



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**

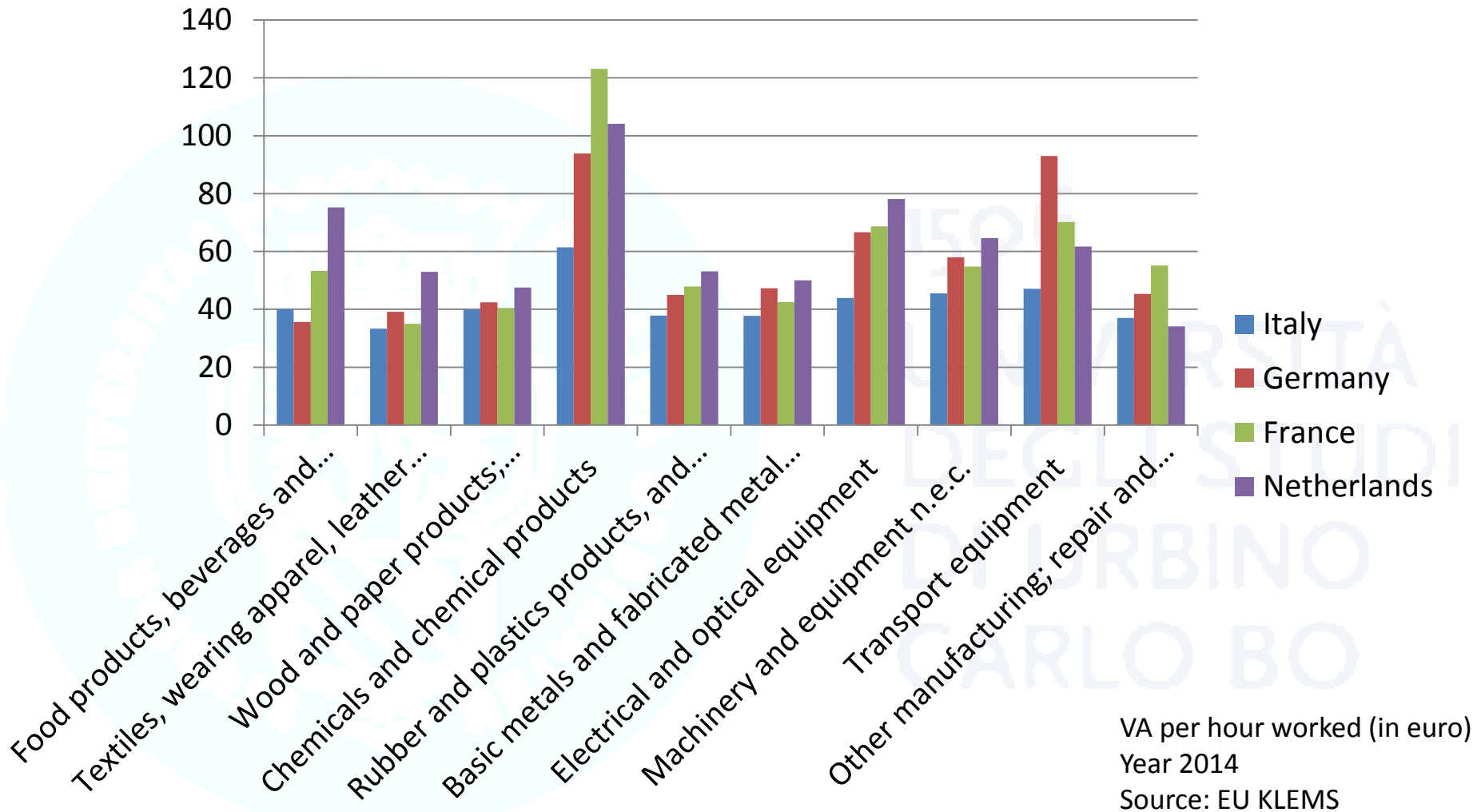
Results of the model

- 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**

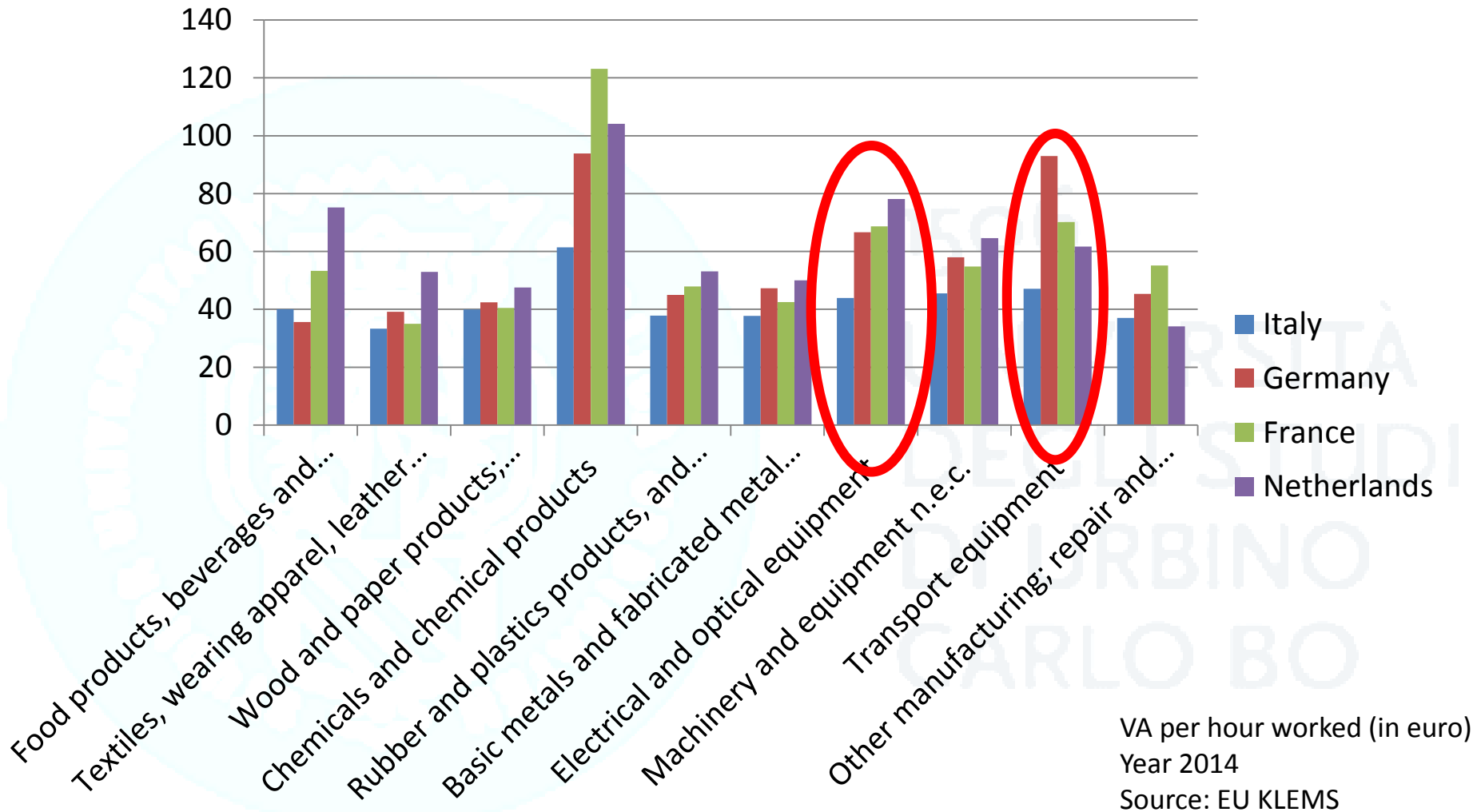
Cross-country differences in productivity



