CUNEF
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Topic 7. The labor market

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Introduction

- In Topic 4, we already described the basic structure of the labor market as well as its main indictor: the unemployment rate $\rightarrow$ Please, review this!!
- In this topic, we are getting deeper at how the market for labor works:
  - In many dimensions, the market for labor si *similar* to any other market: supply vs. demand.
  - In the labor market the traditional roles are reversed:
    - Households are no longer consumers but producers/suppliers of labor.
    - Firms are no longer producers/sellers, but consumers of labor.
  - One key difference is that we care very much about the supply of labor that is not demanded in equilibrium: unemployment.

Outline

1. Labor supply: from individual to market supply
2. Labor demand: from individual to market demand
3. Market equilibrium and labor regulations
4. Labor and technology

Outline

Individual labor supply

- Let's imagine an individual, called Pablo, who needs to decide how many hours to work.
- Pablo's utility/satisfaction depends on two conflicting sources: consumption and leisure.

  To enjoy higher consumption one needs to work more which implies less leisure time.

  $\rightarrow$ Pablo needs to decide how much of each to "consume": consumption vs. leisure
- As the wage Pablo can obtain increases, two effects happen:
  - Working one more hour increase his/her income so that Pablo can consume more.
    - Substitution effect: Pablo gives up more leisure to enjoy more consumption
  - Working one more hour decreases in one hour the amount of leisure Pablo enjoys.
    - Income effect: Pablo demands more leisure time (normal "good").

Individual labor supply

- The substitution effect is larger than the income effect: labor supply is increasing in wages.

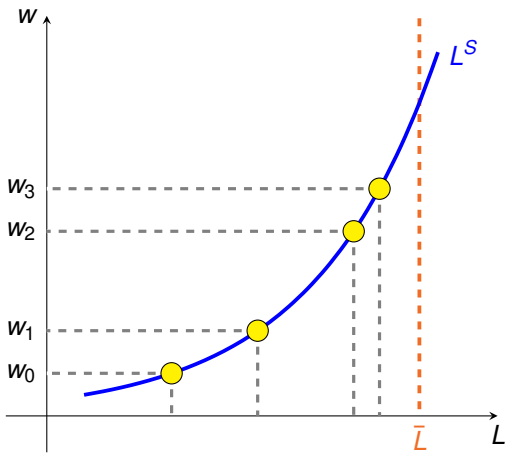
  Assuming we do not consider an insane amount of hours ($L \leq \bar{L}$).

- How much does labor supply increase when wages go up? That depends on the relative magnitude of the two effects, which depend on the level of labor supply itself:
  - When labor supply is low, the extra consumption I can enjoy generates a lot of utility through increased consumption because leisure is already high (not scare, lower "value").

    $\rightarrow$ A small increase in wages generates a large increase in labor supply
  - When labor supply is high, the extra consumption I could enjoy does not generate enough utility to compensate the loss in leisure time, which already small (scare).

    $\rightarrow$ A large increase in wages generates a small increase in labor supply

Individual labor supply



- Labor supply is increasing in wages

  $\bar{L}$: *max hours of work*

- When labor supply is low, income is low and the substitution effect is stronger:

  When L is low, a small increase in wages generates a large increase in labor supply.

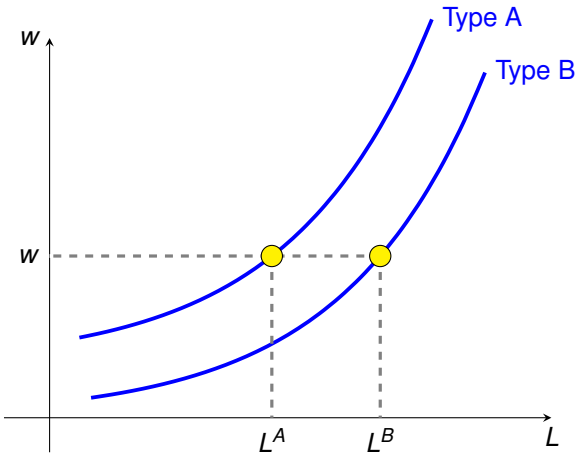
- When labor supply is high, income is already high and the income effect is stronger:

  When L is high, the individual "needs" a large increase in wages to work a bit more.

Individual labor supply

- Wages are not the only thing that matters to determine how much Pablo should work.
  - Other sources of income: if Pablo gets a high income from real estate, for instance, the income effect is stronger and he'll supply less labor for a given wage.
  - Preferences for leisure: if Pablo is a "workaholic", he'll supply more labor for a given wage.
  - Skills: if Pablo is highly skilled, he'll supply more labor for a given wage
    - Think of w as the wage per task completed.
    - If I'm high skill and will be able to complete more tasks in one hour, so my hourly wage is higher and I supply more labor.

