1506
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CARLO BO

Comparative advantage

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References for this lecture

- BBGV
  - Paragraphs 3.1, 3.2, 3.3

- Further suggested reading
  - Krugman P, Obstfeld M, Melitz MJ ‘International Economics. Theory and Policy’. 2012, 9th edition, Pearson, Chapter 3

David Ricardo (UK, 1772-1823)

- The British economist **David Ricardo** introduced (among other things) the concept of **comparative advantage**

- His aim was to evaluate the **role** played by **technology differences** across countries as the main reason for countries to engage in international **trade**

- With **limited supply** of production **inputs** (**opportunity cost**), technology differences induce **specialization**

Results of the model

- Countries **specialize** in the production of **commodities** in which they have a **comparative advantage**
- Even if a country has an **absolute advantage** in producing **all** commodities, **specialization still occurs**
- Specialization according to the comparative advantage is **beneficial** for **all countries**

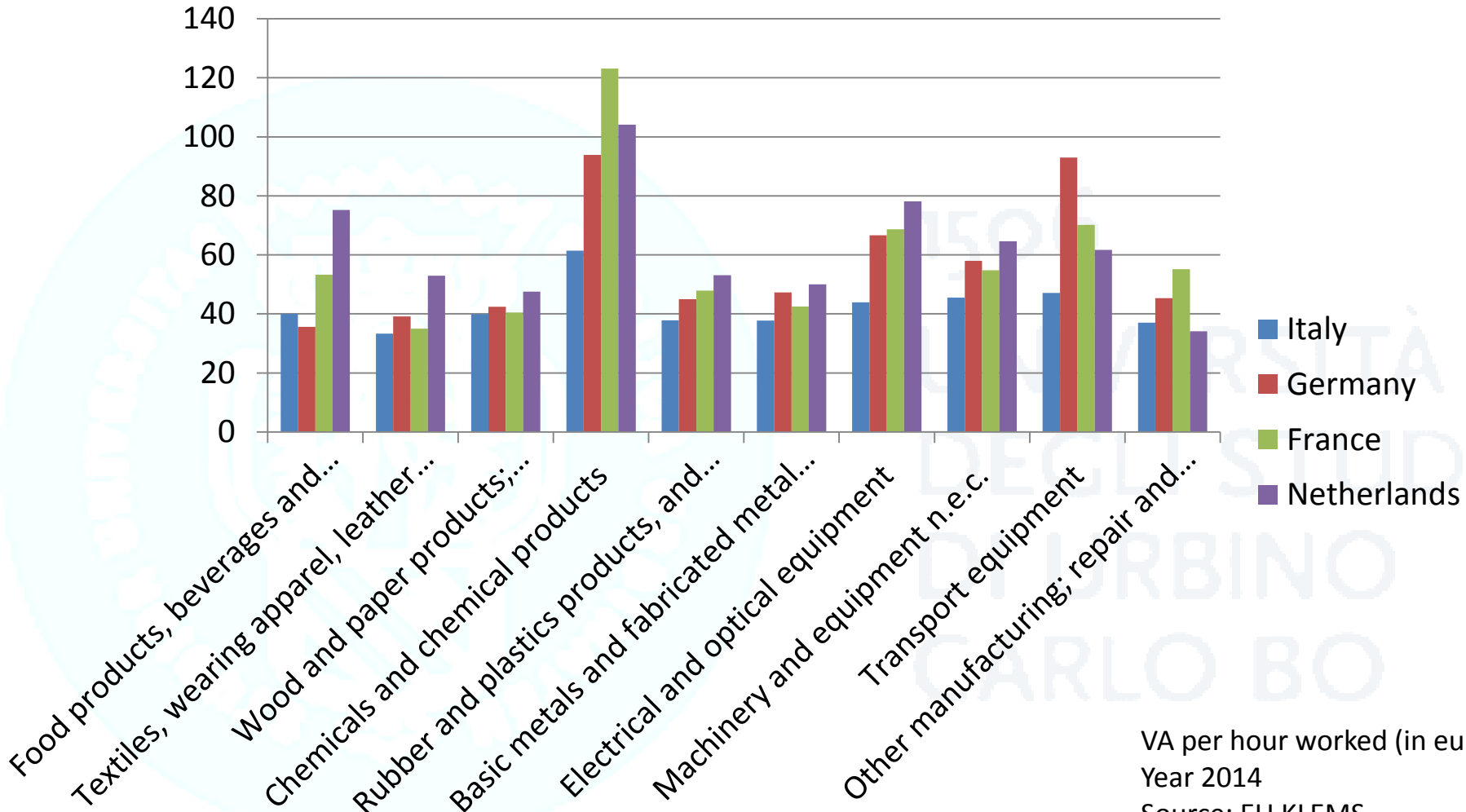
What do we mean for technology?

- In the Ricardo model, **heterogeneity** in **technology** across countries and sectors results in heterogeneity in **labour productivity**

- **Labour productivity** → amount of **output** produced with **one unit** of **input** (e.g. one hour of work)
  - Output/Hour

- Complementary concept → **input requirement**
  - Hour/Output
  - Interpretation → **input** needed to **produce one unit** of **output**