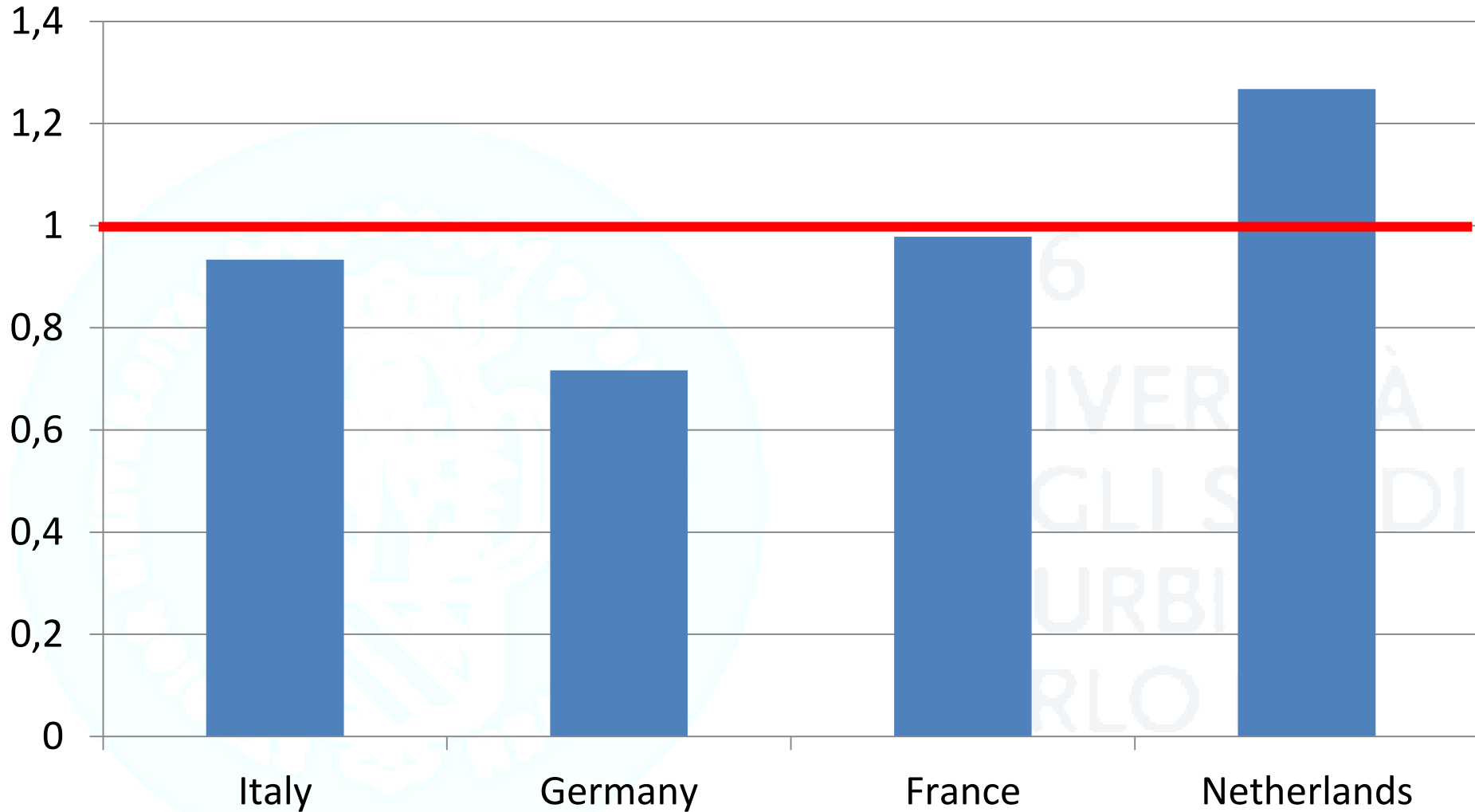
Absolute advantage

- 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' 😊)

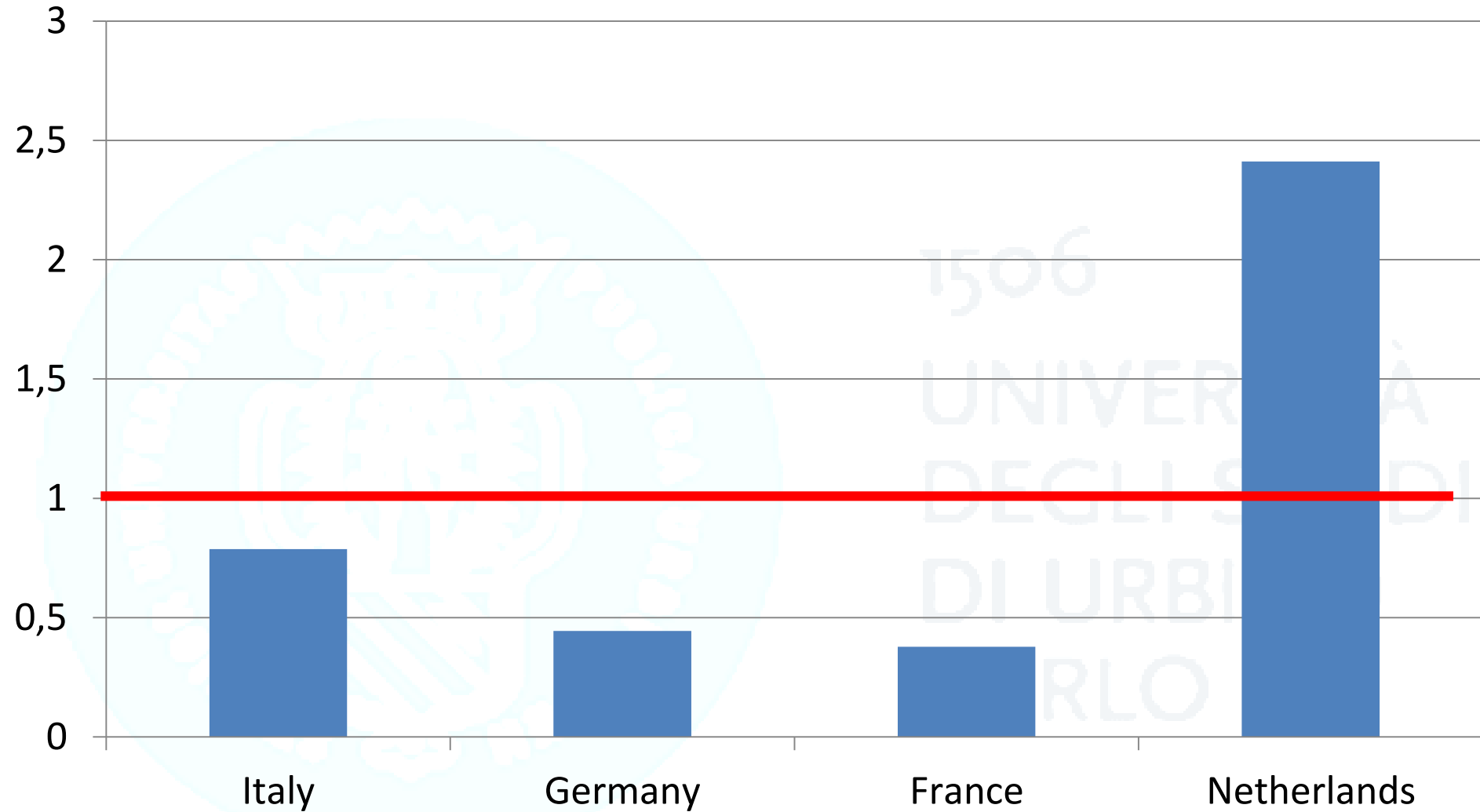
Cross-country differences in productivity