Individual labor supply



- Type A:
  - low skilled
  - high assets
  - high preference
- Type B:
  - high skilled
  - low assets
  - low preference

Individual labor supply

- Would you work, even if very little, if the wage is very low?

  Answer: NO!

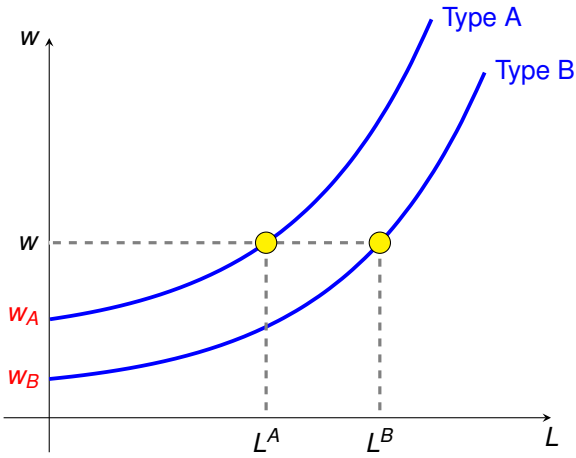
  - Working is costly: time to go the office, cost of waking up early, etc.
  - In other words: not working at all also gives some satisfaction.
  - This level of satisfaction is called outside option: the utility from not working at all

- Implication: Pablo will only work (even if very little) if the wage is above certain value that compensates him for his outside option.

$$L_P^S = 0 \quad \text{if} \quad w < \underline{w}$$

- Graphically...

Individual labor supply



- If Pablo is of Type A, he'll decide not to work at all if the wage is below w_A.
- If Pablo is of Type B, he'll decide not to work at all if the wage is below w_B.

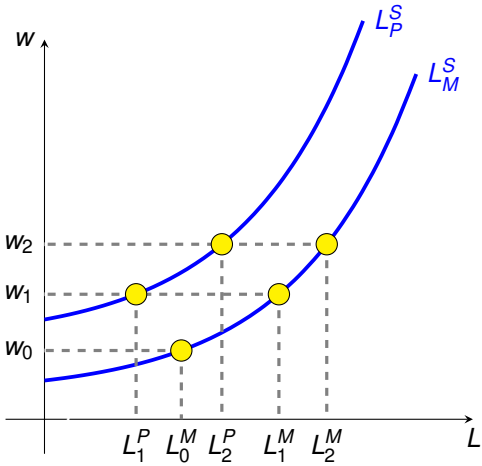
Aggregate labor supply

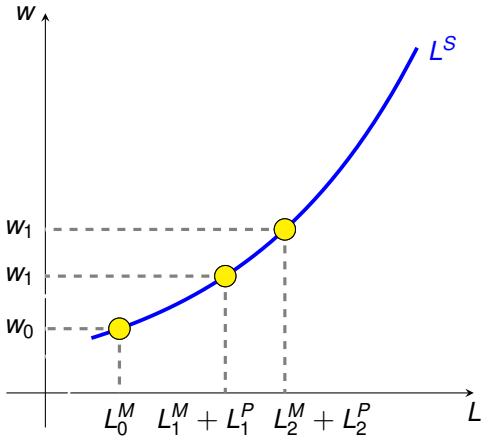
- Overall, given a wage w, Pablo wants to work $L_P^S(w)$.
- Let's now assume there is a second individual, Macarena, who would like to work $L_M^S(w)$ which can be higher or lower than $L_P^S(w)$ depending on Macarena's skills, assets, etc.
- In this (small) labor market, the total (aggregate)= labor supply given w is:

$$L^S(w) = L_P^S(w) \; + \; L_M^S(w)$$

- Let's imagine Macarena is highly skilled while Pablo is not.

Aggregate labor supply





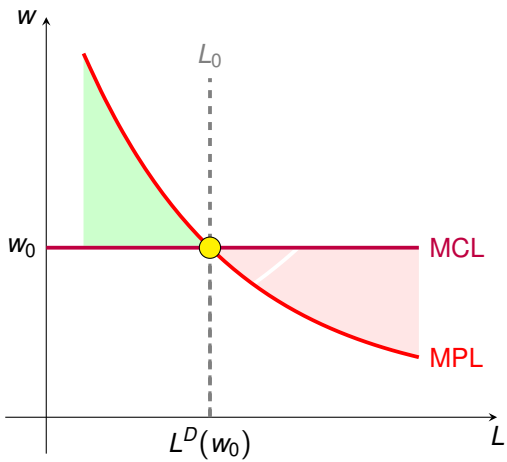
Outline

Individual labor demand

- Imagine CUNEF needs to decide whether to hire Pablo as a new professor.
- Hiring Pablo would imply...
  A. A rise in revenues, from the extra output Pablo produces: Marginal product of labor (MPL)
     - Always positive: adding one extra worker never decreases output.
     - Decreasing as labor grows (law of decreasing return): output grows more from hiring the 10th worker than from hiring the 100th.
  B. An increase in production costs, from Pablo's wage: Marginal cost of labor (MCL)
     - If I hire one extra worker, my labor costs increases by his/her wage.
- Clearly, CUNEF will hire Pablo if and only if MPL $\geq$ MCL...

