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Macroeconomics 1

Lecture 2: The WS-PS Model: Employment, unemployment and real wages.

2025-2026

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Lecture 2

Class outline:

- Employment, unemployment and real wages
- The Wage Setting curve (WS)

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Lecture 2

Readings:

- The CORE Team. (2023). *The Economy 2.0: Macroeconomics* (módulos 1.5-1.6)

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The WS-PS Model: Employment, unemployment and real wages

The WS-PS model

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Model: a simplified representation of certain aspects of reality that allows us to examine or describe how those aspects function.

The WS–PS model is a model that provides a simplified representation of the functioning of the labor market and the goods market (the supply side of the economy).

Its name derives from the two curves that intersect in the model and determine equilibrium: the **WS (wage-setting)** curve and the **PS (price-setting)** curve.

The intersection of these two curves (whose positions depend on a set of variables and parameters) **endogenously determines** the levels of real wages, employment, and unemployment.

The WS-PS model

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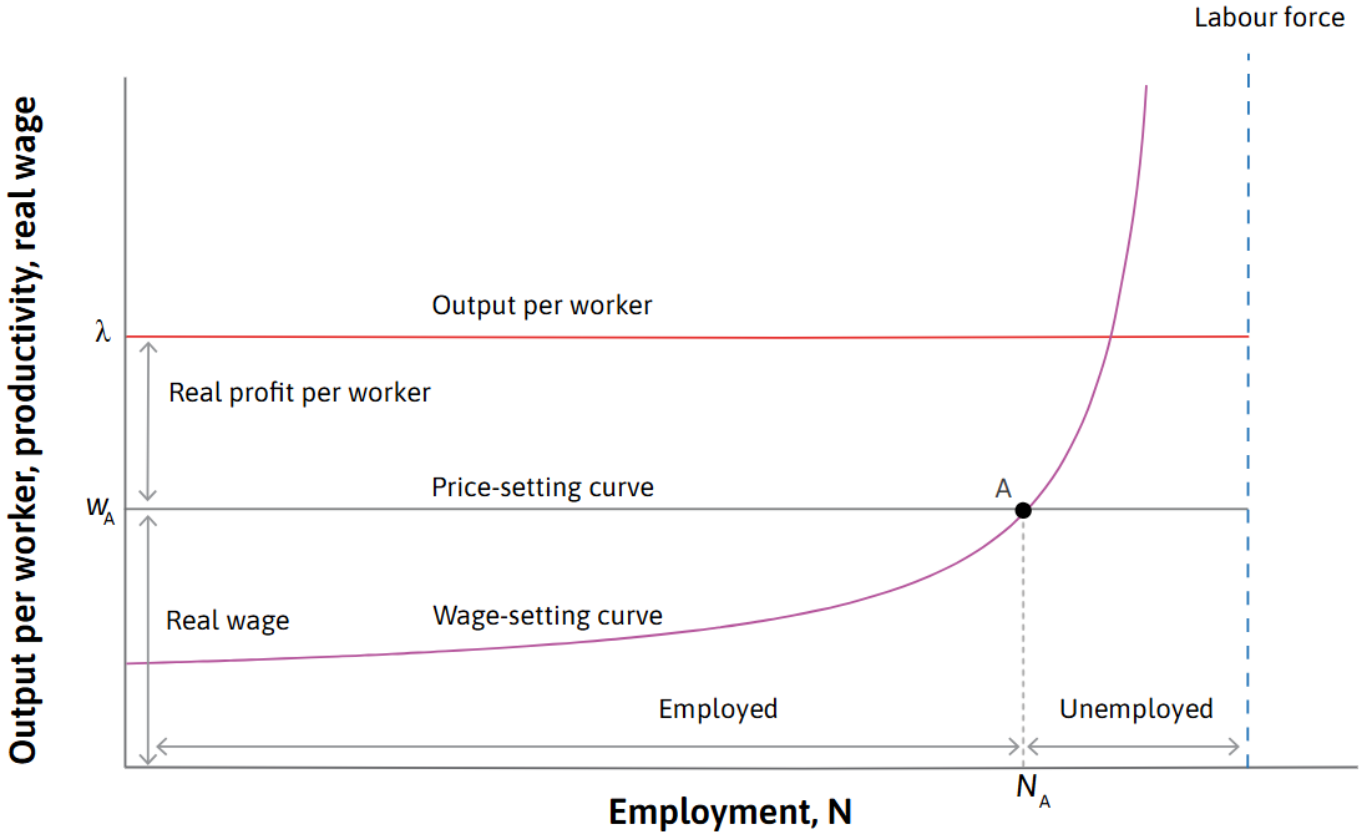

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Figure 1.15 The WS–PS model of the economy's supply side.

The WS-PS model

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We will see, step by step, what determines the position of each of these two curves.

Let us begin by identifying the **economic agents** whose decisions are relevant here:

- **Firms**, which employ workers and sell what they produce.
- **Households**, which buy those products and whose members are employed by these firms (or are unemployed).

These interactions take place in **two markets**:

- The **labour market**
- The **goods market**

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As in any model, we will assume a set of simplifications. For example:

- We assume that there are **no self-employed or inactive workers** (only unemployed workers or workers employed by firms).
- **We ignore differences among workers** in terms of the types of tasks performed, wage levels, etc.
- We also assume that **average labor productivity, Y/N, is constant** and the same for all workers.
- We **ignore differences among the goods and services** produced in the economy (as if all firms were identical and produced only one type of product, whose total quantity produced we denote by Y and whose unit price we denote by P).

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Notation:

Y = quantity produced

P = price of a unit of good

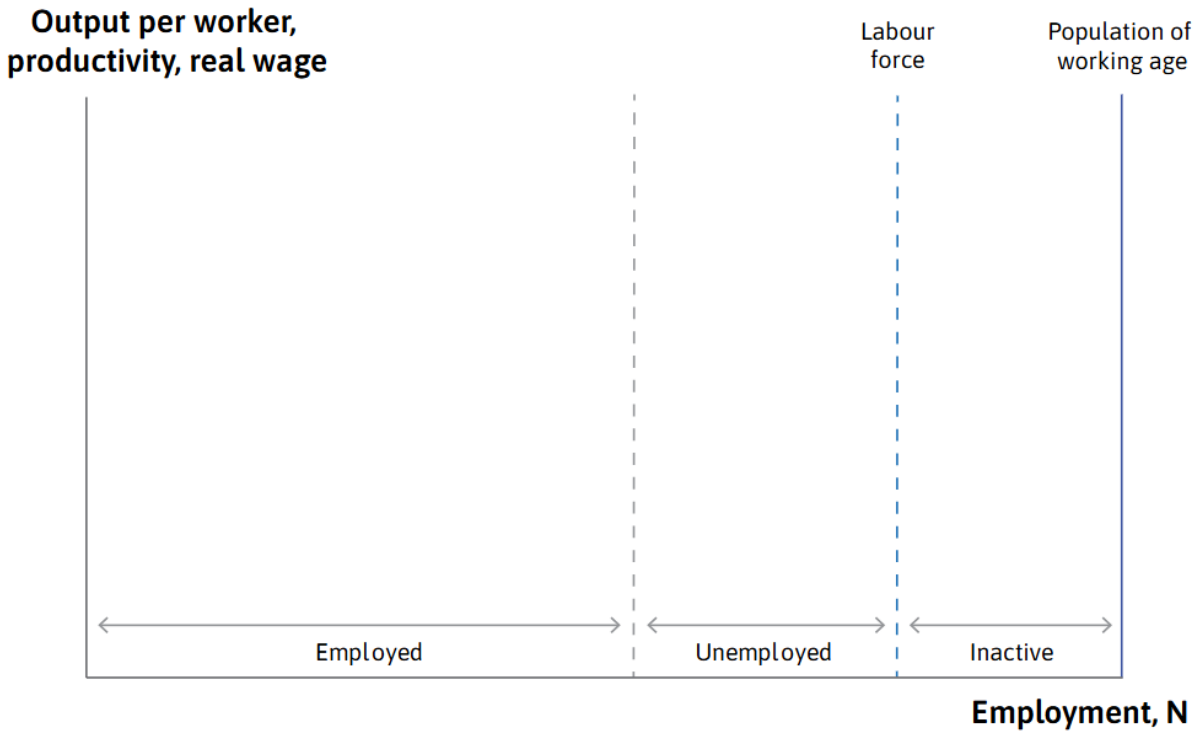
N = number of workers employed

$\lambda = Y/N$ = average labour productivity (output per worker)

W = nominal wage

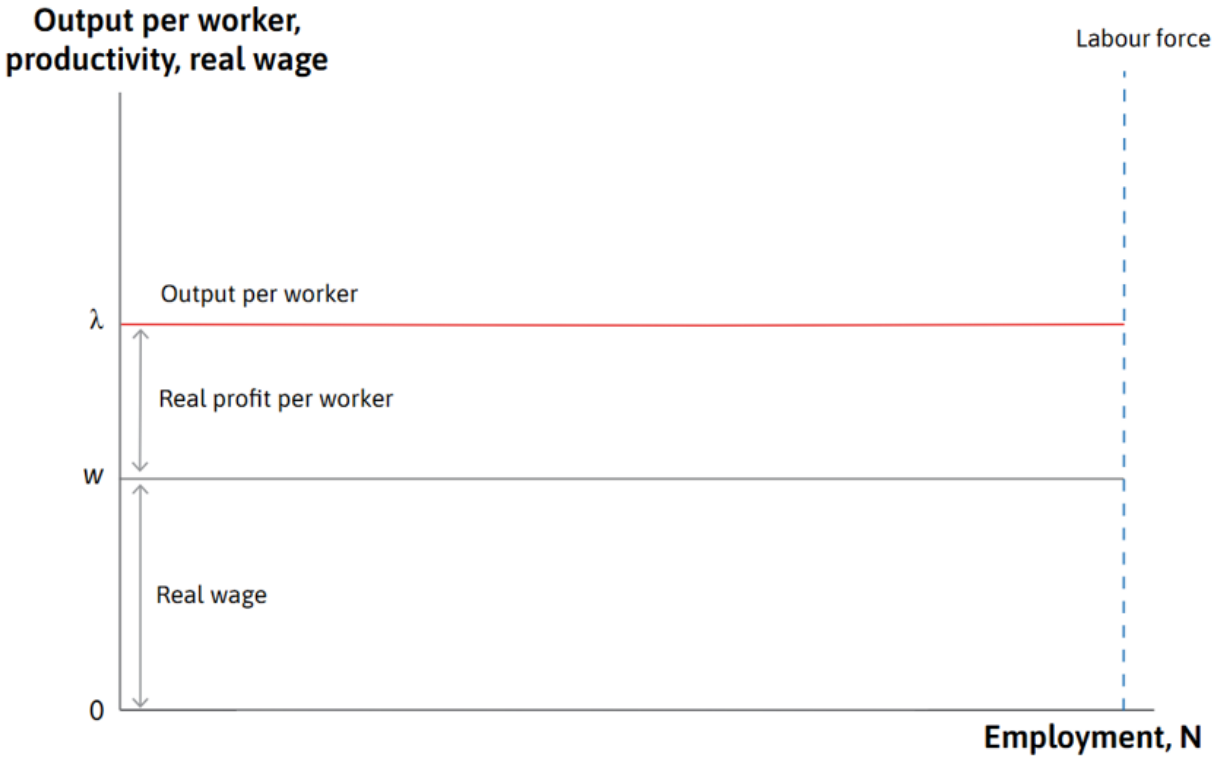
$w = W/P$ = real wage

The WS-PS model



If we represent the level of employment, **N**, on the horizontal axis, that level of employment (given the working-age population and the labor force participation rate) determines the number of employed workers, the number of unemployed workers, and the unemployment rate.

The WS-PS model



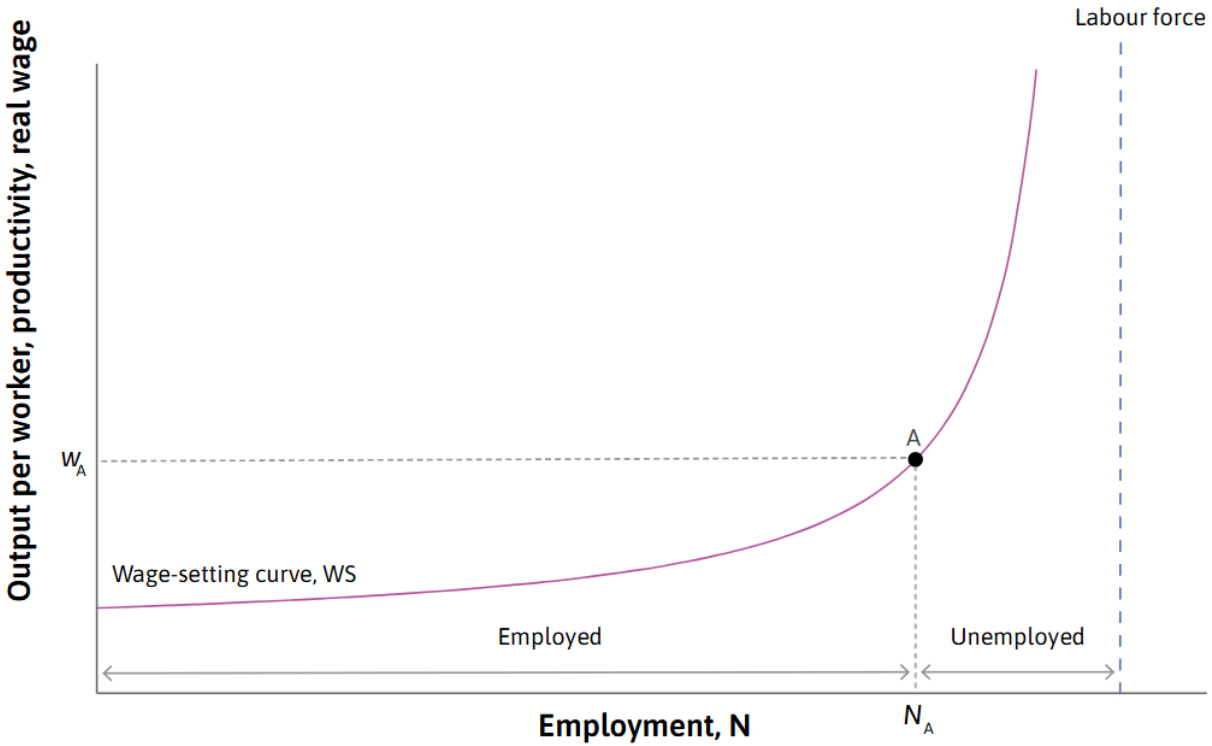
If we place the level of employment **N** on the horizontal axis and represent real output per worker **λ** and the average real wage **w** on the vertical axis:

- we observe that (given the assumptions made) both **λ** and **w** are constant (they do not depend on the level of **N**);
- we observe that the difference **(λ – w)** is equal to real profit per worker

⇓

Functional income distribution

The WS-PS model



The wage-setting (WS) curve relates the level of the real wage to the level of employment.

