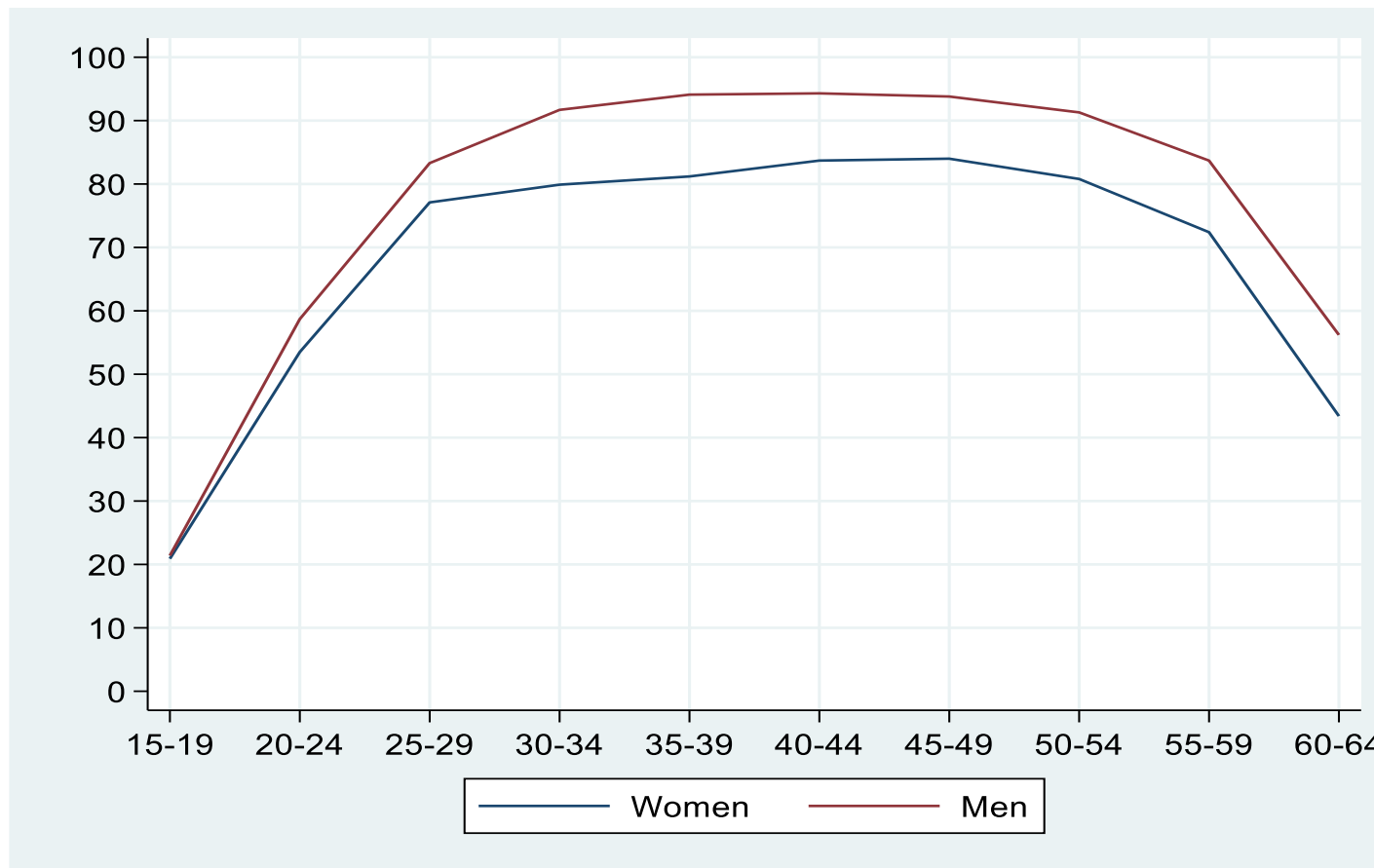
2021



Source : Eurostat.

Tab. 5 : Life-cycle employment rates in the EU(14) & UK

2021



Source : Eurostat. Données pour le RU relatives à 2019.

B. Domestic work

The dichotomy between leisure and paid work hides a large part of the complexity of individual time allocation decisions.

Work is not the only alternative to leisure (e.g. domestic work).

Illustration: Influence of children on the employment rate by gender.

Women's employment rate (generally) decreases when they have children, and the reverse is true for men.

The gender gap in employment widens as the number of children in the household increases.