  ... and will keep hiring professors until MPL $=$ MCL.

Individual labor demand



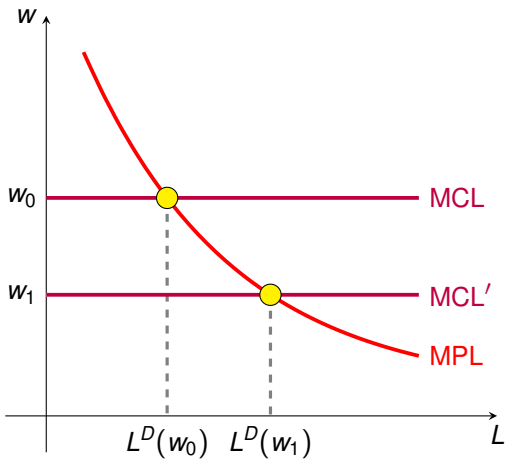
- The marginal cost of labor is given by q, and is independent from the number of workers.
- The marginal product of labor is decreasing with the level of labor.
- For any level of labor below L_0^D, hiring an additional worker generates higher extra revenues (MPL) than extra labor costs (MCL)
- By contrast, for any level of labor above L_0^D, hiring an additional worker generates more costs than revenues.
- If $w = w_0$, the firm should hire L_0^S workers.

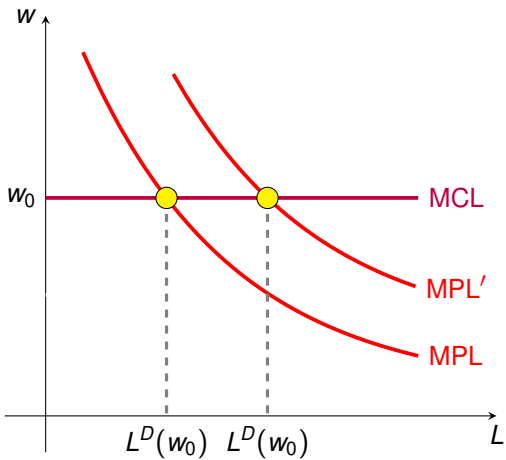
Individual labor demand

- CUNEF should hire as many professor as required in order to make the marginal product of labor equal to the wage (marginal cost of labor).
- The number of professors CUNEF hires will increase when:
  - The wage decreases the level of L at which MPL $=$ MCL increases.

    And vice-versa: if w increases, the level of L at which MPL $=$ MCL decreases
  - The MPL increases, so that the level of L at which MPL $=$ MCL increases too.
    - This may happen when the firm increases its capital or improve its technology.
    - Both changes allows each worker to produce more, increasing the extra revenue each of them generates (marginal product of labor).

Individual labor demand





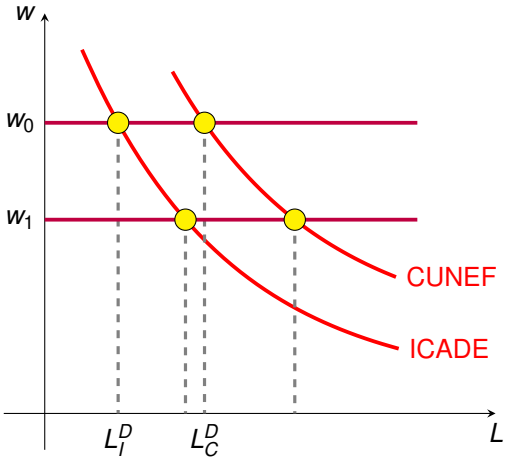
Aggregate labor demand

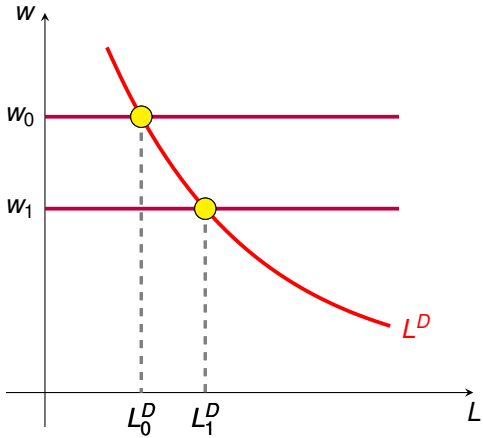
- Overall, given a wage w, CUNEF wants to hire $L^D_{CUNEF}(w)$ professors.
- Let's now assume there is a second university, ICADE, whose labor demand is $L^D_{ICADE}(w)$
- In this (small) labor market, the total (aggregate) labor demand given w is:

$$L^D(w) = L^D_{CUNEF}(w) \; + \; L^D_{ICADE}(w)$$

- Let's imagine ICADE is less productive than CUNEF so that its MPL is lower

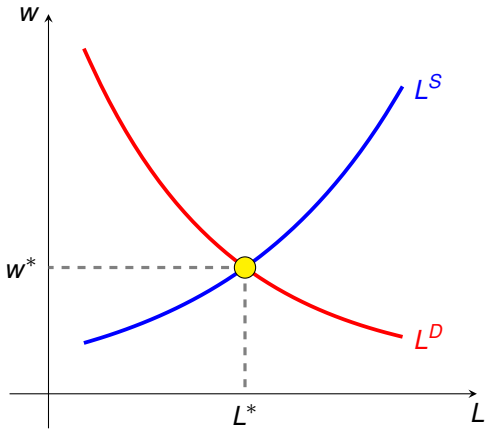
Aggregate labor demand





Outline

Efficient equilibrium



- The aggregate supply of labor is increasing in wages.
- The aggregate demand of labor is decreasing in wages.
- There exists only one level of wages, w^*, such that demand and supply are equal: the equilibrium wage. When $w = w^*$:
  - All those who want to work, do so.
  - No unemployment in the economy.

Efficient equilibrium

- In this economy, there is no unemployment:
  - The labor market is efficient.
  - The equilibrium wage "clears the market": all those who want to work, do so.
- But we do observe unemployment in reality... Where does it come from? Inefficiencies:
  A. Search frictions
  B. Wage rigidities
  C. Labor regulations

Search frictions

- The process of finding a job/employee is complex: firms post vacancies (i.e. Infojobs), workers search for them and then decide whether to accept it or not.
- A worker that is willing to work at the offered wage may still not accept the offer:
  - Maybe the vacancy is in a different city.
  - Maybe the worker thinks she/he may get a better offer soon, and prefers to wait.

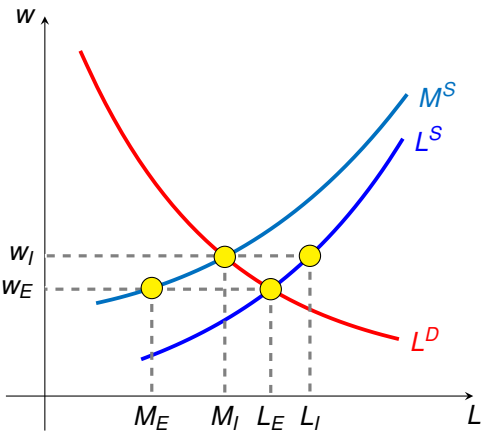
  so that effective labor supply is smaller:

$$M^S(w) = L^S(w) - X(w)$$

  where $X(w)$ is the number of workers that agree on w but still do not accept the offer.

  $\rightarrow$ $X(w)$ is decreasing in the wage: higher w induces workers to accept more offers.

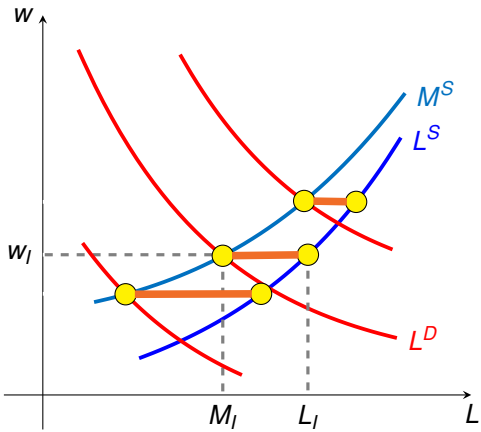
Search frictions



- The efficient equilibrium is (w_E, L_E).
- For a given supply of labor and a wage rate, there is a fraction of people that prefer not to accept the offer.
- However, at this wage, only M_E workers accept offers so firms run short of labor: they need to increase the offered wage.
- The wage increases up to w_I where the demand of labor equals the *effective* supply:

$$L^D(w_I) = M(w_I)$$

Search frictions



- There is unemployment! $u(w_l) = L_l - M_l$
- If the demand of labor increases...

  The equilibrium wage increases and the amount of workers that reject offers is smaller: lower unemployment
- If the demand of labor decreases...