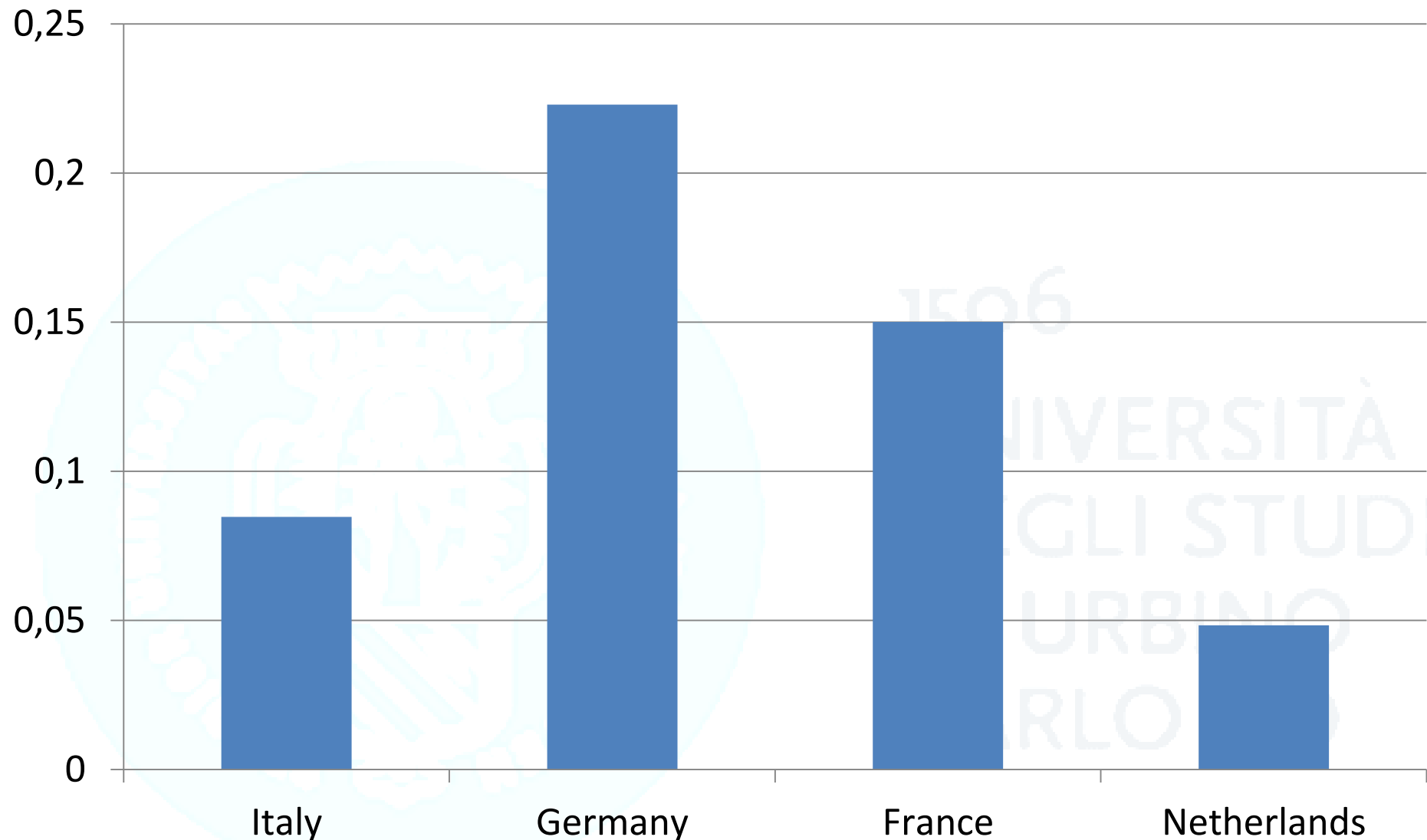
Labour productivity in electrical equip / labour productivity in transportation equip



Output in electrical equipment / output transport equipment



Share of output in transportation equipment over total manufacturing output



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**
 - **Production possibility frontier**