Cross-country differences in productivity

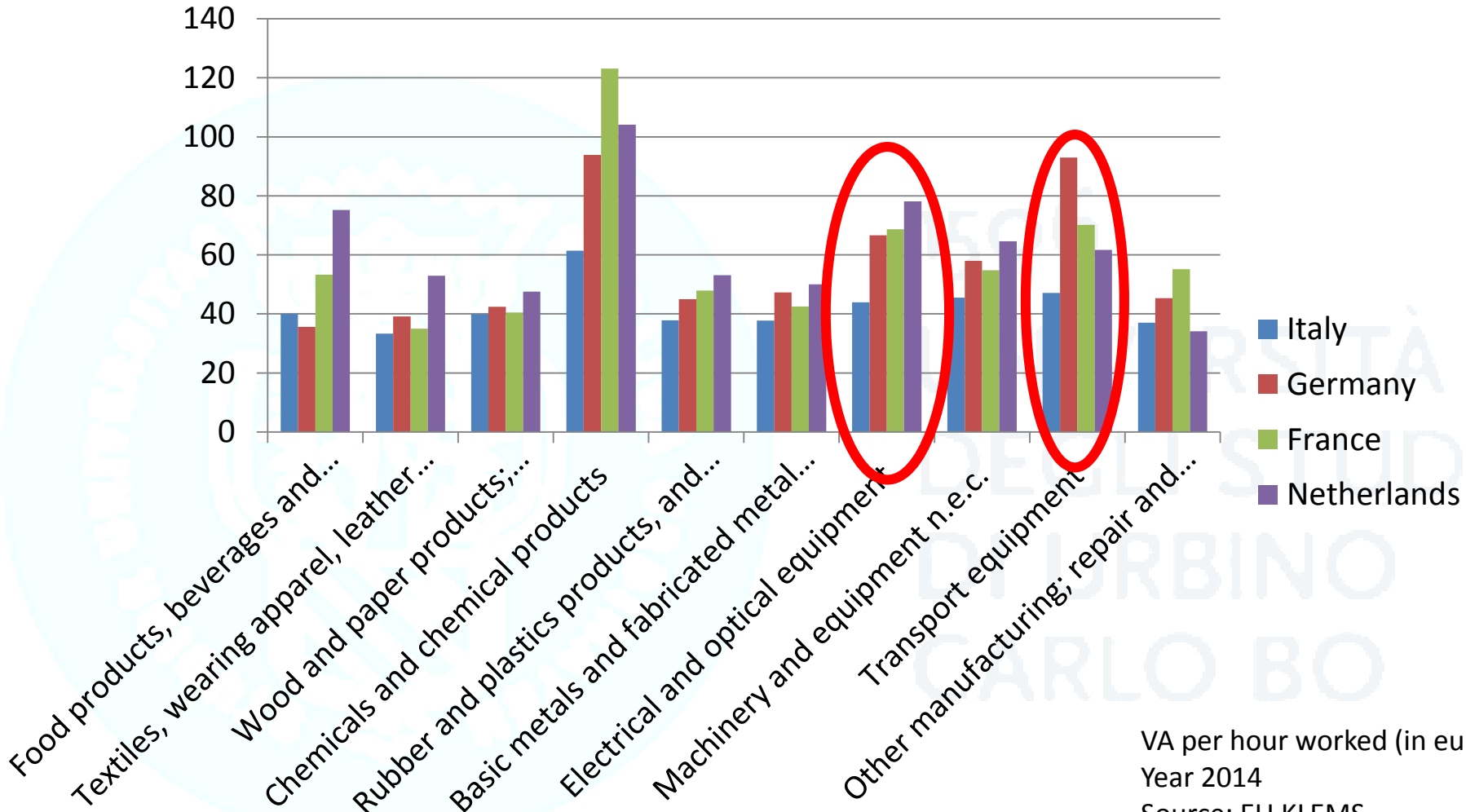


VA per hour worked (in euro)
Year 2014
Source: EU KLEMS

Absolute advantage

- The **Netherlands** has an **absolute advantage** in **seven** out of ten **sectors**
- **Italy** has an absolute **disadvantage** in **eight** out of ten **sectors** (one exception is obviously 'Food and beverage' ☺)