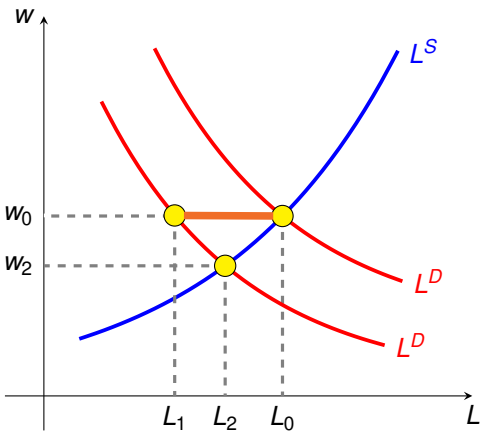
  The equilibrium wage decreases and the amount of workers that reject offers is higher: higher unemployment

Wage rigidities

- Another source of unemployment is the existence of downwards wage rigidities: wages do not adjust intermediately when the demand of labor falls.
- This implies that, for some time, the wage is above the equilibrium wage:
  - The supply of labor remains the same (the wage has not changed)
  - The demand of labor has fallen

  Demand and supply are not equalized: unemployment!

Wage rigidities



- Initial (efficient) equilibrium: (w_0, L_0)
- There is a negative shock in the economy that depresses labor demand (e.g. an increase in energy prices)
- The new (efficient) equilibrium is: (w_2, L_2)
- But if wages do not adjust an stay (for some time) at w_0: $L^D(w_0) < L^s(w_0)$
- Until the wage adjust to its new equilibrium level, the demand of labor is smaller than the supply: unemployment.

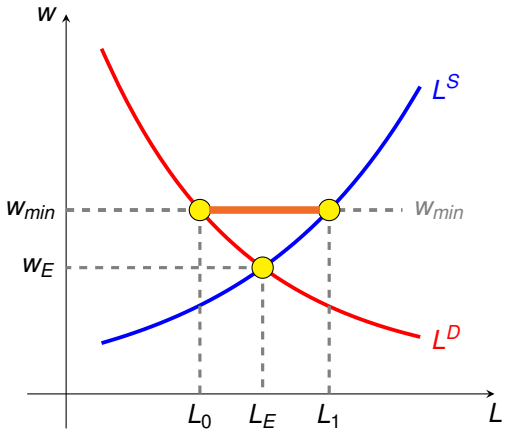
Labor regulations

- An additional source of unemployment may be labor regulation.

  In the pursue of some social goal, the government may want to introduce regulations in the labor market that makes it inefficient.

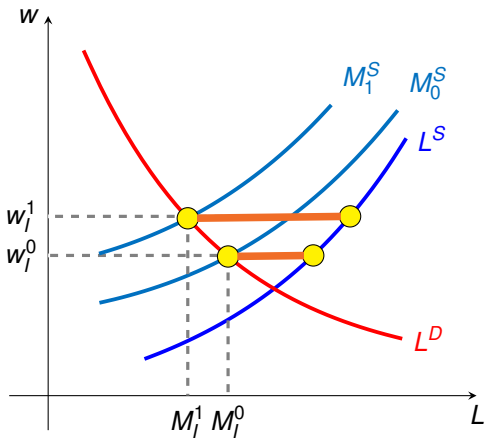
- Two typical examples:
  - The establishment of a minimum wage above which firms cannot hire.
  - The establishment of some unemployment benefits that allowed unemployed individuals to cover their basic needs.
- These two regulations, which may be desirable in other dimensions, distort the efficiency of the labor market potentially generating unemployment.

Labor regulations: minimum wage



- Initial (efficient) equilibrium: (w_E, L_E)
- The government decides to set a minimum wage at w_{min} which is greater than w_E.
- For a wage of w_{min}, firms demand L_0 and workers supply L_1
- The demand of labor is smaller than the supply: unemployment.
- Question: What if $w_{min} < w_E$?

Labor regulations: unemployment benefits



- Imagine there are search frictions and we start at the (inefficient) equilibrium (w_l^0, M_l^0).
- The government decides to establish some unemployment benefits: people get income from the gov. while unemployed.
- This benefits make rejecting an offer less costly, so more people do so.
- The new equilibrium is (w_l^1, M_l^1).

  Higher unemployment!

Summing up on unemployment

- Overall, unemployment comes from:
  A. Search frictions: some people who find it optimal to work at a wage w do not work either because it involves other costs (moving to a different city) or because they expect to receive a better offer soon.
  B. Wage rigidities: the wage does not fall immediately after a negative shock to labor demand, so that, for some time, it is above the equilibrium wage: demand $<$ supply.
  C. Labor regulations:
     - Minimum wage: if the government sets a minimum wage above the equilibrium wage, demand $<$ supply.
     - Unemployment subsidies: if being unemployed yields higher income, not accepting an offer is less costly, exacerbating search frictions.

