

# Supply chain analysis ICT and electronics sector

Substitution of Critical Raw Materials –  
Importance for European Electronics  
Industry Workshop  
Grenoble, 6<sup>th</sup> October, 2014

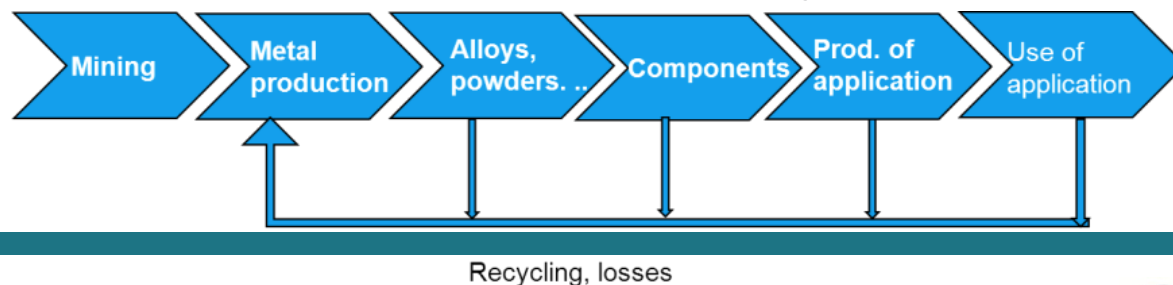
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# Content

- Objectives
- Definition of the sector
- Electronics production of Europe
- Selection of applications for supply chain analysis
- Case studies:
  - LED lighting
  - Assembled printed circuit board (incl. electric components)
- Conclusions

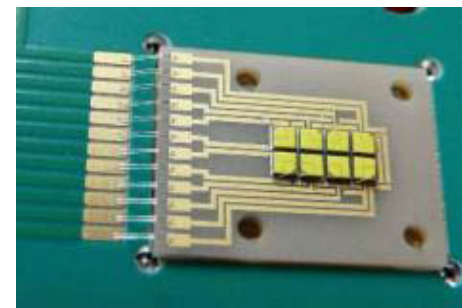
# ICT and Electronics sector Supply chain analysis

- To find out which CRM containing ICT and electronics sector applications, important to European economy,
- Analysis of the supply chains of selected applications for economic importance
  - Identification of the supply chain
  - Statistical analysis – Eurostat
  - Business analysis – Market development, amount of CRMs, development of vulnerability, substitution options



# ICT and electronics sector

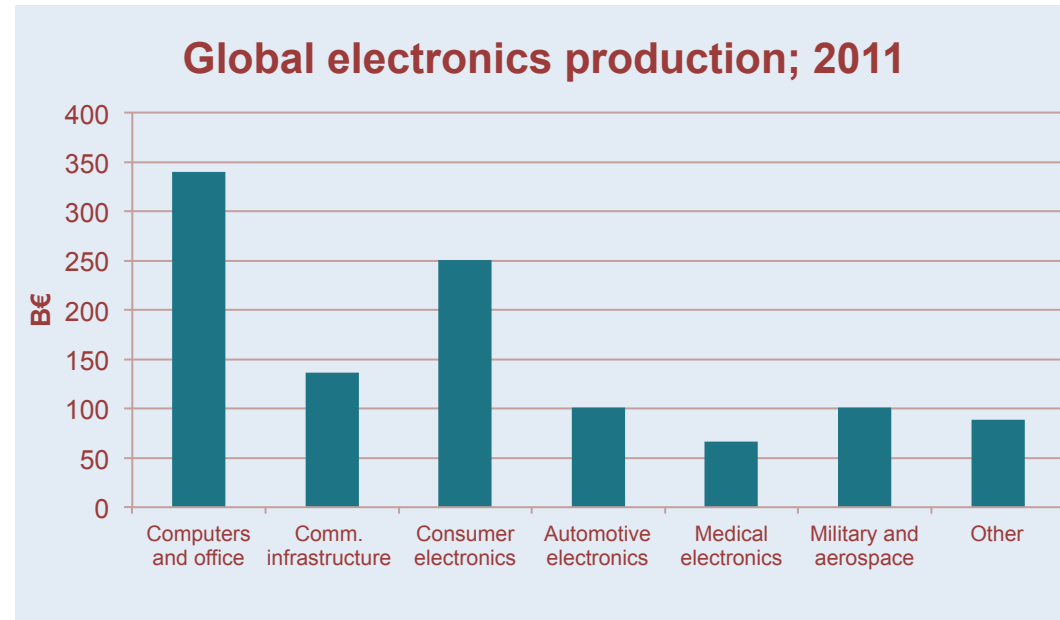
- Products for consumers, industries and professional users
- Products (and services) which capture, transmit and display data and information electronically:
  - Computers, communication equipment, displays, consumer electronics
- Electrical and electronic products
  - Consumer goods: lighting, domestic appliances, toys
  - Professional goods: medical device, electronic control equipment, sensors, tools
- Electronic components (intermediate goods)



Ref. IZM in cycLED Deliverable 2.1:  
Categorization of LED products

# Economic value of the sector

- Global production 1 140 Billion €, European production 250 Billion € (year 2008)
- Sector of rapid changes: Products, production locations, market leaders