Tab. 6: Employment rates by gender and presence of children, 2021
(People aged 25 to 49)

Country	No children			One child & more			Δ Gaps
	Men	Women	Gap	Men	Women	Gap	
Belgium	79,3	79,5	-0,2	90,8	76,9	13,9	14,1
Denmark	83,1	79,3	3,8	93,5	82,2	11,3	7,5
Germany	85,3	85,9	-0,6	91,7	75,6	16,1	16,7
Ireland	81,6	82,4	-0,8	90,0	71,5	18,5	19,3
Greece	73,0	60,8	12,2	89,8	60,5	29,3	17,1
Spain	75,4	73,0	2,4	86,9	69,7	17,2	14,8
France	79,7	80,8	-1,1	90,6	76,0	14,6	15,7
Italy	73,6	63,7	9,9	87,3	56,7	30,6	20,7
Luxembourg	85,8	83,3	2,5	92,1	78,3	13,8	11,3
Netherlands	86,5	82,8	3,7	95,4	82,3	13,1	9,4
Austria	83,4	84,3	-0,9	91,7	77,3	14,4	15,3
Portugal	79,3	81,5	-2,2	94,5	85,7	8,8	11
Finland	77,8	81,3	-3,5	92,0	78,3	13,7	17,2
Sweden	81,3	76,0	5,3	94,2	83,4	10,8	5,5
UK	87,4	85,4	2,0	94,3	75,7	18,6	16,6
EU(14) & UK	80,8	78,7	2,1	91,7	75,3	16,4	14,3

Gap: difference in percentage points between the employment rates of men and women. Data for UK for 2019. Source: Eurostat (2022, LFS series - specific topics). Data for the UK relative to 2019.

Tab. 7: Part-time work, by gender and presence of children, 2021

(% of people working part-time in total employment in each group, workers aged 20-49)

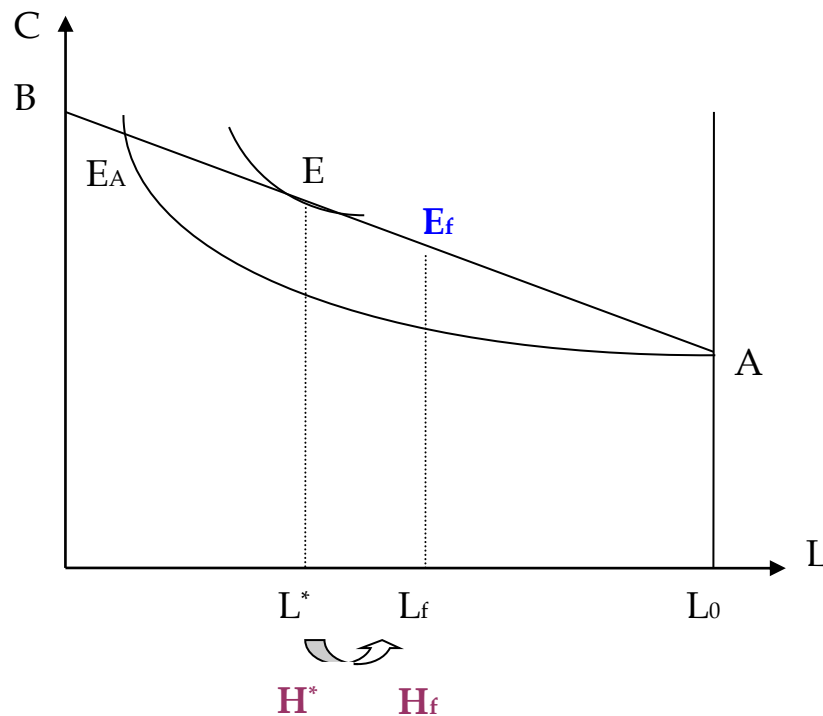
Country	Women				Men			
	Number of children :				Number of children :			
	0	1	2	3 et +	0	1	2	3 et +
Belgium	25,9	38,2	46,6	50,6	7,8	5,4	8,3	6,6
Denmark	36,9	24,9	24,2	28,3	20,1	6,7	4,8	3,3
Germany	27,1	56,4	72,2	76,2	12,8	7,6	6,8	10,7
Ireland	16,1	29,9	29,2	41,9	11,7	8,6	7,3	n.d.
Greece	14,4	15,4	15,0	7,3	7,2	6,9	3,6	3,1
Spain	21,3	25,8	25,2	26,9	9,7	6,6	3,8	6,3
France	20,4	25,9	30,4	39,2	7,8	5,6	4,9	6,5
Italy	27,5	36,8	39,5	43,0	11,1	8,0	5,7	8,1
Luxembourg	17,0	31,0	39,6	50,6	5,9	4,1	4,6	n.d.
Netherlands	44,7	67,0	72,4	77,3	22,6	19,0	13,0	11,6
Austria	31,4	59,3	73,4	77,0	13,2	8,0	6,6	8,4
Portugal	9,1	6,0	4,3	8,3	5,9	4,0	2,7	n.d.
Finland	19,4	14,5	16,1	25,0	13,2	5,7	3,3	4,4
Sweden	28,3	27,3	29,1	31,6	14,9	10,6	8,4	9,0
UK	32,2	41,8	54,6	58,9	14,6	8,6	7,0	11,2
EU(14) & UK	24,8	33,3	38,1	42,8	11,9	7,7	6,1	5,9