Outline

1. Labor supply: from individual to market supply
2. Labor demand: from individual to market demand
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4. Labor and technology

Labor and technology

- "Robots are going to take away our jobs"... Have you ever heard this? The debate on whether technology will substitute workers is much older than what people typically think...
  - During the 1910s, English artisans ("Luddites") destroyed 1,000 looms out of a total of 25,000.
  - In the 1930s, JM Keynes warned of the dangers of technological unemployment.
  - In a 2017 European Commission survey, 72% of respondents said they agreed with the statement "Robots are stealing our jobs."
- Where does this fear come from? The belief that the number of tasks in the economy is fixed.

  $\rightarrow$ "Luddite fallacy"

Labor and technology

- What effects has technological development had on employment over the last 200 years?

  Three key results:

  1. Technological progress has not generated net job losses.
  2. Technological progress has led to a redistribution of employment among sectors and occupations.
  3. Technological progress has allowed for a systematic reduction in working hours.

Labor and technology

1. Technological progress has not generated net job losses.

- No doubt that technological progress has led to the disappearance of many jobs/occupations:
  - The first Industrial Revolution brought the mechanization of textiles...

    ...forcing many artisan to lose their jobs
  - The second Industrial Revolution brought the internal combustion engine...

    ...leading to horse dealers with very little business.
  - The third Industrial Revolution brought computing and the internet...

    ...causing big troubles to typist.
- But it has also created many new jobs/occupations.

Labor and technology

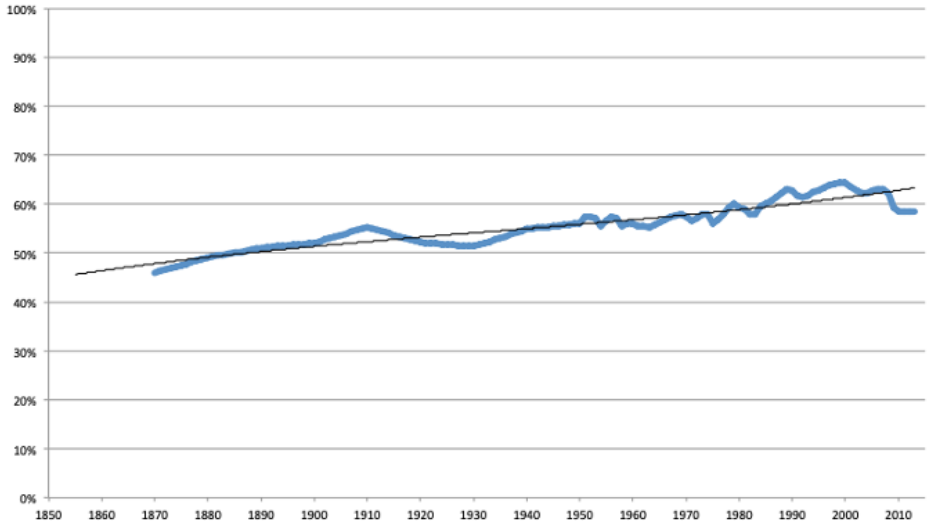
1. Technological progress has not generated net job losses.

- Technological progress creates new jobs that did not previously exist: industrial machines replaced artisans, but created jobs needed to build, repair, and distribute the machines.
- Sectors affected by technology may experience an increase in employment: technological improvement allows for a reduction in the cost of goods, generating an increase in demand which, if large enough, creates employment.

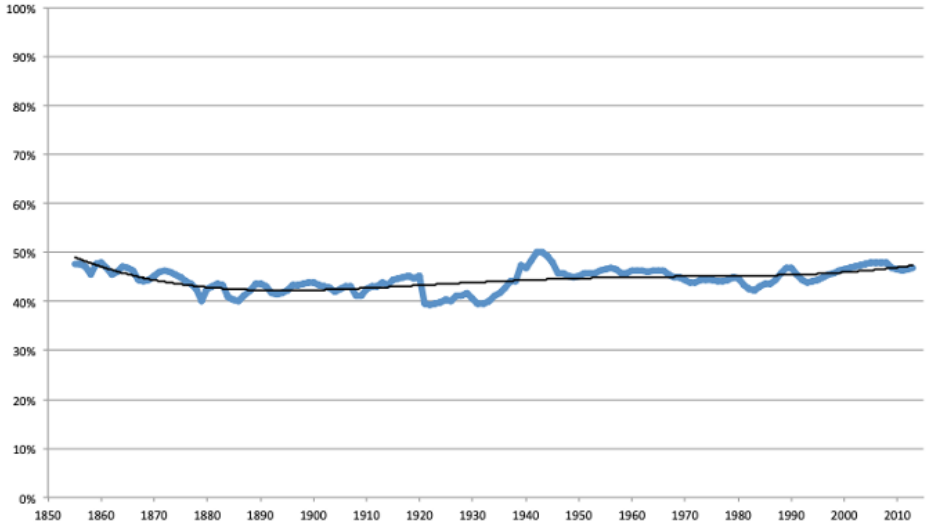
  For example, ATMs reduced the number of employees per bank office from 20 to 13 between 1988 and 2014, but the number of offices increased by 43%.
- New technologies "free" workers from sectors with high productivity growth to sectors with less technological growth (Baumol Effect).