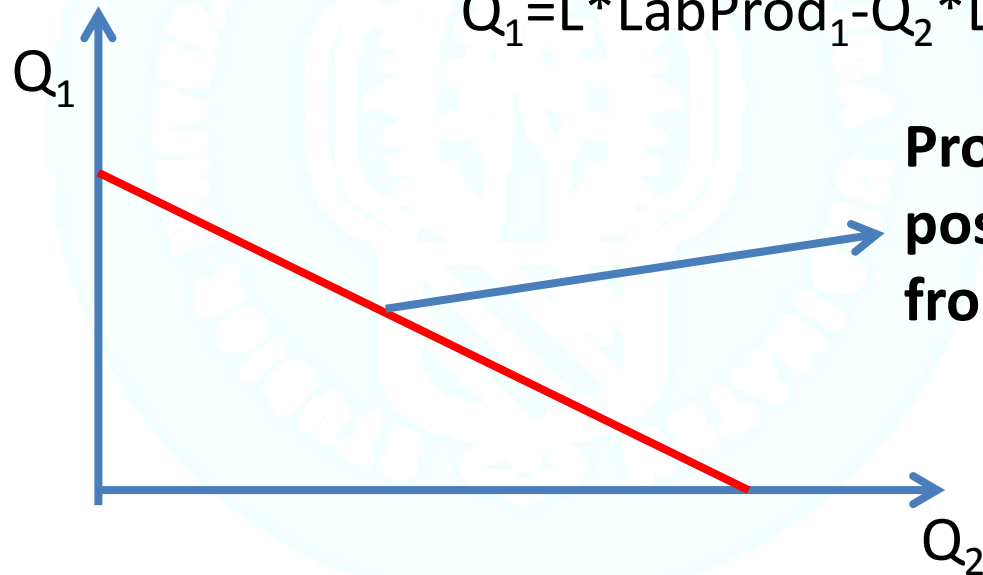
Production possibility frontier

$$\text{LabProd}_1 = Q_1 / L_1$$

$$\text{LabProd}_2 = Q_2 / L_2$$

$$L = L_1 + L_2 = Q_1 / \text{LabProd}_1 + Q_2 / \text{LabProd}_2$$

$$Q_1 = L * \text{LabProd}_1 - Q_2 * \text{LabProd}_1 / \text{LabProd}_2$$



**Production
possibility
frontier**

The **production 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 → **productivity** (or input requirement)
 - Assumed to be **constant**
 - Constant **marginal costs**
 - Marginal costs are equal to **average costs** (no fixed cost of production)
 - **Wages**

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

$$P_{\text{cloth}} * \text{LabProd}_{\text{cloth}} > P_{\text{wine}} * \text{LabProd}_{\text{wine}}$$

$$P_{\text{cloth}}/P_{\text{wine}} > \text{LabProd}_{\text{wine}}/\text{LabProd}_{\text{cloth}}$$

- 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** = $2 * 6 = \underline{12}$; **Wine** = $2 * 4 = \underline{8}$

- **EU**

- L for cloth => 8; L for wine => 4

- **Cloth** = $8 * 1 = \underline{8}$; **Wine** = $4 * 2 = \underline{8}$

- **World**

- **Cloth** = $12 + 8 = \underline{20}$

- **Wine** = $8 + 8 = \underline{16}$

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 $\rightarrow 6*4=24$
 - EU wine production $\rightarrow 12*2=24$
- Assume, on the contrary, that countries **specialize 'against' comparative advantage**
 - USA will only produce wine $\rightarrow 4*4=16$
 - EU will only produce cloth $\rightarrow 12*1=12$

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**

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

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:

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

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

- **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**

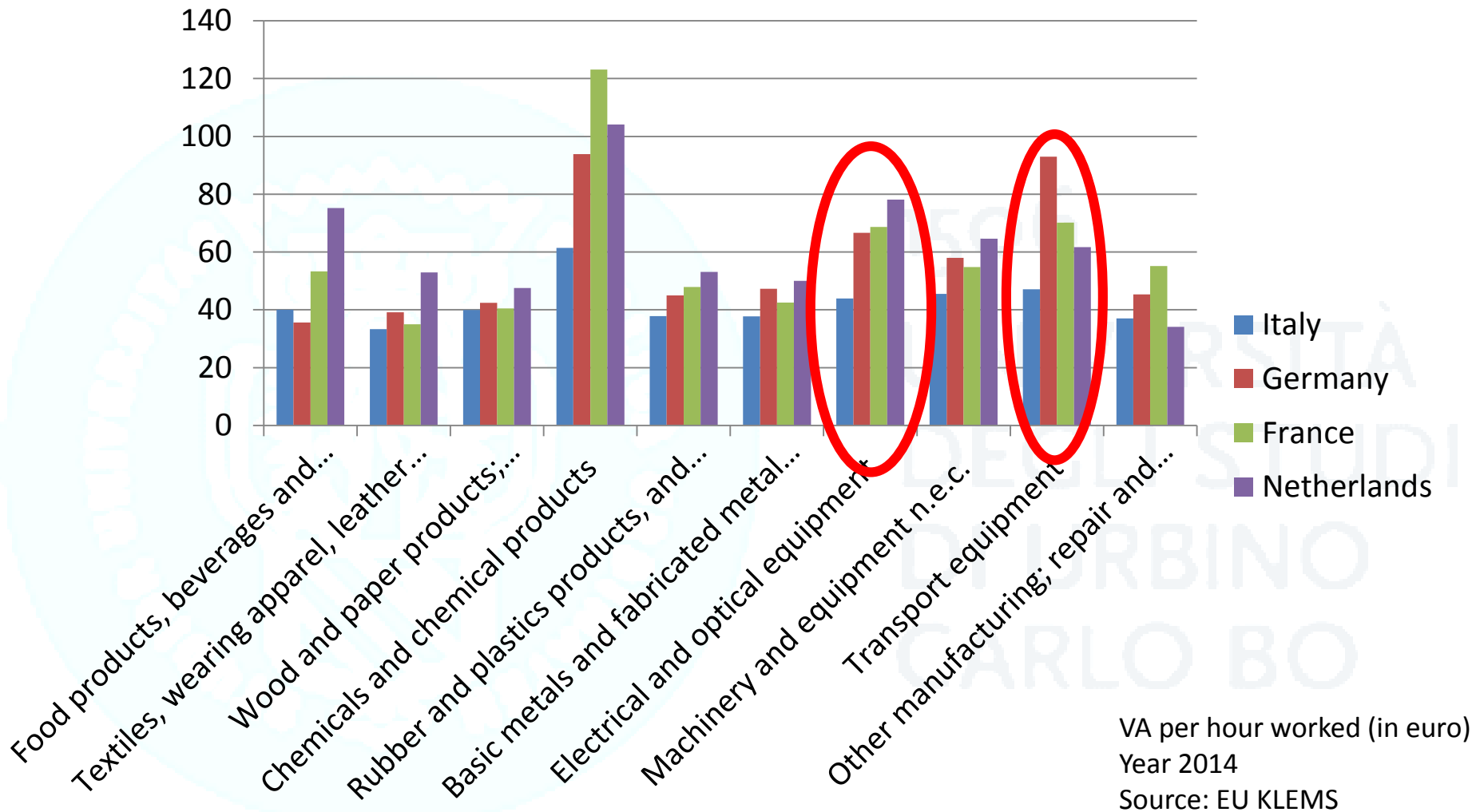
Wage adjustment in the Ricardo model