Cross-country differences in productivity



VA per hour worked (in euro)
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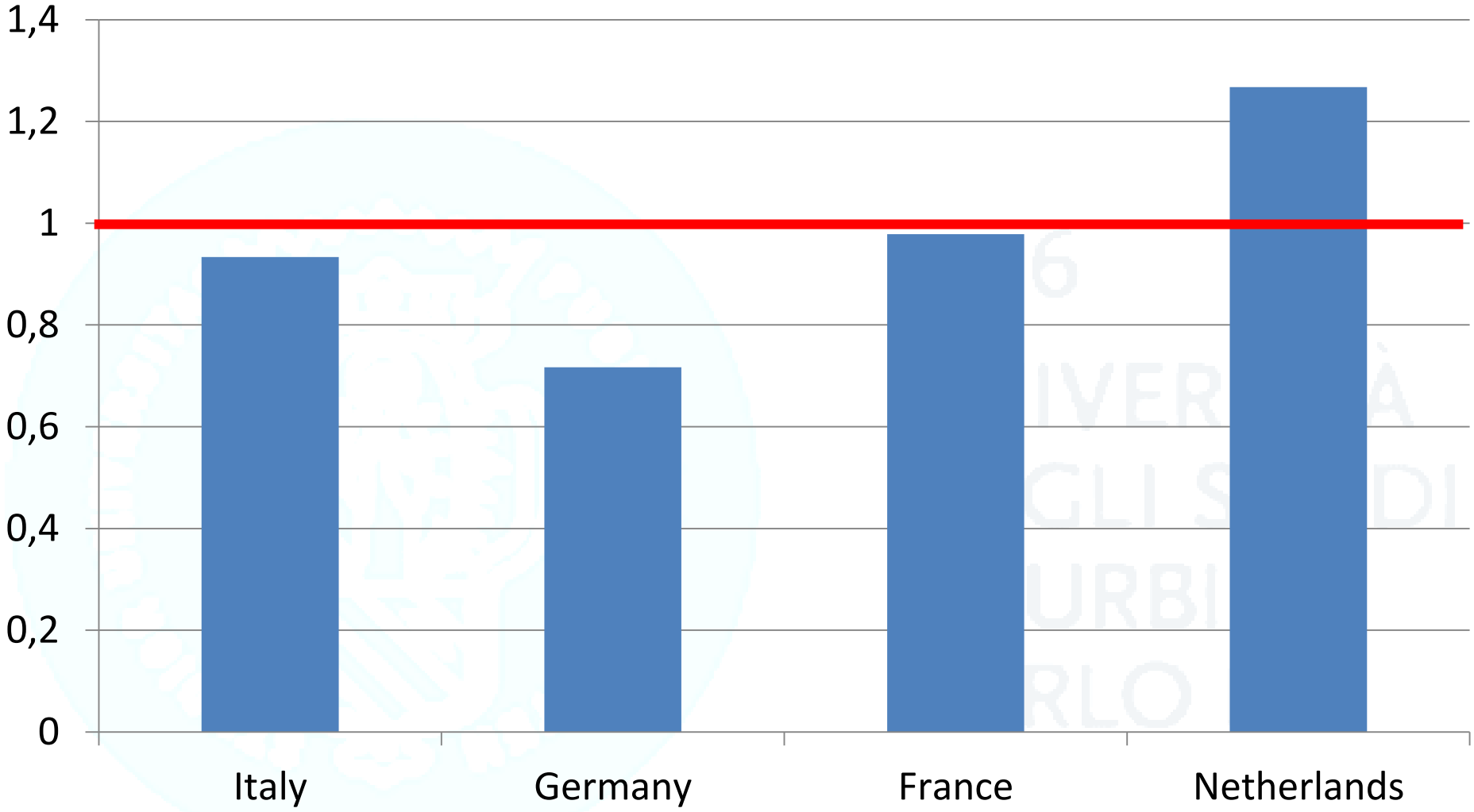
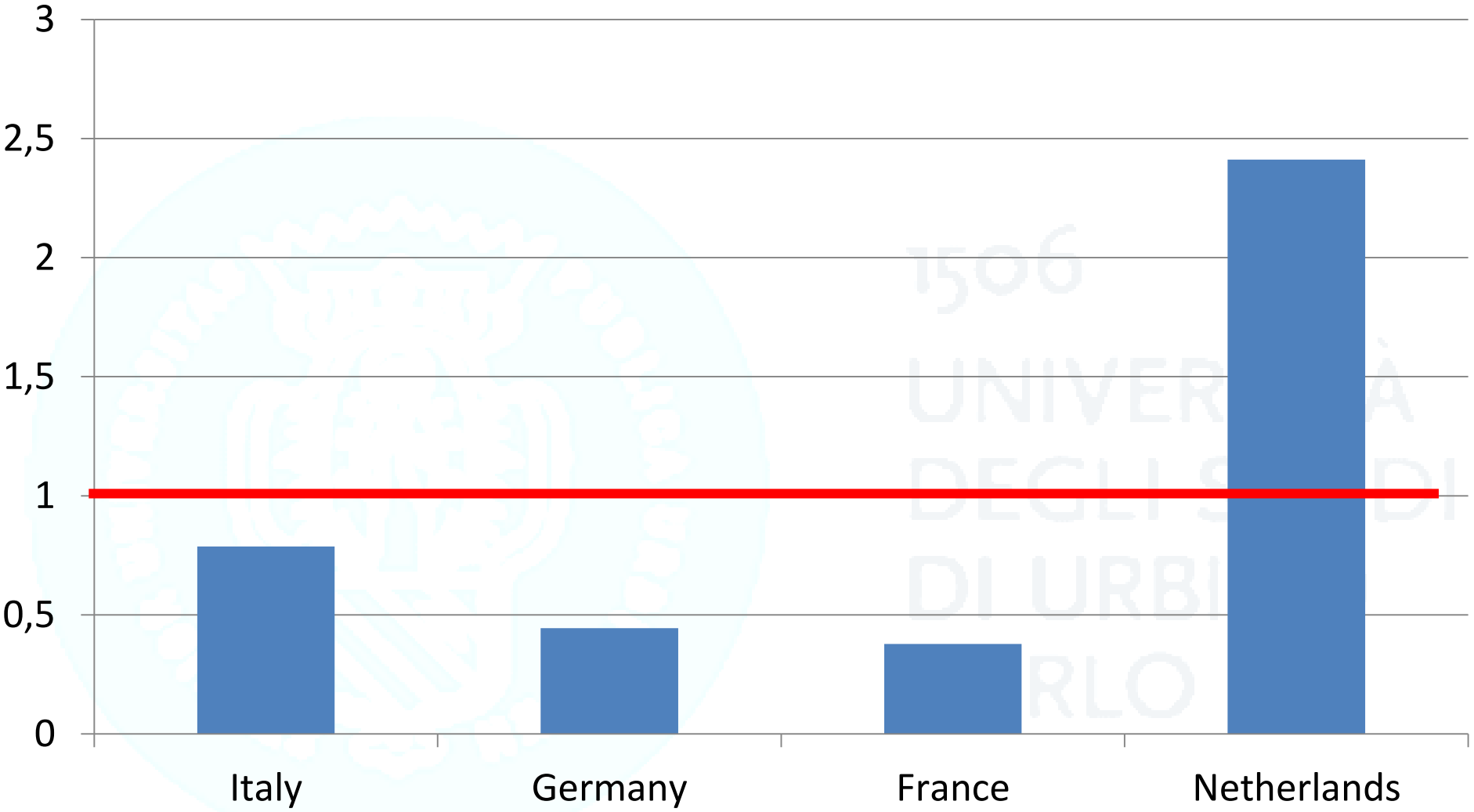
Labour productivity in electrical equip / labour productivity in transportation equip