It tells us what **real wage firms must pay for each level of employment they wish to hire**: the more workers they want to recruit, the higher the wage they must pay (we will examine in detail why this is the case later on).

The curve **becomes increasingly steep as the level of unemployment approaches zero** (we will also see why), which implies that there is always unemployment in the economy in this model.

The WS-PS model

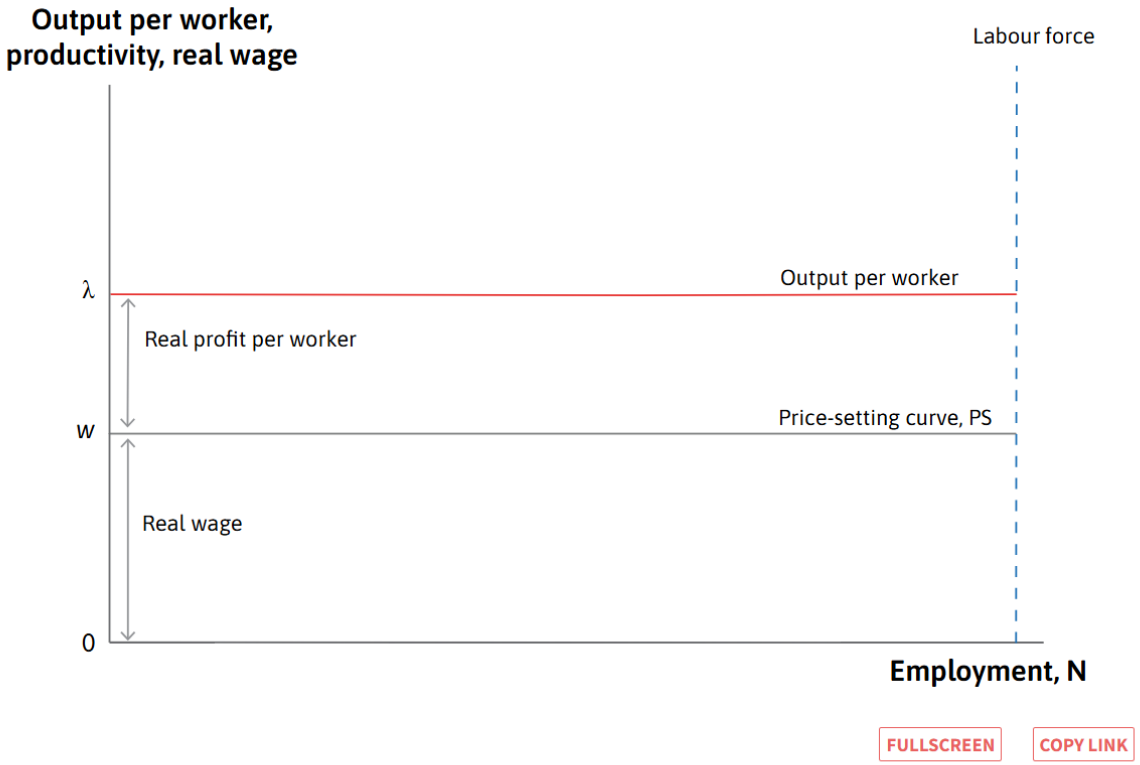


Figure 1.14 The price-setting (PS) curve.

The price-setting (PS) curve indicates the level of the real wage **w** that results from firms setting the price **P** in order to maximize their profits (we will see how this works in more detail later on).

The real wage **w** depends on **P** because **w = W / P**. When firms increase the price **P**, the real wage **w** decreases.

Recall that neither **λ** nor **w** depend on the level of employment **N**, and therefore they are represented as horizontal lines in this graph.

The WS-PS model

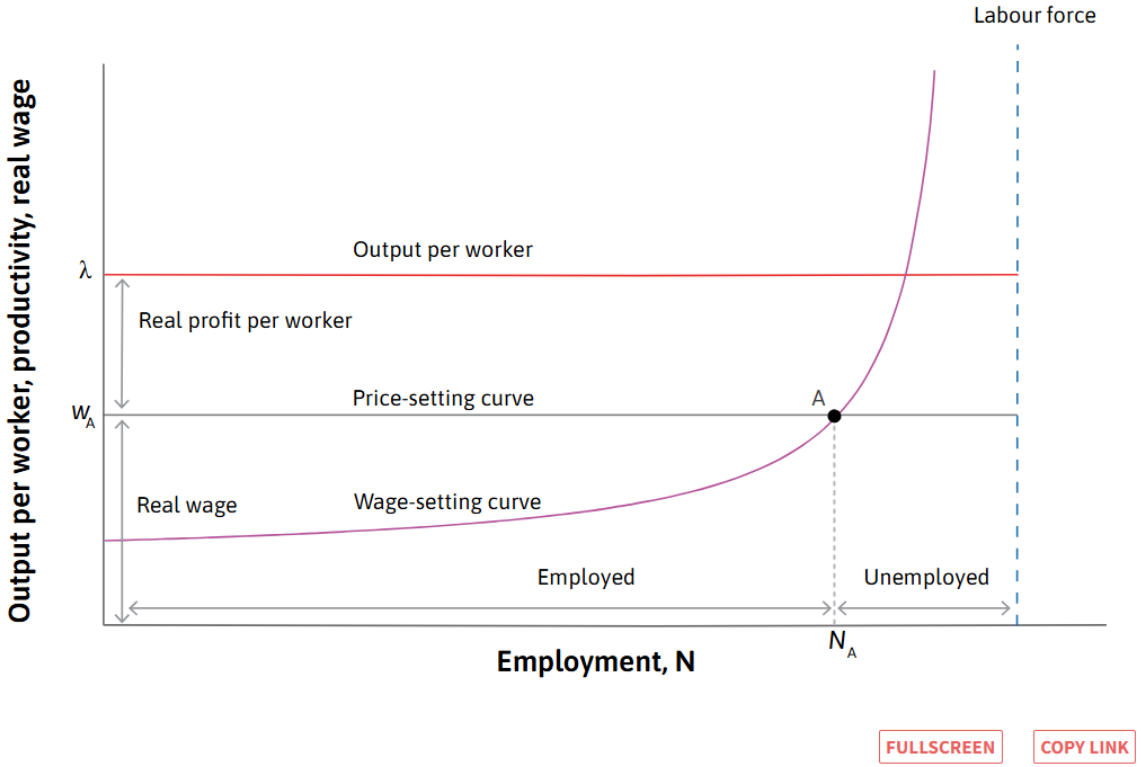


Figure 1.15 The WS–PS model of the economy's supply side.