- **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

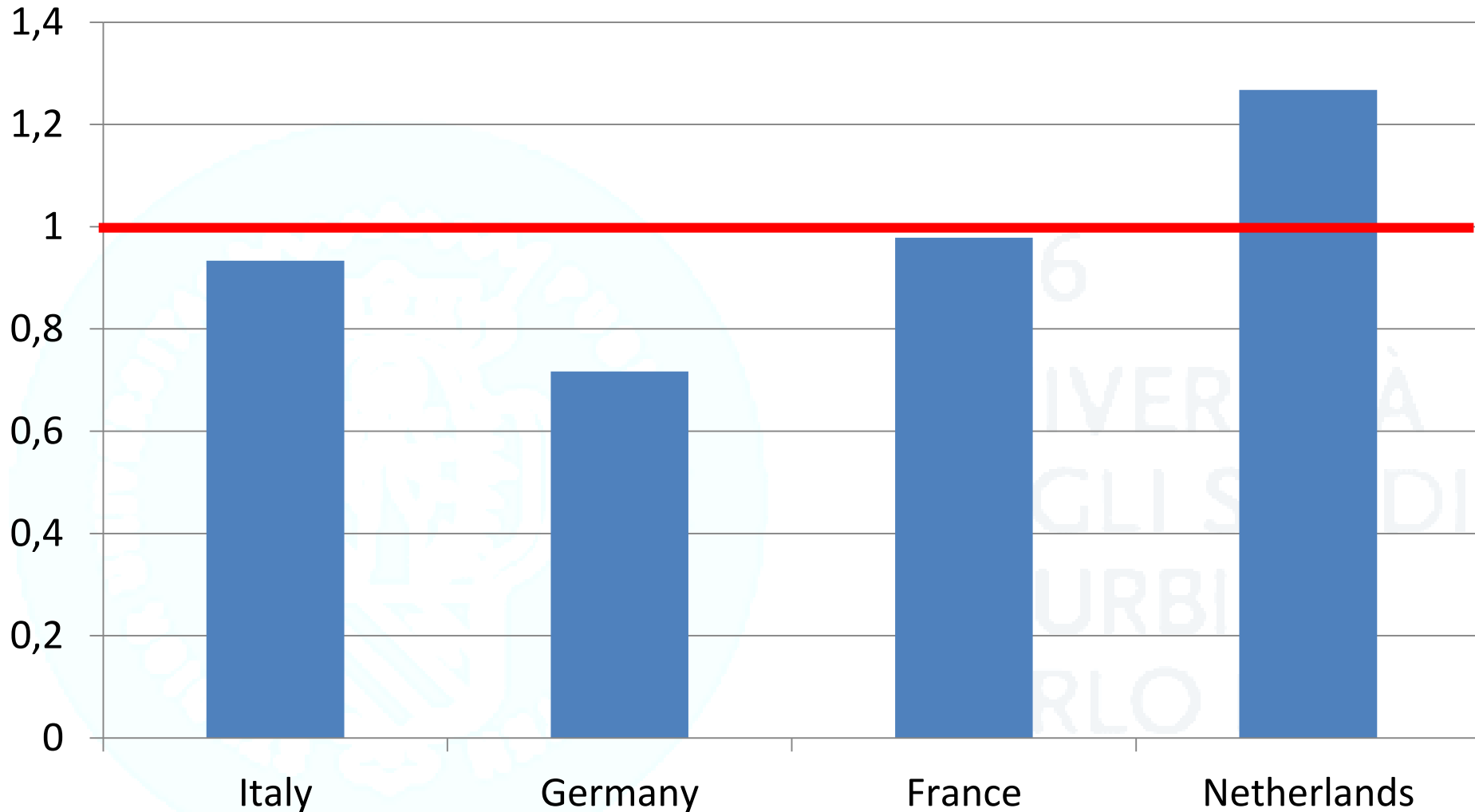
Comparative advantage - consequence

- **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**

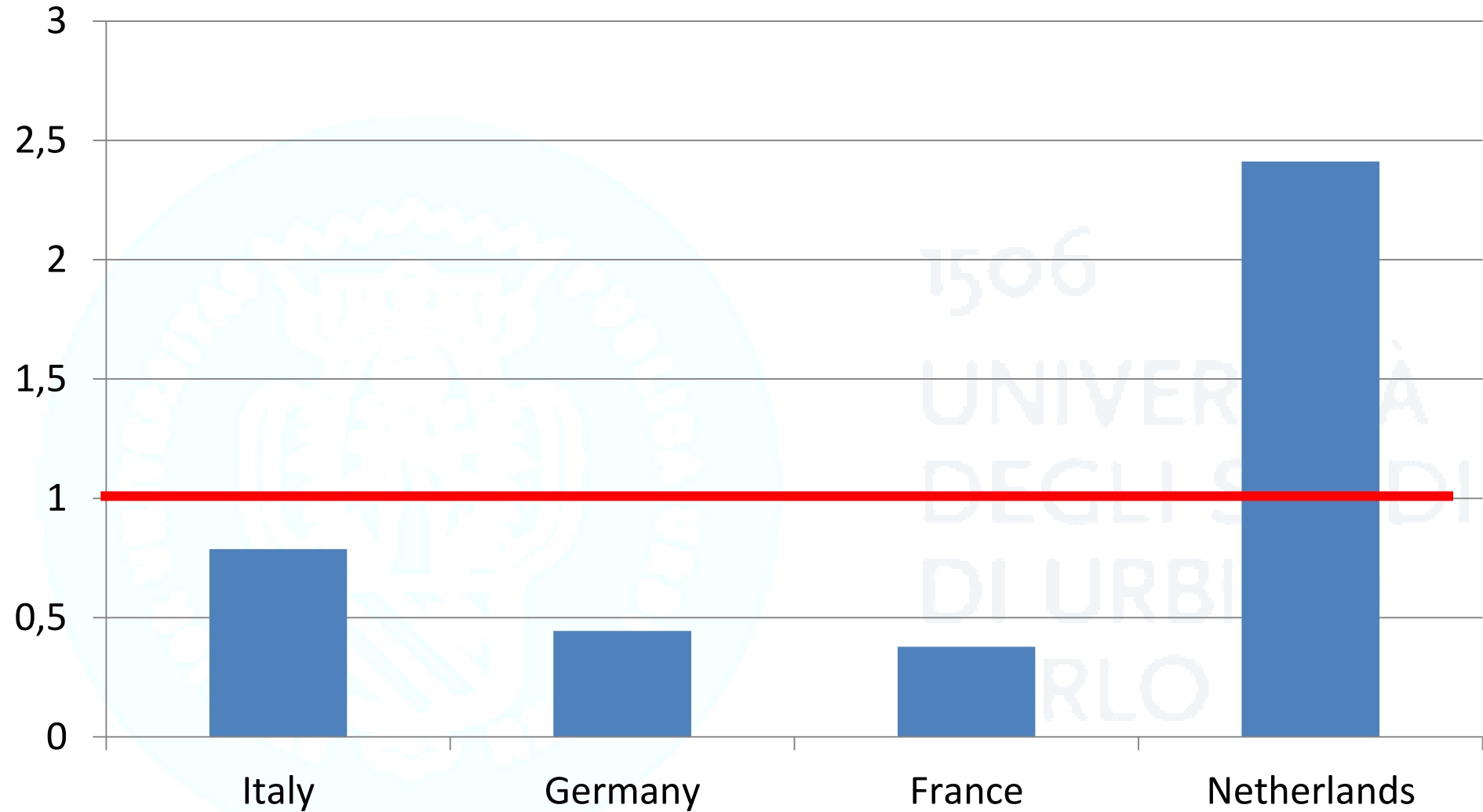