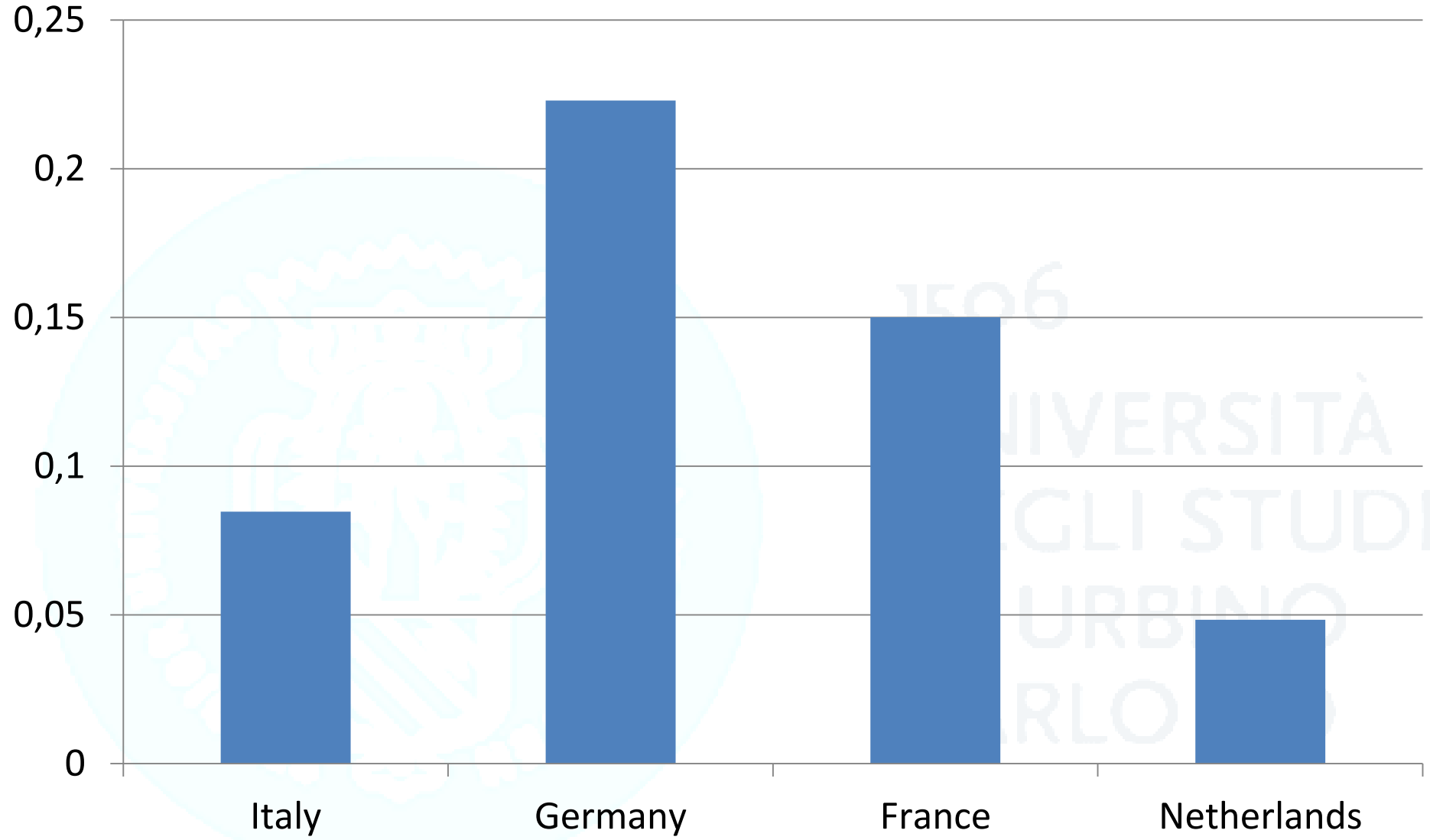
Year 2014
Source: EU KLEMS

Output in electrical equipment / output transport equipment



Year 2014
Source: EU KLEMS

Share of output in transportation equipment over total manufacturing output



Year 2014
Source: EU KLEMS

Opportunity cost

- Why isn't the **Netherlands** producing **all manufacturing** goods for **EU consumers**?

- In case of **limited availability** of **labour** input, that input should be **allocated** to producing **either** transportation equipment or electrical equipment

- **Opportunity cost**
  - **Reduction** in the **production** of transportation equipment that is **needed to increase** the production of electrical equipment of a certain amount ➔ **cost** of **one commodity** in terms of the **other** commodity
  - **Why?** ➔ with **full employment**, that **shift** in production is the result of **moving labour from one sector** to the **other**

Assumptions in the basic Ricardo model

- There is only **one factor of production**: labour
  - **Homogenous**
  - Perfectly **mobile within** the **country across industries**
  - Perfectly **immobile across countries**

  ➢ **Wages will be the same across all industries within the country but may differ across countries**

- **Supply** of (total) **labour** is **limited** and there is **full employment**
- **Markets** are perfectly **competitive**
- **Constant returns to scale**
- The economy is composed of (at least) **two commodities**
- **Consumers** in the two countries have the **same preferences**

Implications of assumptions

- **Perfect mobility** of labour **within country**
  - Workers can move at **no cost** and **without barriers** across firms in different **sectors**
  - Workers will move across sectors **as long as wages differ** across sectors

- In **equilibrium**, **wages** should be **equal across sectors** within the country

Implications of assumptions

- **Labour** does **not move** across **countries**
  - Migration is **not allowed** in this model
  - Cross-country **heterogeneity** in **wages**

Implications of assumptions

- **Perfect competition**
  - **Prices** of **commodities** and **inputs** (i.e. wage) are taken **as given** by producers and consumers
  - Firms' **profits** are **zero**

Implications of assumptions

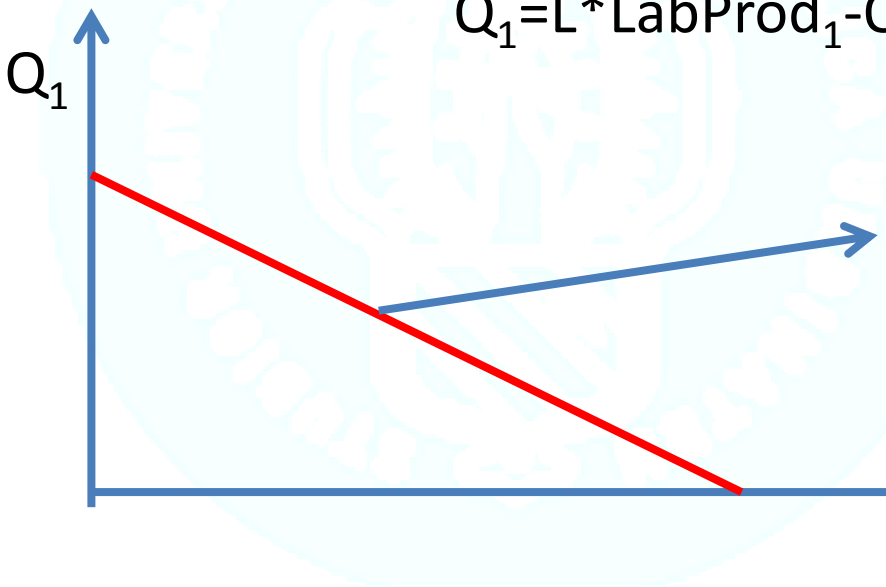
- **Limited supply** of labour
  - In **full employment**, **total labour** is given by the **sum of workers** employed in producing **commodity 1** and workers employed in producing **commodity 2**
  - ➢ **<u>Production possibility frontier</u>**

Production possibility frontier

$LabProd_1 = Q_1/L_1$ $LabProd_2 = Q_2/L_2$

$L = L_1 + L_2 = Q_1/LabProd_1 + Q_2/LabProd_2$

$Q_1 = L*LabProd_1 - Q_2*LabProd_1/LabProd_2$



Production possibility frontier

The p**roduction possibility frontier** represents a sort of '**budget constraint**' for consumers in the country with **closed economy**

Closed economy

- Before looking at the equilibrium with trade, it is useful to see what happens in a **closed economy** (i.e. **autarchy**) and use this result as a **benchmark**

- **Closed economy**
  - All **commodities** are **produced** at **home**

Production costs only one input

- **Total cost** of production depends on:
  - **Number of workers** needed to **produce one unit** of the commodity ➔ **<u>productivity</u>** (or input requirement)
    - Assumed to be **constant**
      - Constant **marginal costs**
      - Marginal costs are equal to **average costs** (no fixed cost of production)
  - **<u>Wages</u>**

Production cost=Wage * Quantity / Lab productivity

Table 3.1 Hypothetical labour productivity, production per hour

	USA	EU
Cloth	6	1
Wine	4	2

- **USA ➔ endowment** of **4** hours of **labour** (L=4)
- **EU ➔ endowment** of **12** hours of **labour** (L=12)

- **USA** will
  - **Produce only cloth** if the **value** of **marginal product** of labour employed in **cloth** production is **higher** than the value of marginal product of labour employed in **wine** production

$$\mathbf{P_{cloth} * LabProd_{cloth} > P_{wine} * LabProd_{wine}}$$

$$\mathbf{P_{cloth}/P_{wine} > LabProd_{wine}/LabProd_{cloth}}$$

  - Produce **both cloth** and **wine** if the value of marginal products of cloth and wine are **equal**
  - **Prices** are set according to **consumers' preferences**

Closed economy - example

- **USA**
  - L for cloth => 2; L for wine => 2
  - **Cloth** = 2*6 = 12; **Wine** = 2*4 = 8
- **EU**
  - L for cloth => 8; L for wine => 4
  - **Cloth** = 8*1 = 8; **Wine** = 4*2 = 8
- **World**
  - **Cloth** = 12+8 = **20**
  - **Wine** = 8+8 = **16**