Source : Eurostat (2022). Data for the UK for 2019.

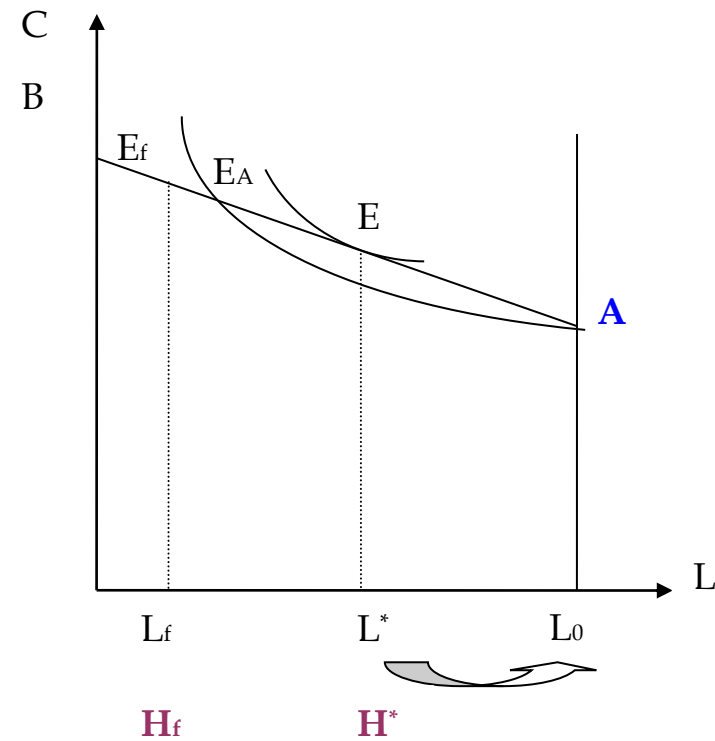
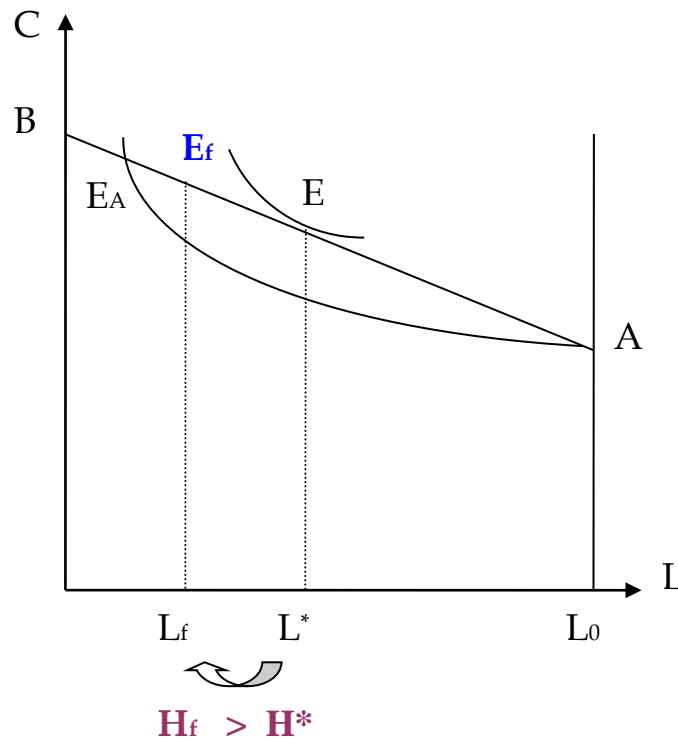
C. Rigidity in the choice of the number of hours worked

Hypothesis : individual can work ($H=L_0-L_f$) or not work at all ($H=0$).