Cross-country differences in productivity



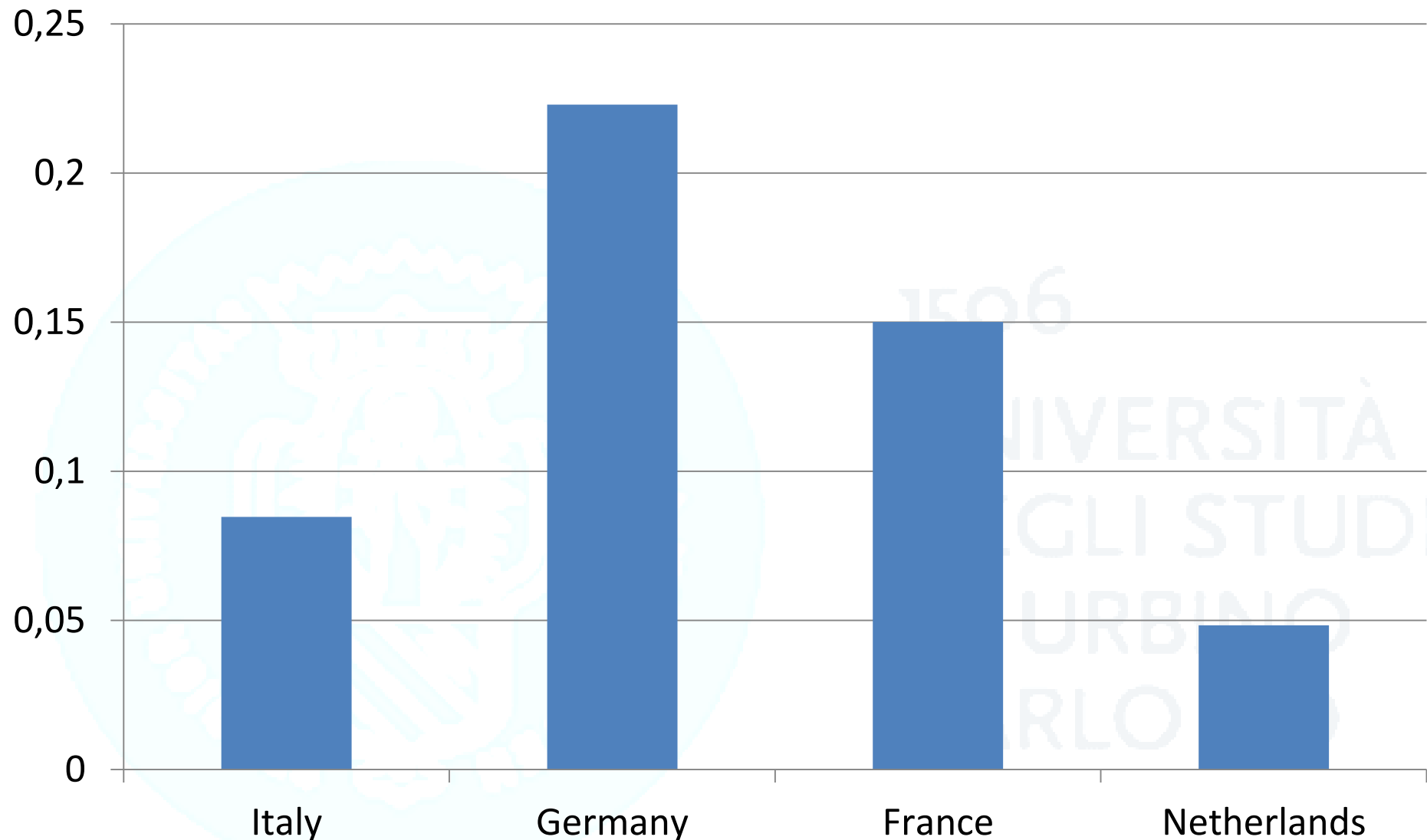
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Share of output in transportation equipment over total manufacturing output