Table 3.1 Hypothetical labour productivity, production per hour

	USA	EU
Cloth	6	1
Wine	4	2

- **Cloth** production
  - USA is six times (6/1) as productive as the EU in the production of cloth
- **Wine** production
  - USA is two times (4/2) as productive as the EU in the production of wine

➢ USA has **absolute advantage** in both cloth and wine production

➢ Recall, however, that the **amount of labour** in the USA is **fixed**

Table 3.1 Hypothetical labour productivity, production per hour

	USA	EU
Cloth	6	1
Wine	4	2

- What is the 'cost' (**opportunity cost**) of producing **cloth in terms of wine**?
  - USA ➔ 6/4=1.5
  - EU ➔ 1/2=0.5

- What is the cost of producing **wine in terms of cloth**?
  - USA ➔ 4/6=0.66
  - EU ➔ 2/1=2

Table 3.1 Hypothetical labour productivity, production per hour

	USA	EU
Cloth	6	1
Wine	4	2

- The **USA** is **relatively more productive** in making **cloth** than in making wine

- The **EU** is **relatively more productive** in making **wine** than in making cloth

➢ **COMPARATIVE ADVANTAGE**

Open economy

- Now we assume that **countries** are **allowed** to **trade**

- Trade is **costless**
  - **No** trade **barriers** (e.g. tariff or import quota)
  - **No transportation cost**

  ➢ The **price** received by the **exporter** in the **same** as the price paid by the **importer**

Table 3.1 Hypothetical labour productivity, production per hour

	USA	EU
Cloth	6	1
Wine	4	2

- Assume that **countries specialize** in the production of the commodity in which they hold a **comparative advantage**
  - USA cloth production ➔ 6*4=**24**
  - EU wine production ➔ 12*2=**24**

- Assume, on the contrary, that countries **specialize 'against' comparative advantage**
  - USA will only produce wine ➔ 4*4=**16**
  - EU will only produce cloth ➔ 12*1=**12**

Total world production

	Autarchy (for 'arbitrary' preferences)	Specialization according to comparative advantage	Specialization against comparative advantage
Cloth	20	24	12
Wine	16	24	16

- **Specialization** according to **comparative advantage** results in the **highest possible world production** of both cloth and wine
- Is this specialization '**sustainable**'?
  - **USA** is **more productive** than EU in **absolute** terms
  - **Wages** in the two countries will **adjust** to **account** for **differences** in productivity

Comparative advantage and commodity prices - cloth

Price of a commodity = wage rate / labour productivity

- **Consumer** should choose **whether** to buy a unit of **cloth** from the **USA** or the **EU**
  - **USA** are **6 times** as **productive** than the EU in **cloth** production
    - **Cloth price** in **USA** = **Wage rate US * 1/6**
    - **Cloth price** in **EU** = **Wage rate EU * 1/1**
  - **Consumers** will buy **clothes** from the **USA** if the **price** is **lower** than the price in the **EU**

$$P_{USA,cloth} < P_{EU,cloth} \rightarrow w_{USA} * 1/6 < w_{EU} * 1/1$$

Comparative advantage and commodity prices - wine

- **Consumer** should choose **whether** to buy a unit of **wine** from the **USA** or the **EU**
  - **USA** are **2 times** as **productive** than the EU in **wine** production
    - **Wine price** in **USA** = **Wage rate US * 1/4**
    - **Wine price** in **EU** = **Wage rate EU * 1/2**
  - **Consumers** will buy **wine** from the **EU** if the **price** is **lower** than the price in the **USA**

$$P_{EU,wine} < P_{USA,wine} \rightarrow w_{EU} * 1/2 < w_{USA} * 1/4$$

Comparative advantage and commodity prices

- If the following **conditions** are **satisfied**, **EU** will specialize in **wine** production and **USA** will specialize in **cloth** production:

$$w_{USA} * 1/6 < w_{EU} * 1/1 \rightarrow w_{EU} / w_{USA} > 1/6$$
$$w_{EU} * 1/2 < w_{USA} * 1/4 \rightarrow w_{EU} / w_{USA} < 1/2$$

$$\mathbf{1/6 < w_{EU} / w_{USA} < 1/2}$$

- **Wages** in the **USA** will be between **two** and **six times higher** than wages in the **EU** → **absolute advantage**!

- The **exact wage ratio** is **not determined** unless we know the international equilibrium prices for cloth and wine → cannot be determined **without specifying** the **demand side of the economy**