When we combine the price-setting (PS) curve and the wage-setting (WS) curve, we obtain the complete WS–PS model.

The intersection of the two curves produces a **unique equilibrium** (point A), which is a **general equilibrium**, as it links equilibrium in two markets: the labor market and the goods market. This equilibrium determines the level of the real wage (**w**), the level of employment (**N**), and the level and rate of unemployment.

Only at point A do firms simultaneously ensure two conditions: that the **price level P** maximizes their profits, and that **the real wage w** level allows them to recruit and motivate the workers needed to sustain that level of production.

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The wage setting curve (WS)

"*Matching*" in the labour market

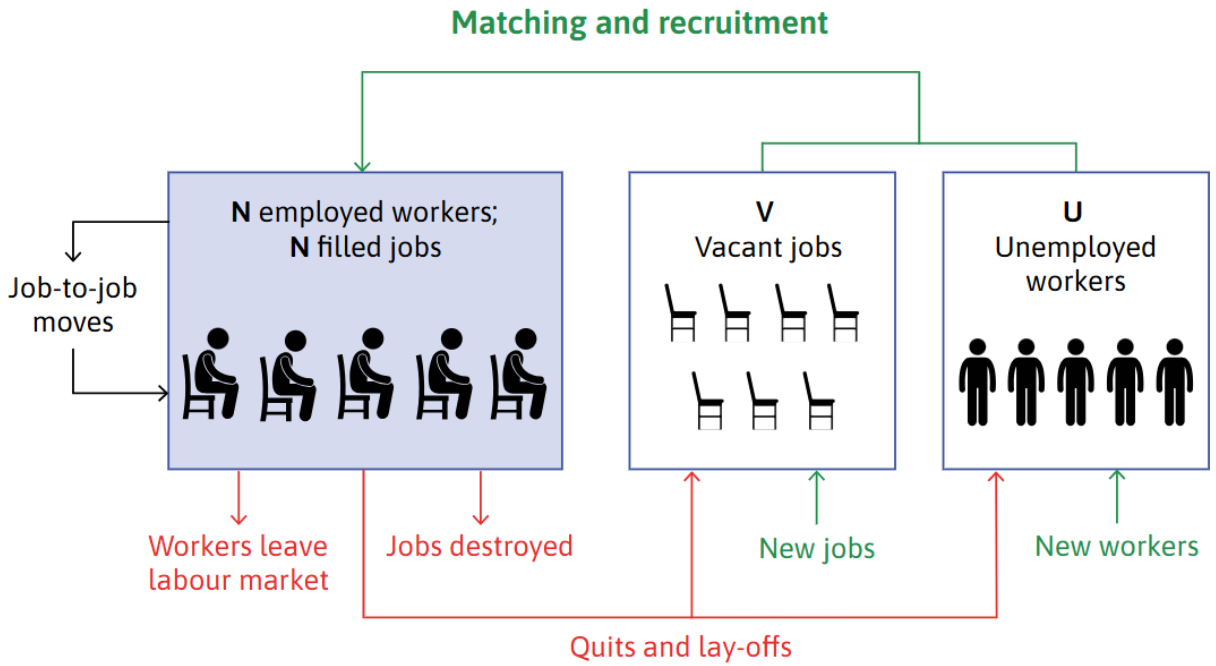

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Figure 1.17 Labour market matching: flows, workers, and jobs.

The firm's recruitment problem

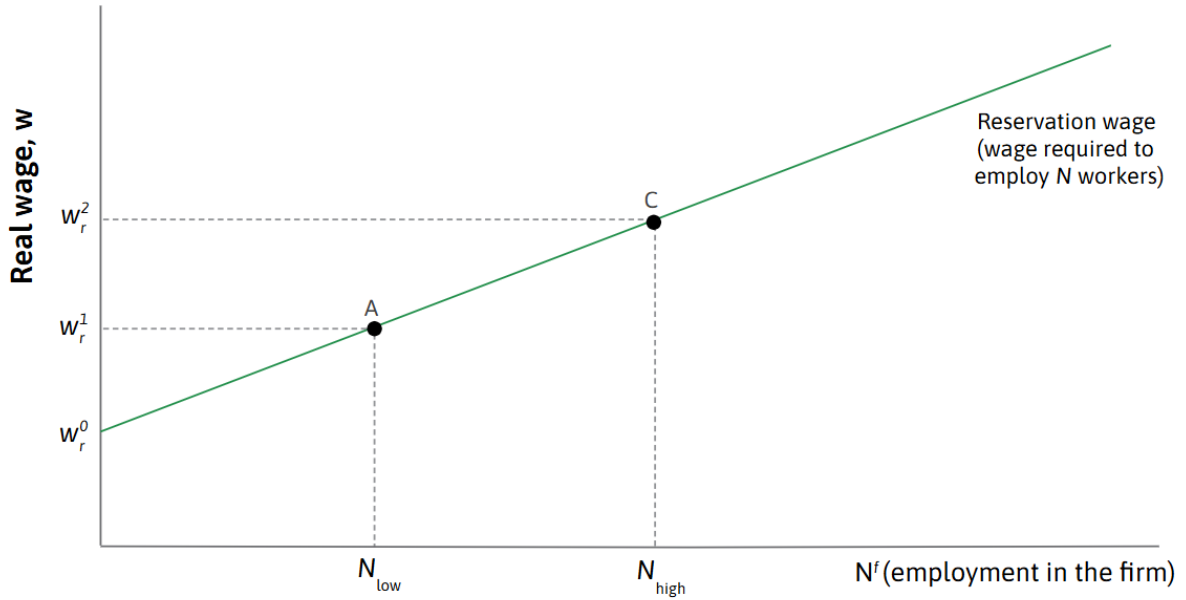

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Figure 1.18 The reservation wage facing the firm.