- i) If E is to the left of E_f , the individual agrees to work ($H_f = L_0-L_f$) hours. The individual would simply have liked to work more because $(H_f = L_0-L_f) < (H^* = L_0-L^*)$.



- ii) If E lies to the right of E_f , individual agrees to work the proposed fixed number of hours H_f , if, and only if, the point E_A – which corresponds to the intersection of the indifference curve passing through A and the budget curve – lies to the left of E_f .



Tab. 8: Incidence of involuntary part-time employment, 2022

Country	Part-time employment as % of total employment ¹	Share of women in part-time employment ¹	<i>Involuntary</i> part-time employment as % of part-time employment ²
Portugal	4,4	73,6	34,2
Greece	8,7	66,6	47,2
USA	11,7*	64,5*	3,7
Spain	11,9	72,9	49,7
France	12,5	71,5	23,8
Sweden	10,1	57,9	19,6
Finland	15,8	60,5	23,5
Belgium	16,7	72,9	18,4
Italy	16,2	74,6	57,2
Denmark	16,5	60,8	5,4
Germany	20,8	75,1	5,8
UK	20,4	71,9	10,1
Netherlands	34,1	70,3	2,6
Average**	15,7	69,1	23,2

Notes: Involuntary part-time employment refers to workers who work part-time because they cannot find full-time work. ¹ Part-time employment refers to workers who usually work less than 30 hours per week in their main job. ² Part-time employment is based on national definitions. * Data for 2020. ** Unweighted average of countries in this table. Source: OECD (2023), OECD Employment Outlook, Paris.

5.3. An example of economic policy : unemployment benefits

A. Some facts

In all industrialised countries, there are unemployment benefit systems with varying degrees of generosity.

These benefits are generally linked to the individual's work history, their efforts to find a job and the reasons why they are unemployed.

Unemployment benefit systems are a combination of insurance and assistance.

Insurance benefits depend on contributions paid previously and give entitlement to compensation when a person loses their job. In a way, this is compensation for the 'loss' that the person has just suffered.

Assistance benefits generally depend neither on past contributions nor on the individual's employment history. They are paid for relatively long periods to people whose income is deemed insufficient.

In Belgium : Revenu d'Intégration Sociale (RIS, 'Social integration income' / 'Living wage') paid by the Centre Public d'Action Sociale (CPAS, 'Public centre for social action').

Similar mechanisms exist in most OECD countries.

However, there are very significant variations in the scale of the sums involved and the conditions under which they are paid.

To determine the “generosity” of the unemployment benefit system (after tax), a “net replacement ratio” is generally calculated.

This indicator measures the average ratio between the net benefits paid to unemployed people and their previous net wages.

It is calculated for people who have been unemployed for different durations.

Tab. 9.1: Net replacement rate for *low-paid* workers*, 2021

Pays	Net replacement rate** (in % of net earnings in employment)			
	<i>According to the length of time unemployment benefit has been paid :</i>			
	After 1 month ***	After 1 year	After 2 years	After 5 years
Luxembourg	92	92	69	69
Japan	87	69	69	69
Portugal	87	87	87	48
Belgium	84	84	72	68
Germany	83	83	64	64
Italy	83	74	64	58
Norway	83	83	83	63
Sweden	83	80	78	78
Spain	82	82	82	53
Netherlands	80	77	77	56
Finland	80	80	72	72
Austria	78	76	76	76
USA	75	62	50	47
Ireland	74	72	71	71
France	74	75	75	61
UK	64	61	61	61