Wage adjustment in the Ricardo model

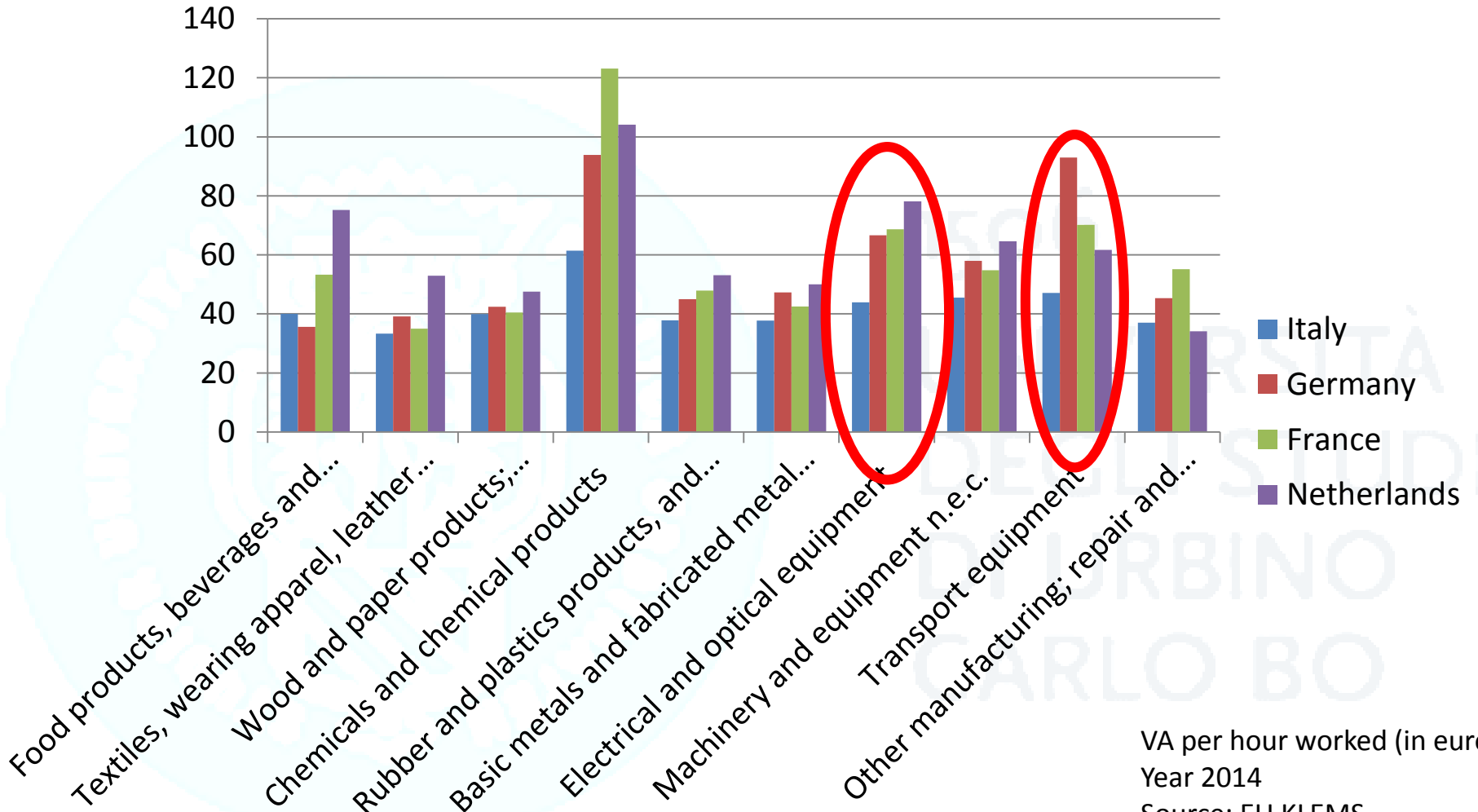
- **Example**: assume that **wages** in **USA** are **eight times** higher than wages in the **EU**
- Both **wine** and **cloth** will be **cheaper** in the **EU**
- **Massive demand** for **EU** products and **collapse** in **demand** for **USA** products has two effects:
  - **Increase** in **labour demand** in **EU**, with a subsequent **positive impact** on **wages** → labour supply is fixed
  - **Decrease** in **labour demand** in **USA**, with subsequent **negative impact** on **wages** → unemployment in the USA will induce workers to supply their work for lower wages

Comparative advantage - consequence

- **Countries can always compete** in world markets, **even if** they **are less productive** (in **absolute** terms) than their trading partners

- Less productive countries **compensate** lower productivity by **lower wages**

Cross-country differences in productivity



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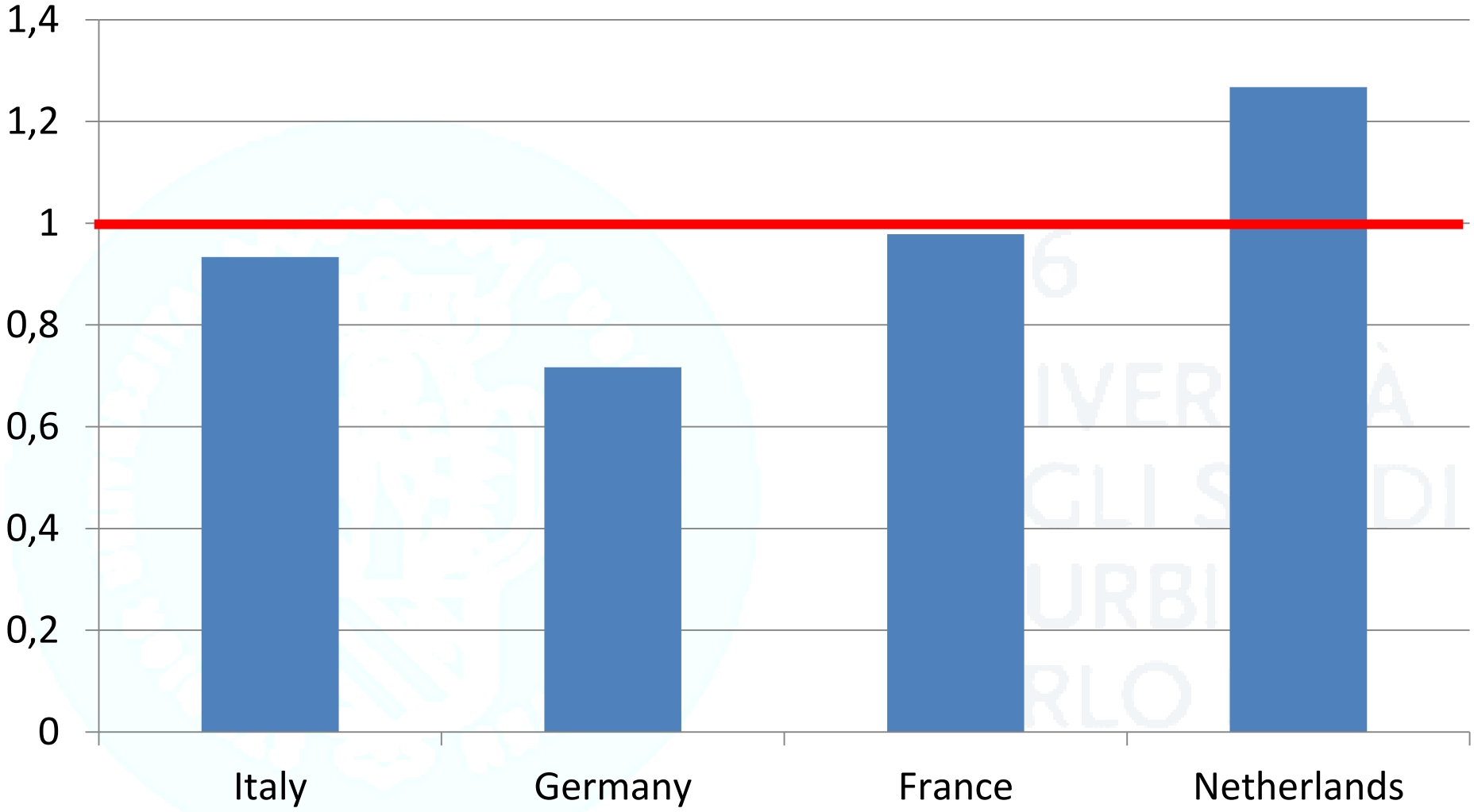
Labour productivity in electrical equip / labour productivity in transportation equip