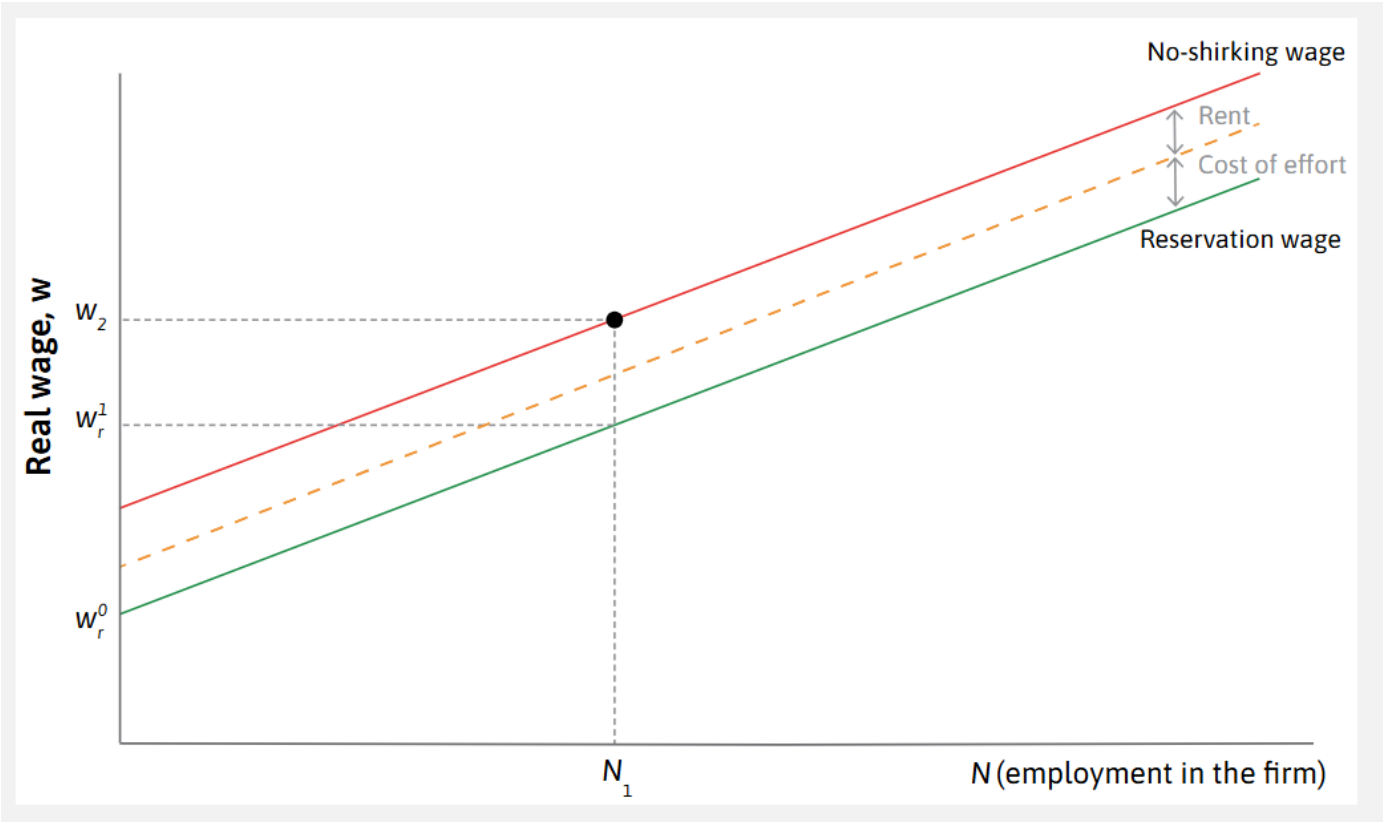
Each worker has what is known as a **"reservation wage"** (the wage at which the worker is indifferent between working and earning that wage, or being unemployed).

This reservation wage depends on several factors, such as unemployment benefits, the net utility of unemployment, wages paid elsewhere in the economy, the ease of finding alternative employment, and so on.

Reservation wages differ across workers. The more workers a firm wishes to hire, the higher the wage it will have to pay.

Example: uber dynamic wage for US drivers.

The firm's recruitment problem

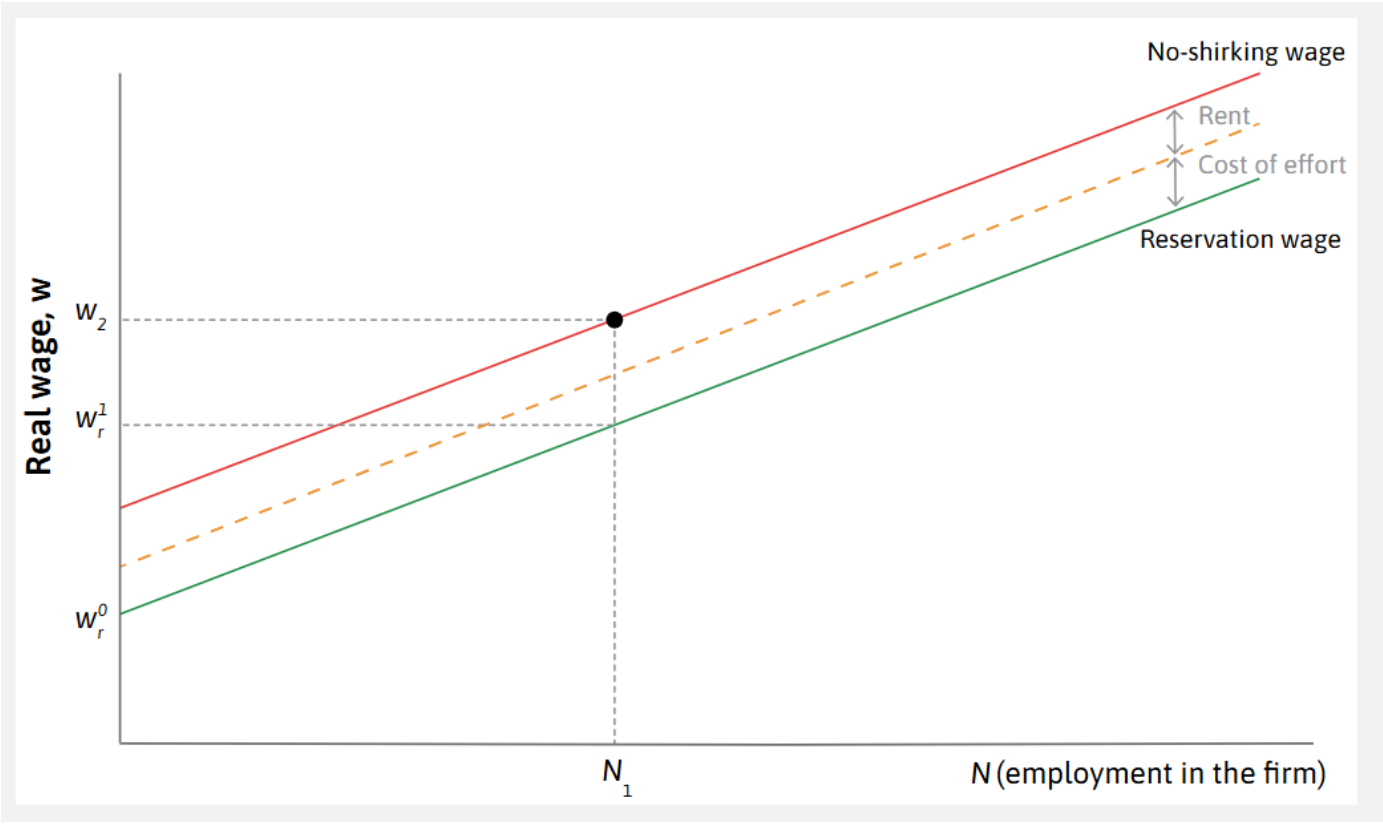


However, the firm also faces a **motivation problem**, resulting from the fact that workers' effort and dedication are not easily observable or controllable.

The firm wants to ensure that workers are diligent and exert effort. To achieve this, it pays a wage **above the reservation wage**, so that workers have something to lose if they do not exert effort and are caught.

This is known as the **no-shirking wage**: it starts from the reservation wage and includes an additional component that covers (i) the disutility of extra effort, and (ii) a **rent**, corresponding to the advantage that would be lost in the event of dismissal.