  Agricultural technology allowed a large portion of the population to be employed in industry.

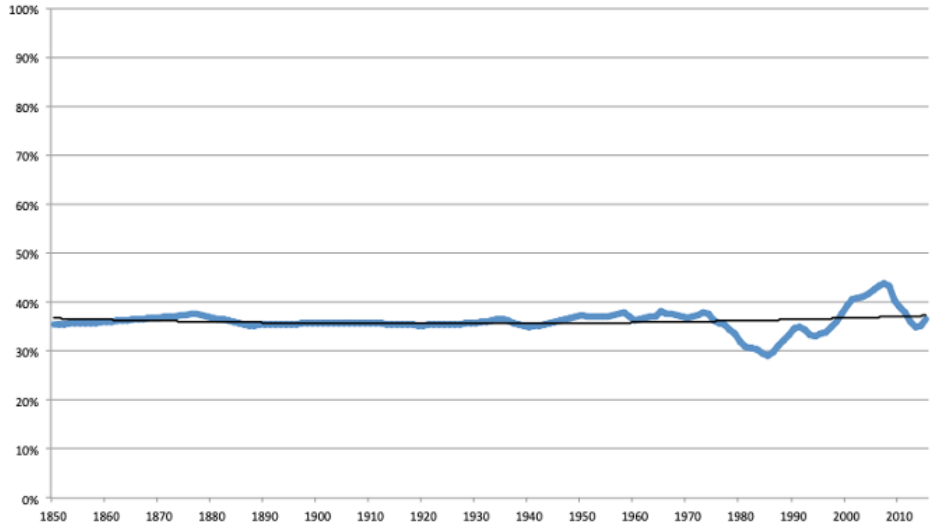
Employment share in the US



Employment share in the UK



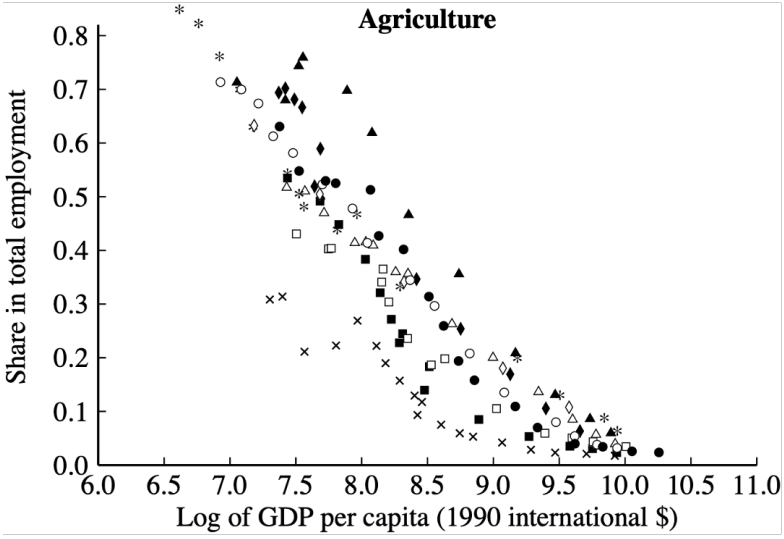
Employment share in Spain



Labor and technology

2. Technological progress has led to a redistribution of employment among sectors and occupations.

- If technology has destroyed jobs, but total employment has not changed, where have the destroyed jobs gone?
- The Baumol effect, which we have already mentioned, tells us that technology allows workers to be freed up in some sectors and employed in others.
- This is exactly what we observe: as a country develops, employment...
  - It falls in the agricultural sector.
  - First it rises and then it falls in the industrial sector.
  - It increases in the services sector.