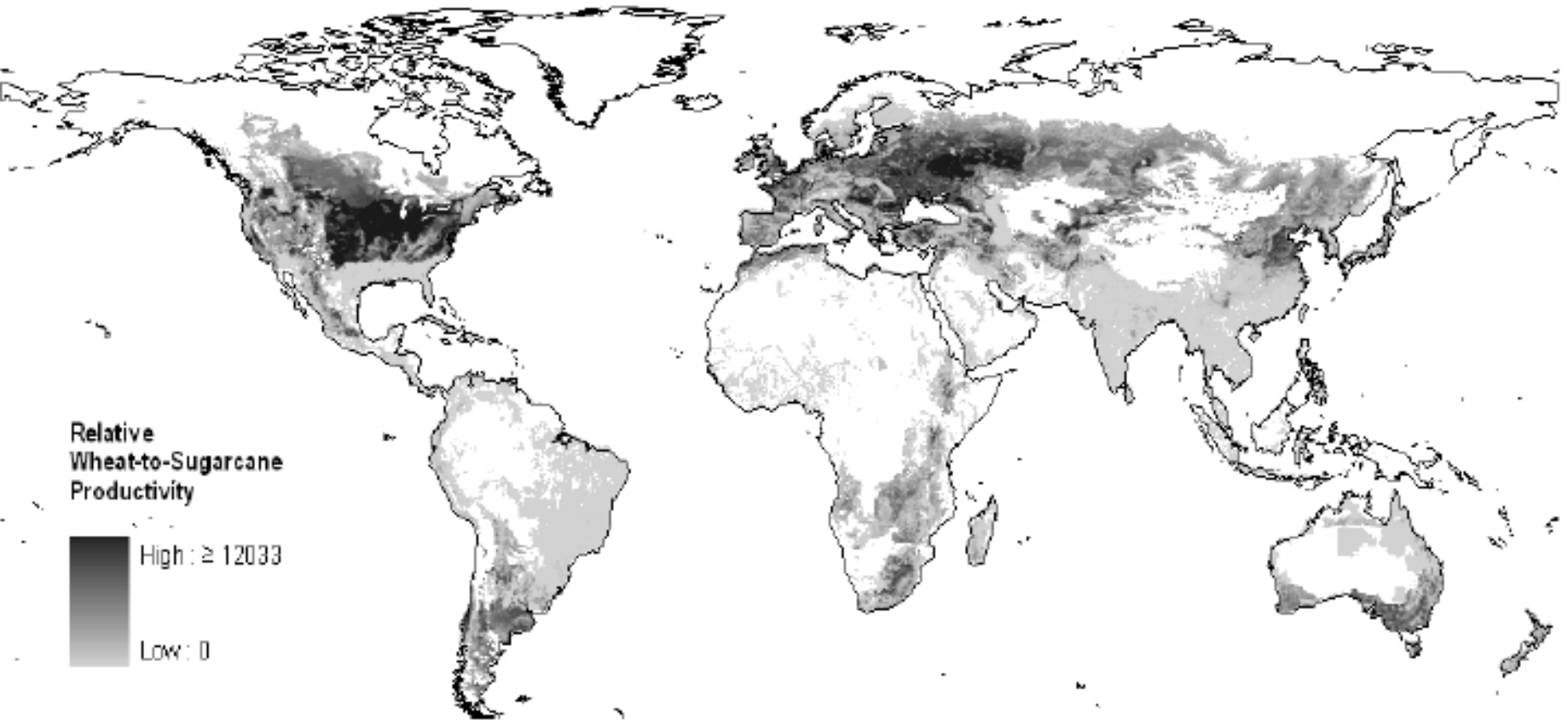
Gains from trade

- **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 they 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**