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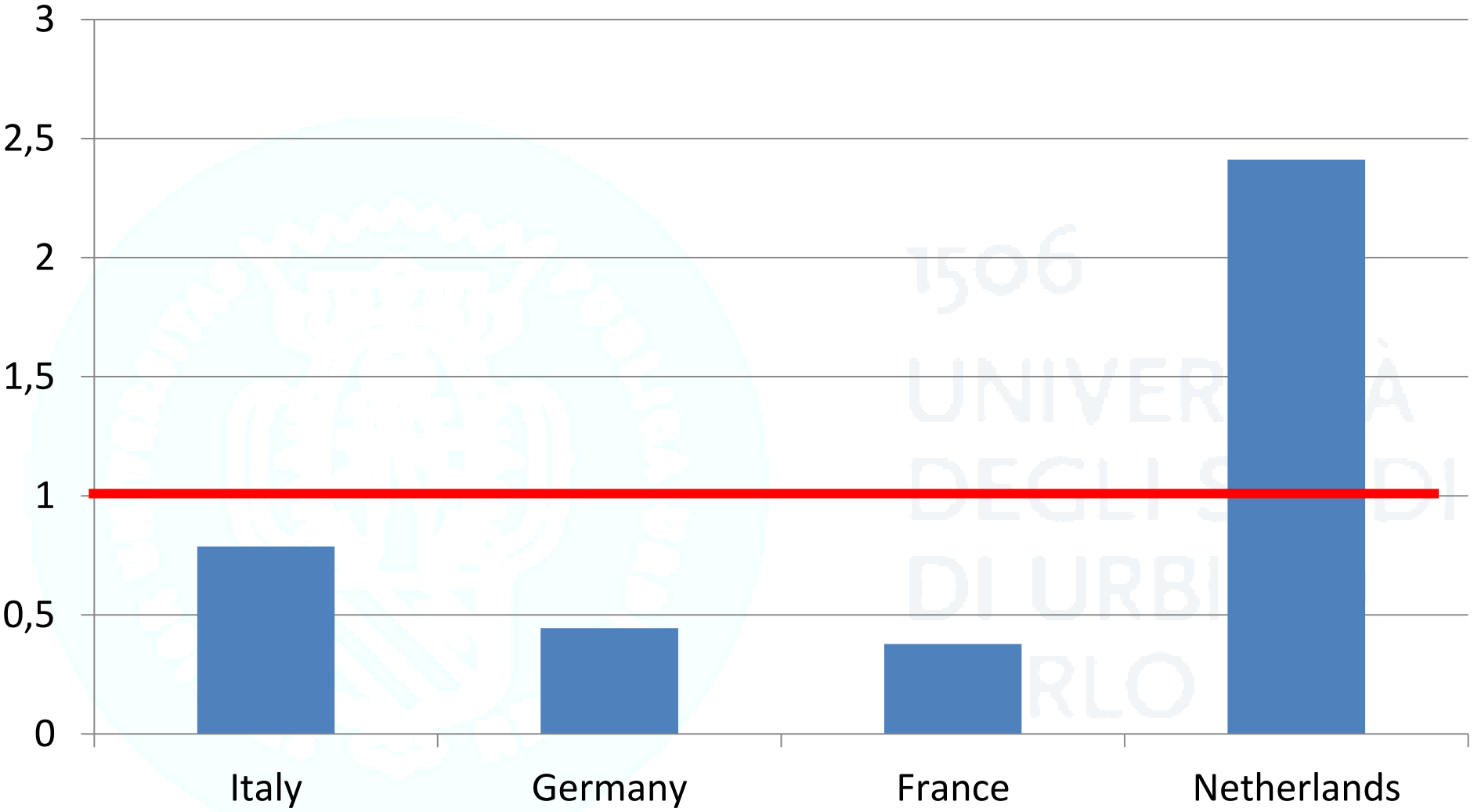

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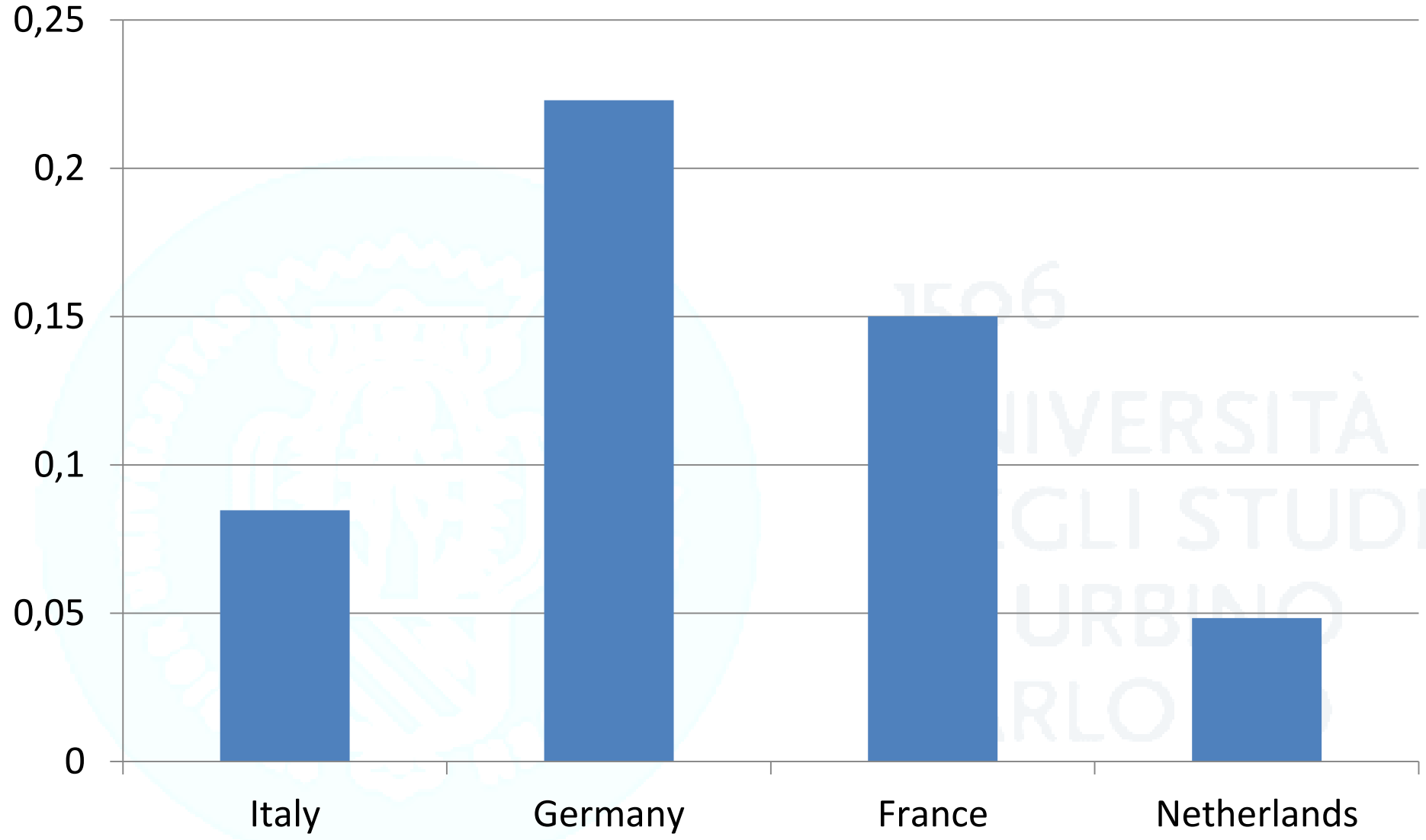