Agriculture
Share in total employment
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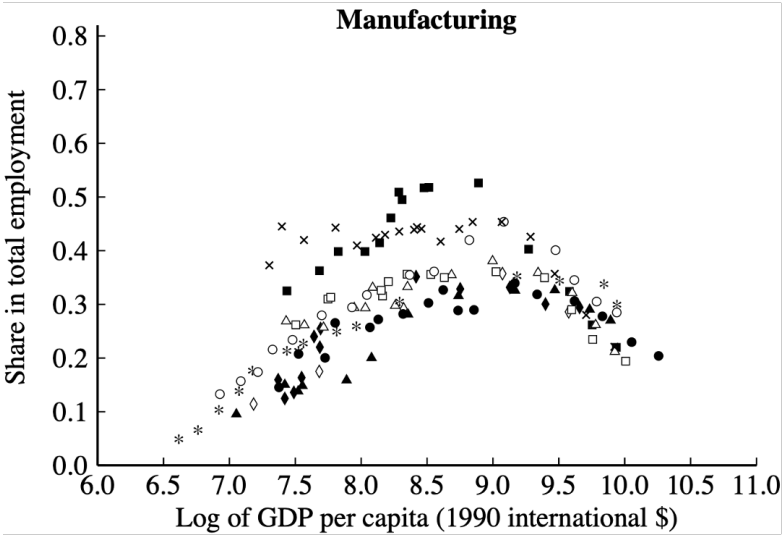
Log of GDP per capita (1990 international $)


Manufacturing
Share in total employment
0.0
0.1
0.2
0.3
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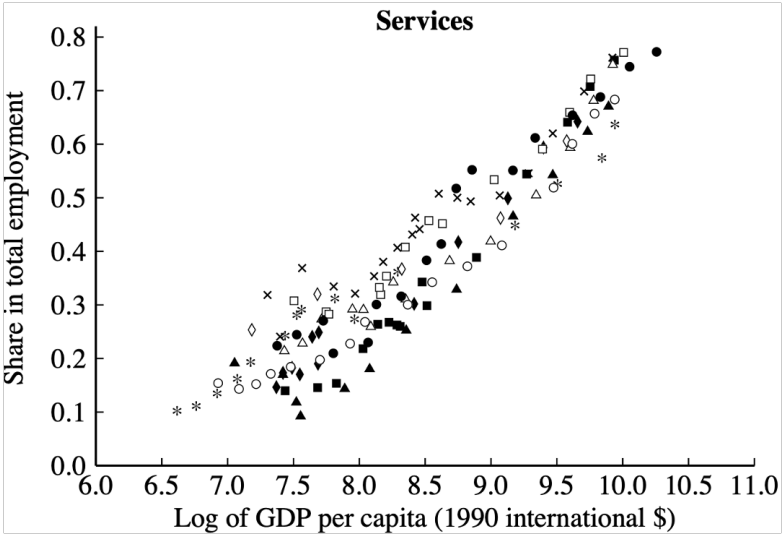
Log of GDP per capita (1990 international $)


Services
Share in total employment
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7.0
7.5
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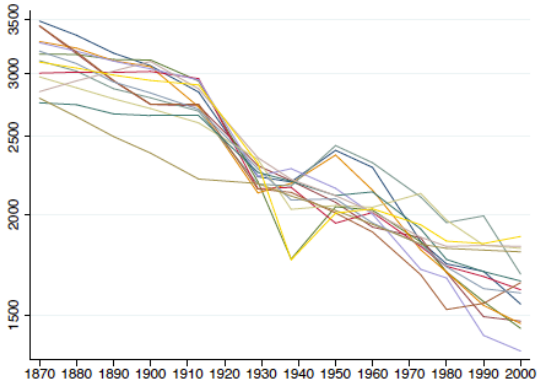
Log of GDP per capita (1990 international $)

Labor and technology

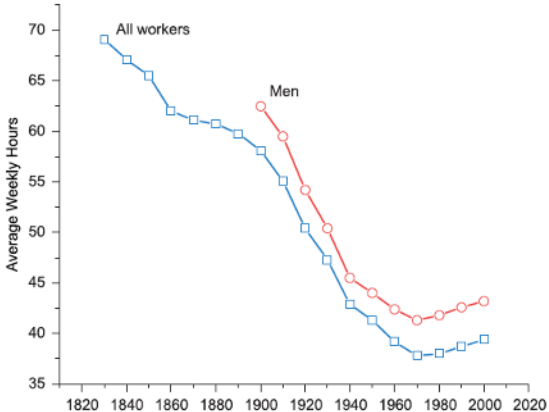
3. Technological progress has allowed for a systematic reduction in working hours.



- Hours per worker have been steadily decreasing in (almost) all developed economies.
- Technological progress increases income, and leisure is a “normal good”: higher income increases its demand.
- At the core of this trend is the fact that with better technology we can produce more in less time.

Labor and technology

3. Technological progress has allowed for a systematic reduction in working hours.



- Exceptionally, working hours have increased in the US in recent years. Why?
- Increasing income inequality:
  - High pay jobs are paying much more.
  - Higher incentives to work longer to promote and get one of those jobs.
  - “Fighting for your career”.

Questions?