The firm's recruitment problem



Factors that shift (upward or downward) the reservation wage curve and the no-shirking wage curve:

- Changes in unemployment benefits
- Changes in quality of life without employment relative to quality of life with this job
- Changes in the ease of finding alternative employment (lower unemployment rate)
- Changes in wages in alternative jobs
- Changes in the employer's ability to monitor worker effort
- Changes in the ease and cost for the employer of dismissing a worker if caught shirking
- Changes in the utility/disutility for the worker of exerting the required effort

Example: how should you set the minimum wage across region within the same country?

Generalizing the recruitment problema to the economy as a whole: the WS curve

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The previous slides show us how each individual firm must pay a higher wage the greater the number of workers it intends to recruit.

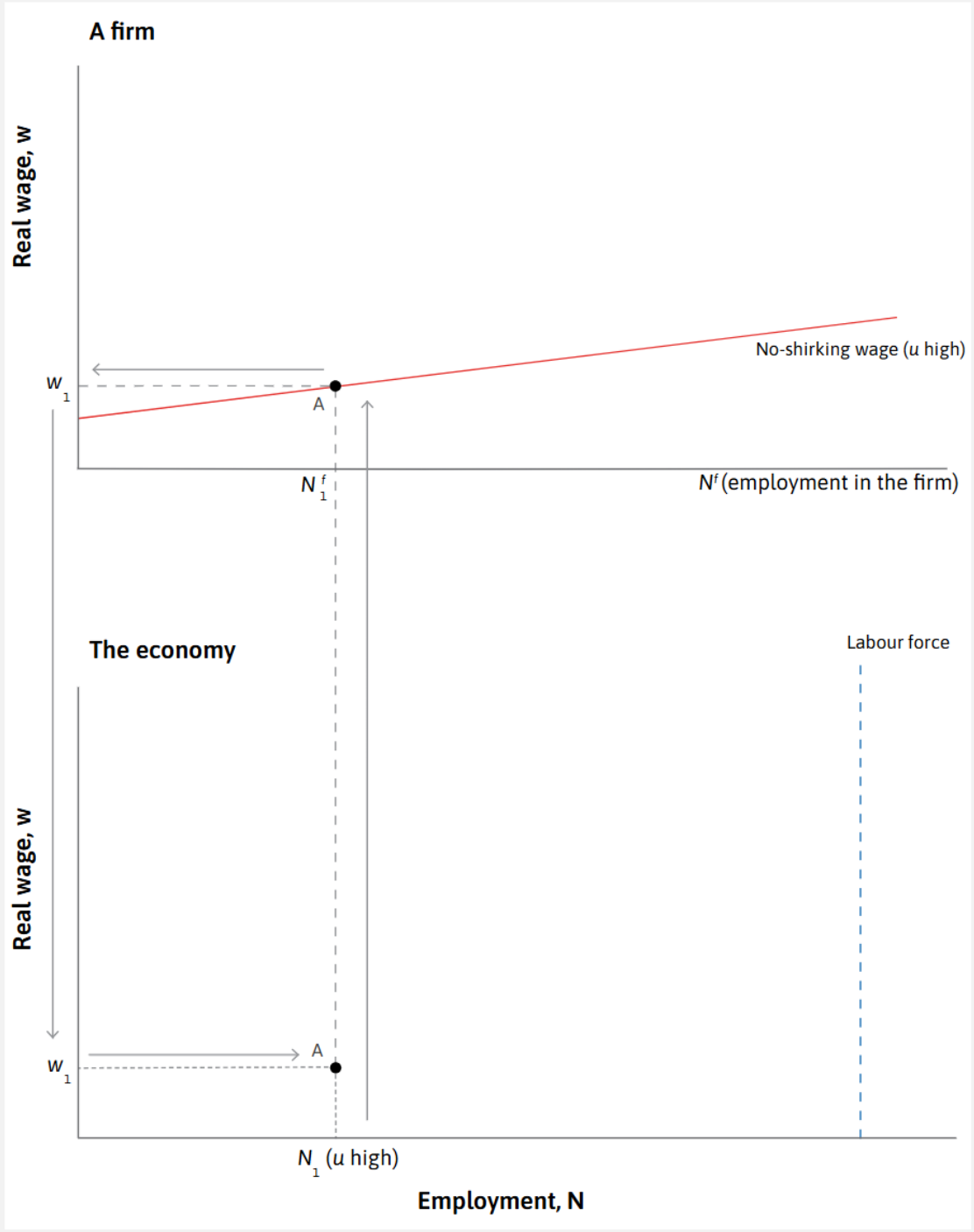
That wage level depends on the reservation wages of the various workers (which in turn depend on a range of individual and institutional factors) and on the additional component intended to ensure motivation / prevent shirking.

When we move to the scale of the economy as a whole, we must take into account the **interdependencies** between different firms: for example, if all firms decide to offer higher wages and hire more workers, this simultaneously affects the probability and attractiveness of alternative jobs, so that the reservation wage curve (and the no-shirking condition) itself also shifts.

The WS curve

By paying the real wage $\mathbf{w_1}$, the firm hires $\mathbf{N^f_1}$ workers.

If the economy is composed of many identical firms, this results in a total level of employment $\mathbf{N_1}$.



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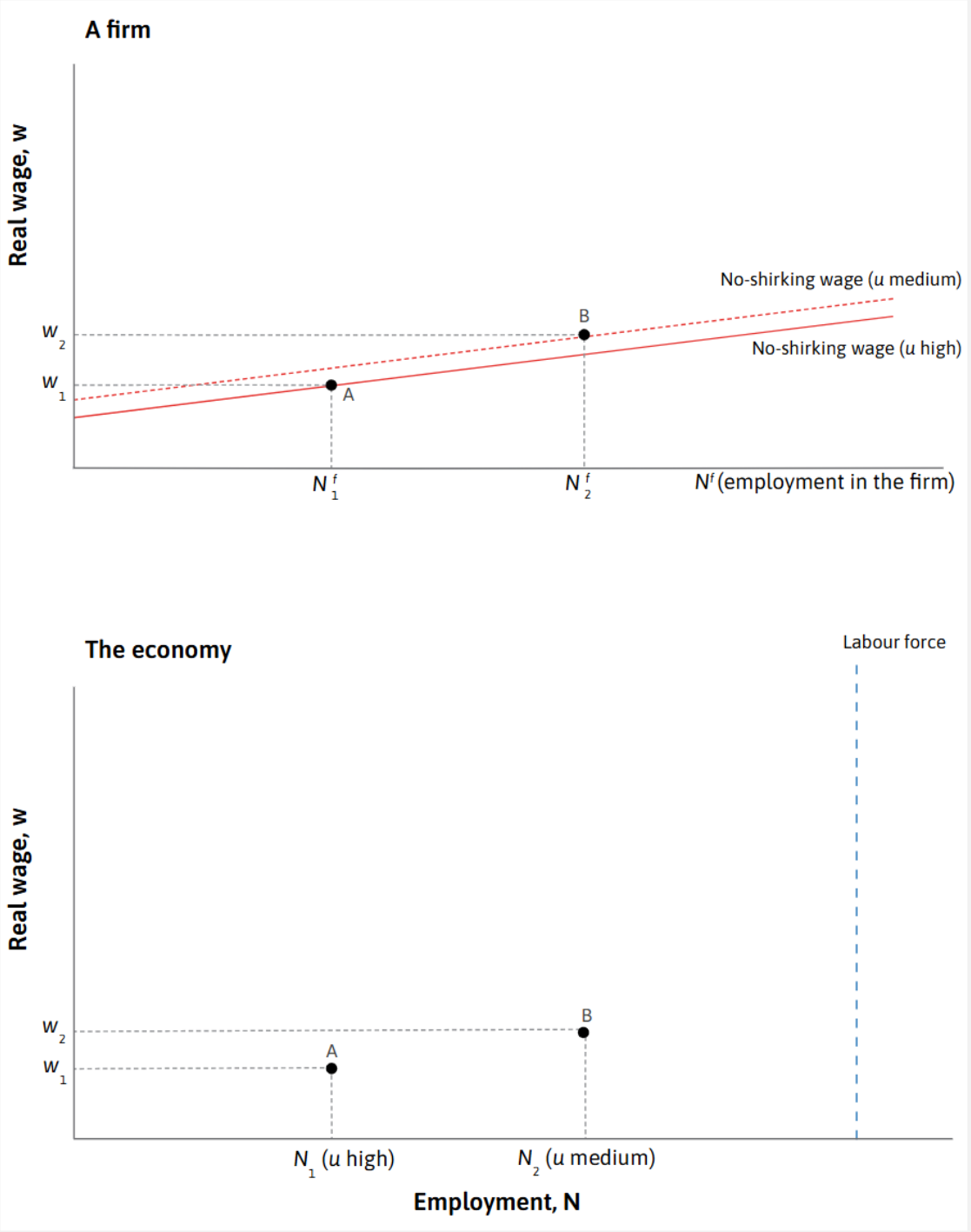
The WS curve