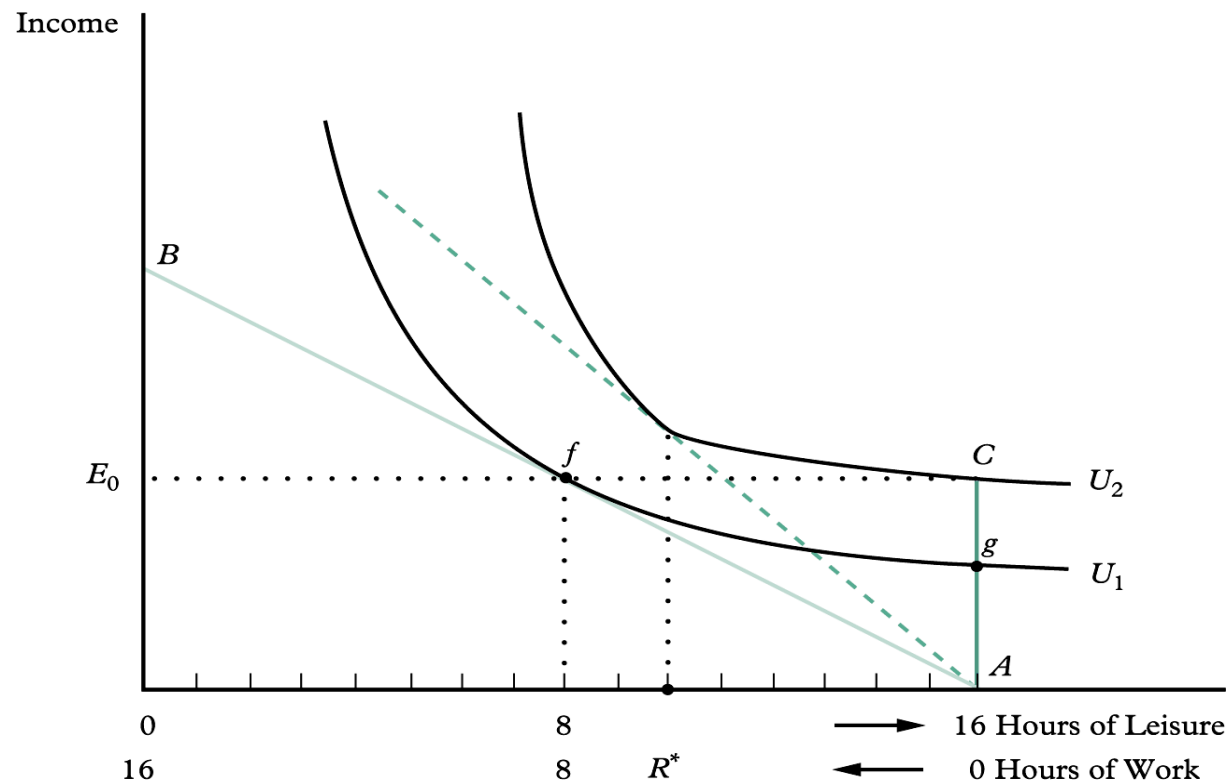
* In this table, net replacement rates are calculated for **low-wage earners** (i.e. **people with previous employment earnings equal to 67% of average earnings**), who are generally among the main recipients of unemployment benefit. In additionou en Suède (78%°.. + **When the duration of unemployment insurance benefits is exceeded (which is almost always the case after 5 years of unemployment), net income outside employment corresponds to means-tested unemployment benefits, i.e. social assistance.**

Source : OCDE (2019), *Benefits and Wages*, Paris. (www.ocde.org/els/benefitsandwagespolicies.htm).

Duration of payment of unemployment *insurance* benefits:

- ✓ In **Belgium**, there is **no time limit on the duration of unemployment insurance benefits**. However, recipients of these benefits are subject to tighter controls. Since 2012, the reform of the unemployment insurance system in Belgium has also increased the degressivity of unemployment benefits (depending on the length of the benefit period).
- ✓ Within **OECD** countries, the **maximum duration** of unemployment insurance benefits **varies from less than six months** in Hungary and Israel **to almost three years** in Iceland and Sweden.
- ✓ The limited duration of unemployment insurance benefits reflects the idea that unemployment *insurance* should cover temporary income losses linked to unemployment.
- ✓ People who exhaust the maximum duration of unemployment *insurance* benefits and need ongoing income support can usually fall back on unemployment *assistance* or generic social assistance programmes (whose main aim is to reduce poverty rather than smooth consumption).