Year 2014
Source: EU KLEMS

Gains from trade

- **Trade** as an **indirect method** of **production**
  - EU can produce cloth directly, but trade with the USA allows to **produce cloth by producing wine and then trading wine for cloth**

- In **absence of trade**, **consumption** possibilities are the **same** as **production** possibilities

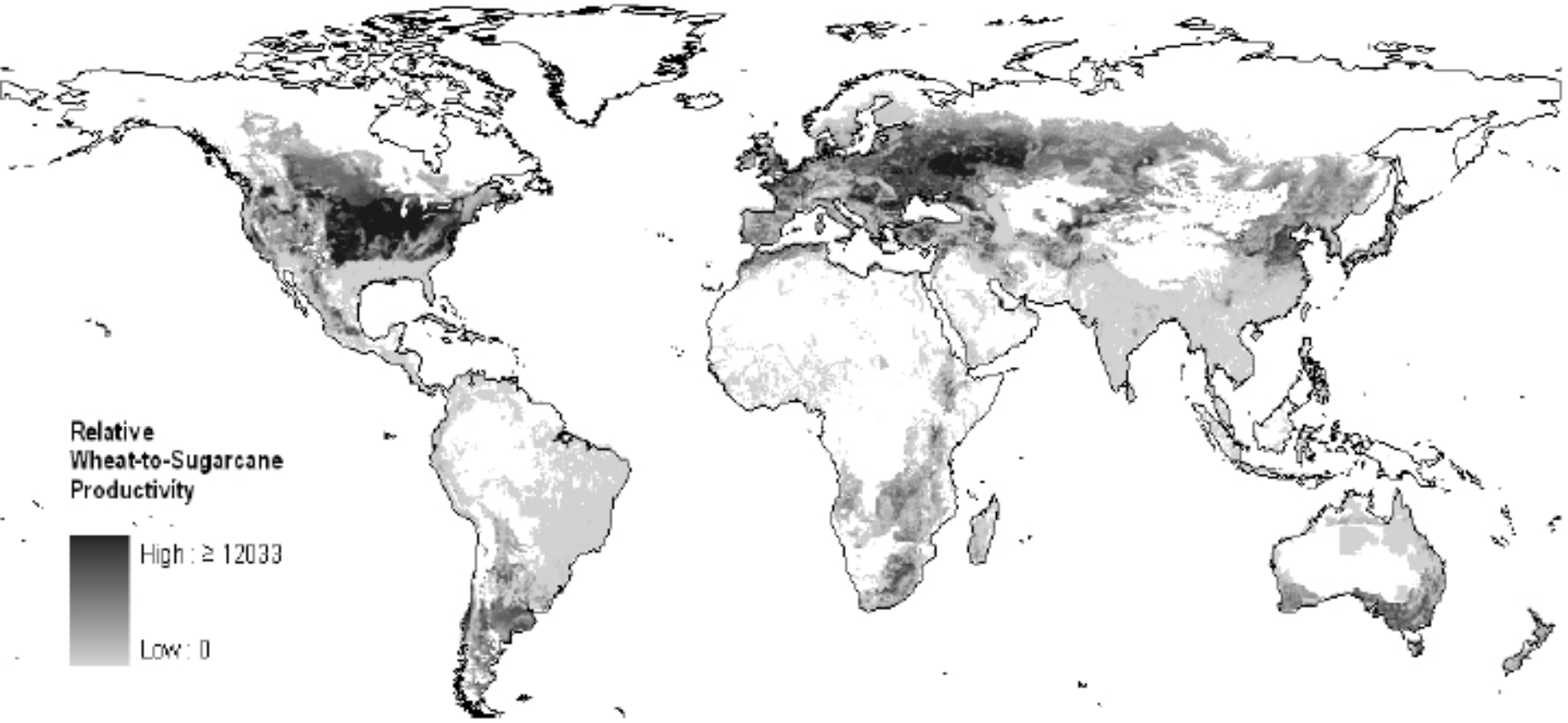
- Once **trade** is allowed, each economy can **consume** a **different mix** of commodities from the mix it **produces**

Issues in empirical testing of comparative advantage

- In **equilibrium**, the **sector** where the country has **no comparative advantage** should **disappear** → theoretically **impossible** to **measure** comparative **advantage**

- There are **other factors** that influence trade that **prevent full specialization**

Figure 3.2 Ratio of productivity in wheat (tonnes/ha) to productivity in sugarcane (tonnes/ha)



Source: Costinot and Donaldson (2012), reprinted with permission; areas shaded white have either zero productivity in wheat, or zero productivity in both wheat and sugarcane; areas shaded dark with the highest value have zero productivity in sugarcane and strictly positive productivity in wheat.

Comparative advantage and competitiveness

- **Conventional wisdom**
  - **Nation-states**, just like firms, can **benefit** from **competitive advantages** or **suffer** from **competitive disadvantages**

- **Politicians** in rich countries often claim that **rich countries are harmed** by a competitive disadvantage as a result of **high wages** in their countries (or **too low wages abroad**)

- They also claim that **lower productivity** at home implies that the **race for competitiveness** has been **lost**

Comparative advantage and competitiveness

- **Countries never** go **bankrupt** as firms do (or at least they do go bankrupt but for different reasons)

- If a **sector loses competitiveness**, resources will **shift** to **other sectors**
  - That process can be **painful** and **costly** for workers and firms
  - **Adjustment** is **needed** to '**recover competitiveness**'

- **Market forces** induce **comparative advantage** to **emerge** as an equilibrium

Misconceptions about comparative advantage

- "Free trade is **beneficial only** if your country is **strong enough** to stand up foreign competition"
  - **Comparative** (and not **absolute**) advantage matters
  - **Low-productivity** countries can **benefit** from trade **avoiding** the (otherwise high) **cost** of producing the **good** for which the have **no comparative advantage**
- "Foreign **competition is unfair** and hurts other countries when it is based on **low wages**"
  - **Adjustment** in wages allows to **produce more globally** and to **consume more** at home (compared to autarchy)
- "Trade **exploits a country** and makes it **worse off** if its **workers** receive much lower wages than workers in other nations"
  - The **real question** should be whether these workers are worse off exporting goods based on low wages than they **would be** if they **refused** to enter into such a **trade**