To hire $\mathbf{N^f_2}$ workers, the firm must pay a higher real wage ($\mathbf{w_2}$).

Note that point **B** is no longer on the original no-shirking curve, but on a new curve, slightly above it (because in the meantime the level of unemployment has fallen, which shifts that curve upward).



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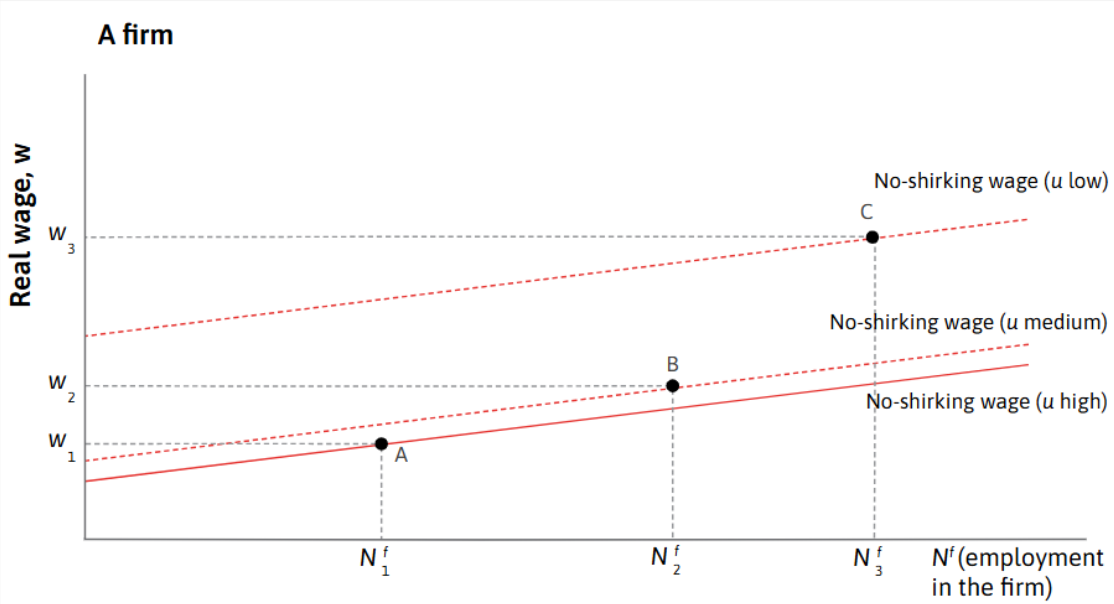
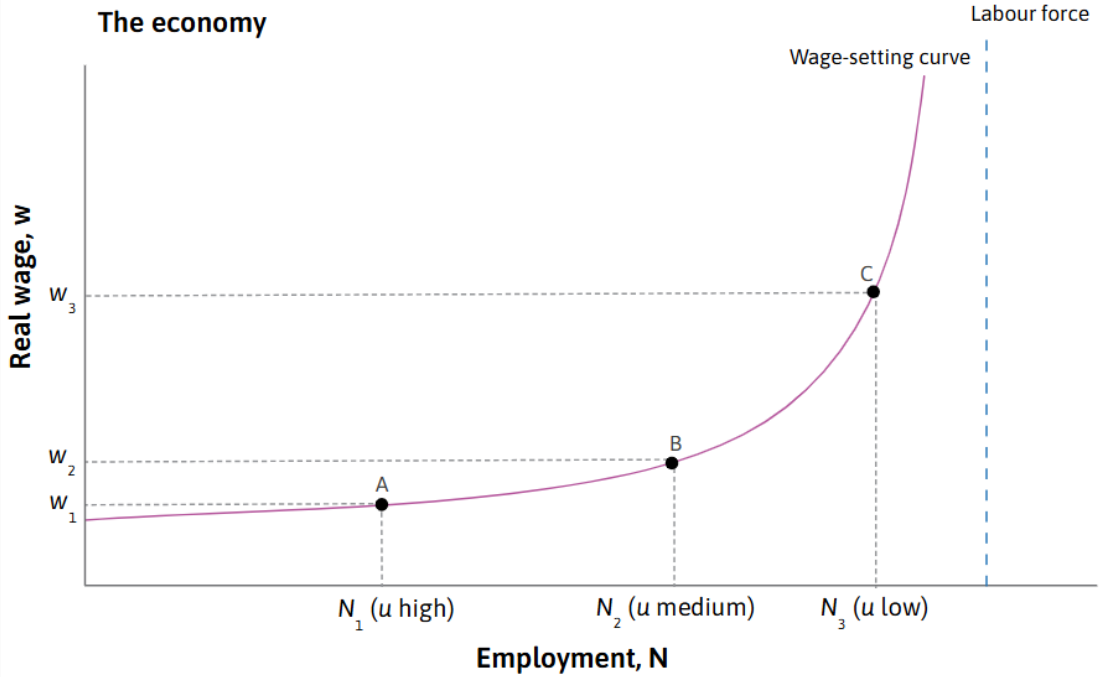
The WS curve

As **N** increases and unemployment (**u**) approaches zero, the no-shirking curve shifts increasingly upward. Ultimately, if **u = 0**, there would be certainty of immediately finding a new job in the event of dismissal, and it would not be possible to motivate workers to exert effort.