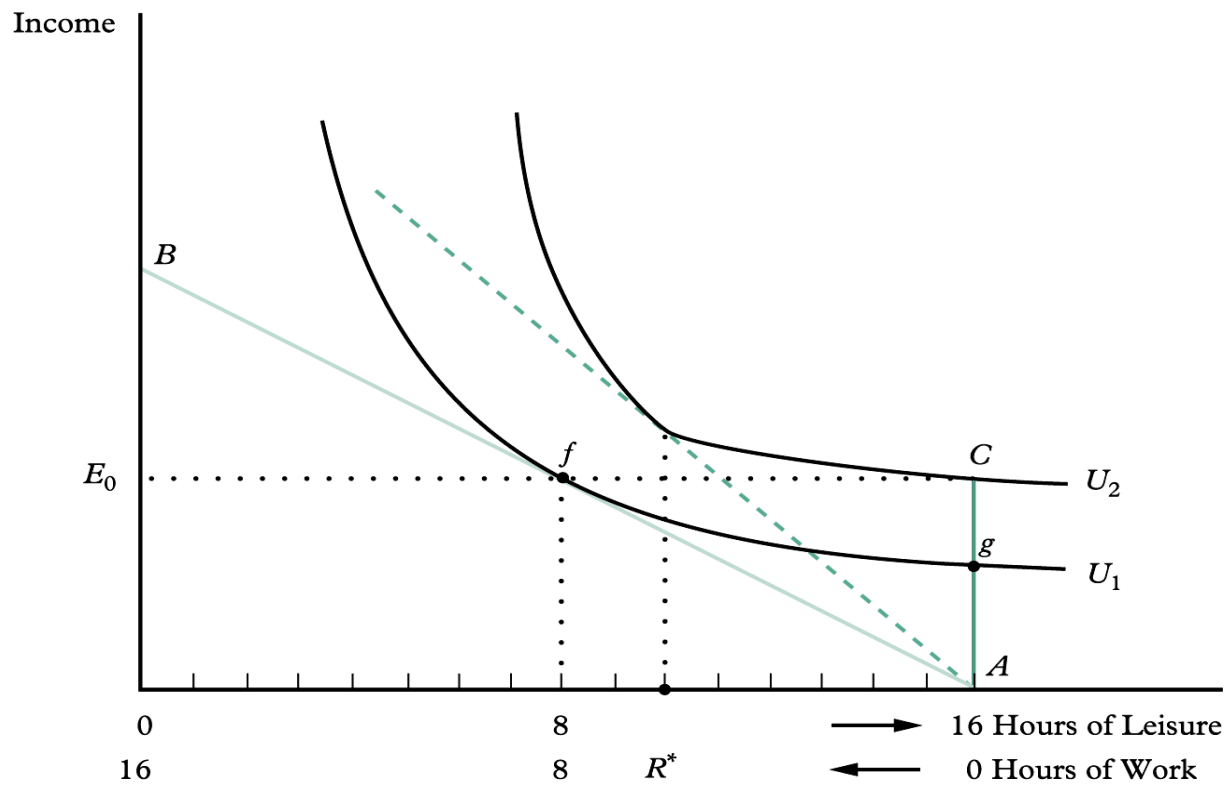
B. Theoretical illustration



AB = market budget constraint. Constraint when the individual has a job and there is no unemployment compensation. Optimum at point f ($H = 8$ h)

Now suppose that:

- i) The individual loses his job.
- ii) There is an unemployment benefit system.
- iii) There is no time limit on the duration of the benefit.
- iv) The amount of the benefit (segment AC) is equal to the individual's last daily wage, i.e. E_0 .
- v) The amount of this benefit remains constant over time.
- vi) As soon as the individual works for even one hour (declared), his unemployment benefit is withdrawn.
- vii) The individual's budget constraint, if he finds a job, is exactly the same as it was before he lost his job.



BAC = individual's new budget constraint.
 Optimum at point C ($H = 0$).

C. Résultats empiriques

The gains of the unemployed have little influence on the duration of unemployment.

In other words, the probability of accepting a job offer depends only slightly on the replacement ratio.

The sensitivity of the average duration of unemployment to the replacement rate (i.e. the amount of the unemployment benefit) depends on the duration of unemployment.

Example :

- Van Den Berg (1990), Netherlands.

A 10% increase in unemployment benefits after 2 years would increase the average duration of unemployment by about 5 weeks, instead of 1 week for benefits in the first year of unemployment.

The duration of benefit payments has a negative impact on the probability of exiting unemployment. The magnitude of this effect is not negligible.

Examples :

- Moffitt (1985) et Katz & Meyer (1990), USA.

An increase of 10 weeks in the potential duration of payment increases the average duration of unemployment by 1 to 2 weeks.

- Joutard et Ruggiero (1994), France.

The likelihood of finding a job increases significantly as the end of the entitlement period approaches. This effect is much more marked for unemployed people who previously received high wages because:

- a) They can find jobs more easily.
- b) The loss of income at the end of the entitlement period is lower for low-skilled workers, because the salary they can expect to obtain by working is relatively lower.