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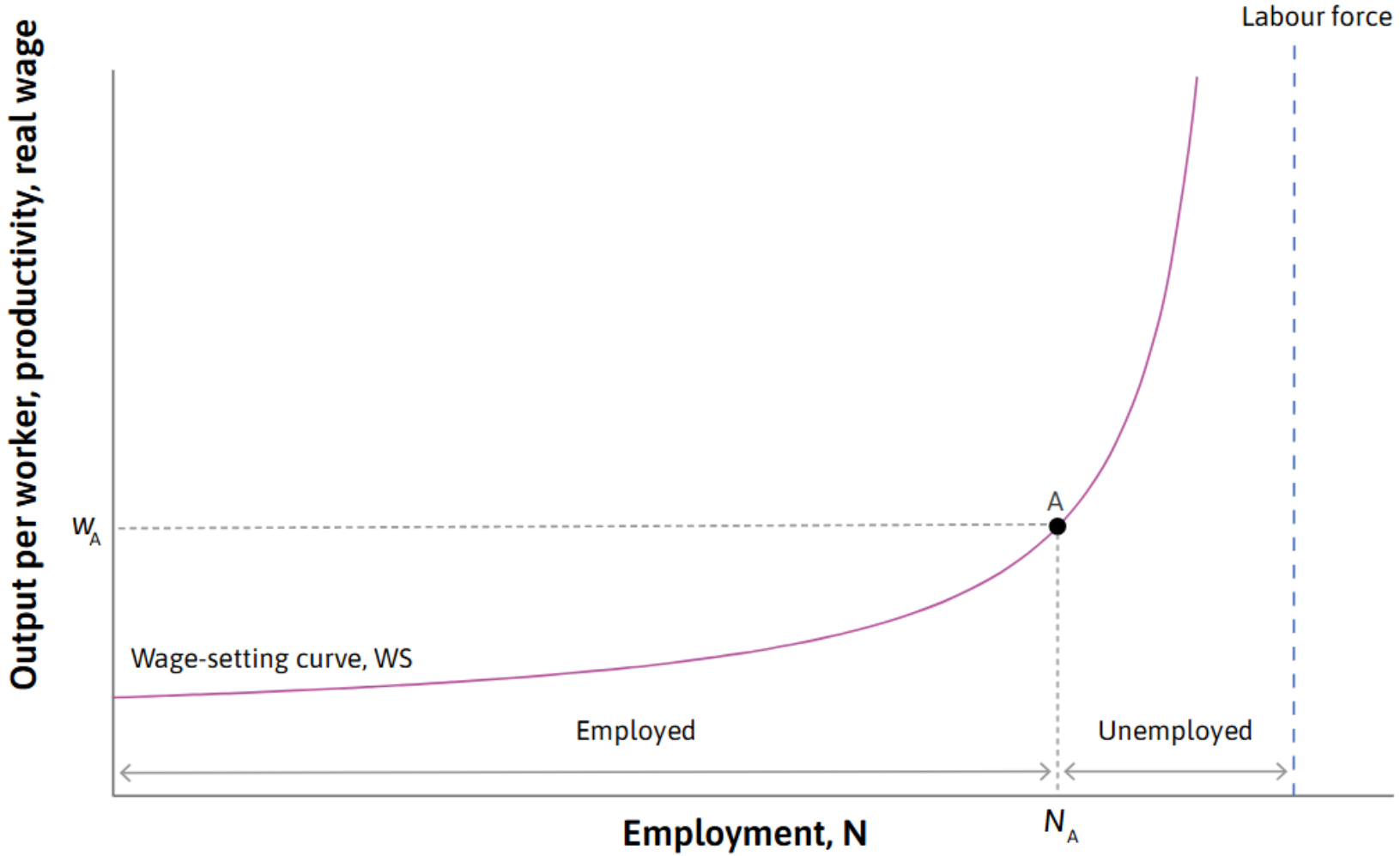
The WS curve is formed by the set of combinations of **w** and **N** that lie on the various no-shirking curves (for the corresponding levels of unemployment).

It tends asymptotically to **+∞** as **u** approaches zero, due to the increasingly upward shifts of the no-shirking curve.

The WS curve


Labour force
Output per worker, productivity, real wage
A
w_A
Wage-setting curve, WS
Employed
Unemployed
Employment, N
N_A

Empirical estimation of the WS curve for the US economy

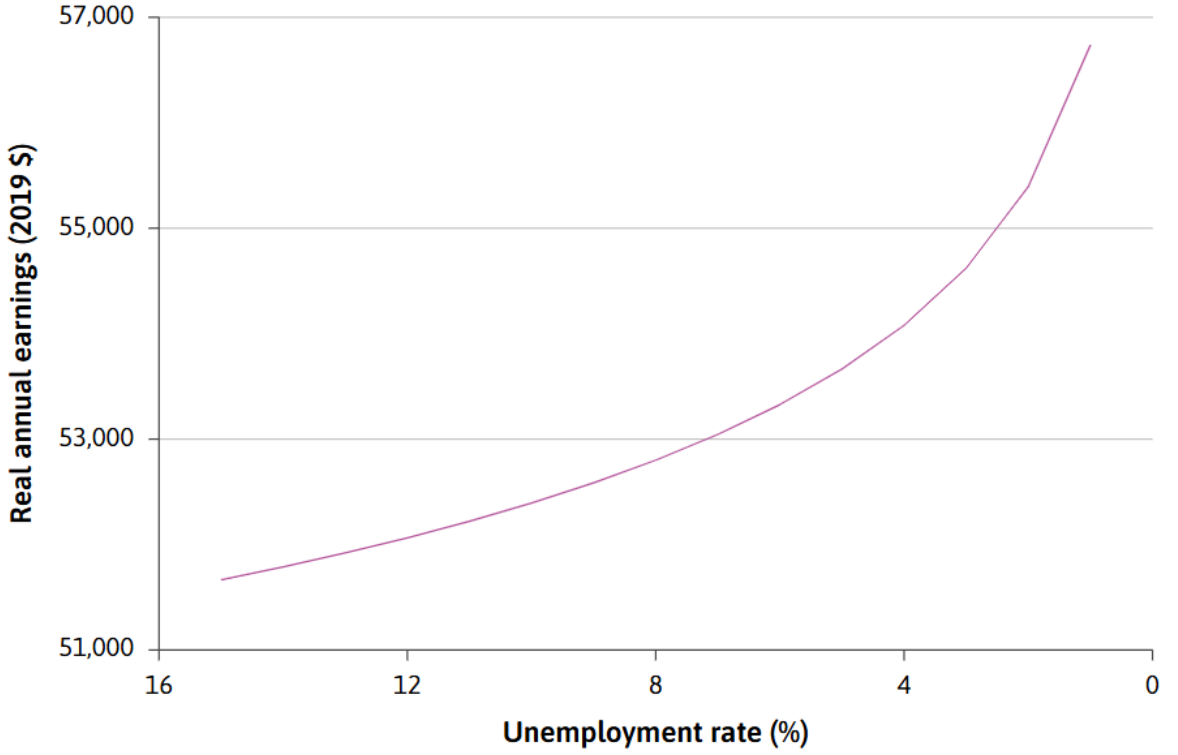


Figure 1.21 A wage-setting curve estimated for the US economy (1979–2019).

Estimated by Stephen Machin (LSE, 2023) from Current US Population Survey microdata from the Outgoing Rotation Groups for 1979 to 2019. Data for men aged 26 to 64, with controls for age, education, race, state, and year.