Source: INEMI roadmap 2013

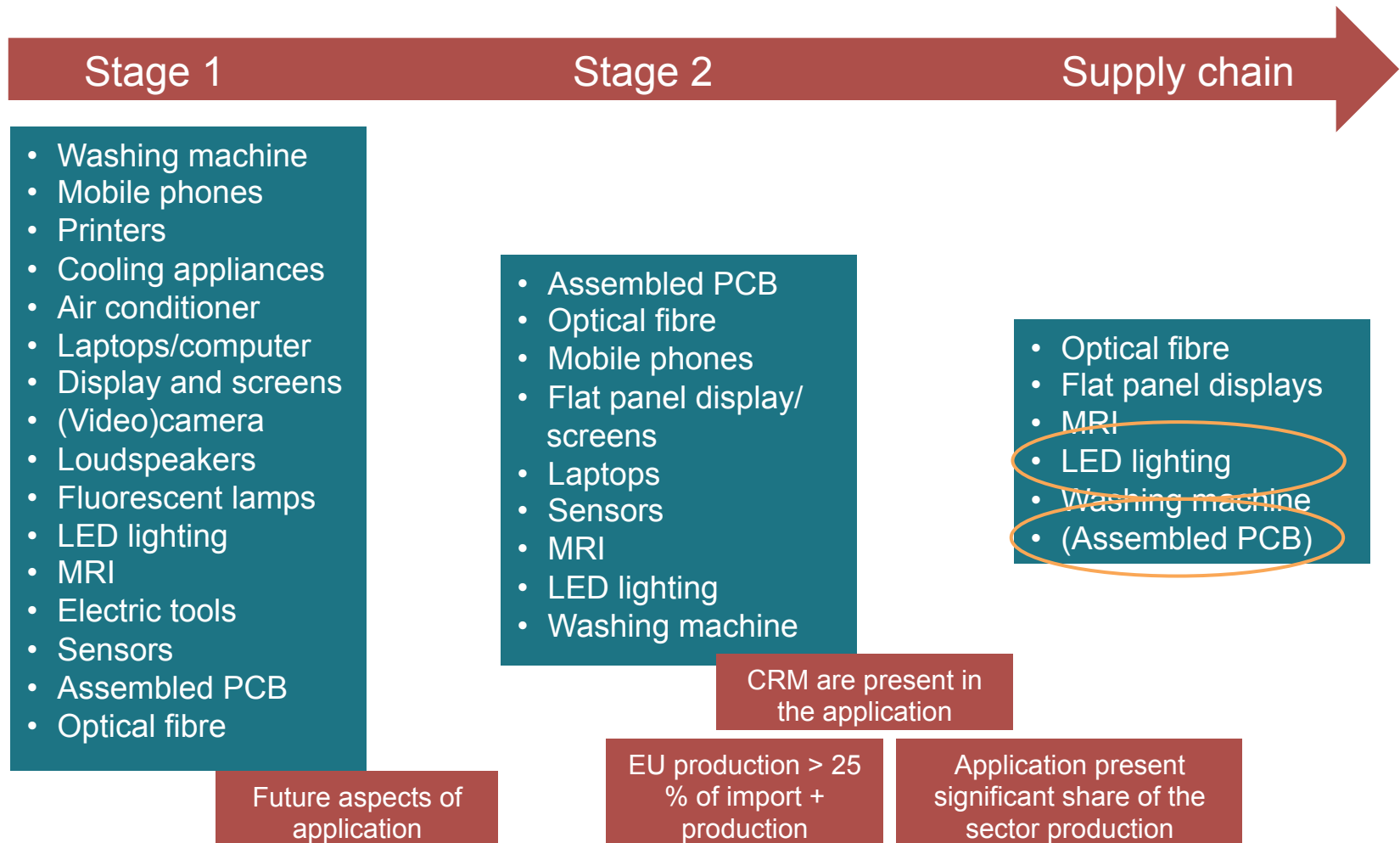
# Electronics production in Europe

- Production in Europe has been declining
  - Assembly and component production moved to countries of lower costs
- European strengths:
  - **Areas where creative application of electronics is critical – innovative producers and access to advanced electronics**
  - Industrial and professional electronics is an area with scientific, technological, and industrial traditions
    - For example automobile electronics, medical applications, sensors and control, machine tools, innovative led applications

# CRM in electronics applications

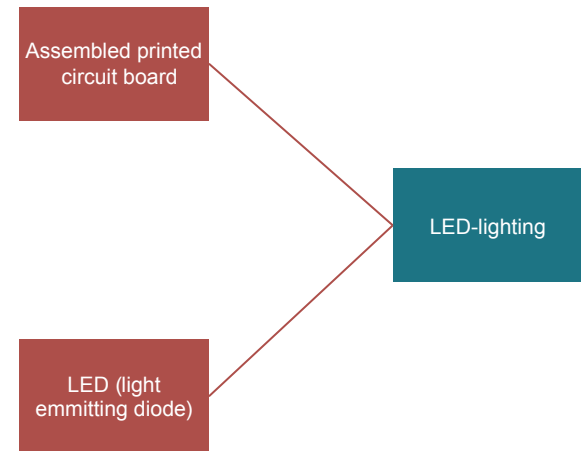
- Typically electronic products contain small amounts of several critical raw materials
- Same type of components are used in different products:
  - Assembled printed circuit boards (and subcomponents), magnets, luminescent materials
  - Displays, leds, sensors

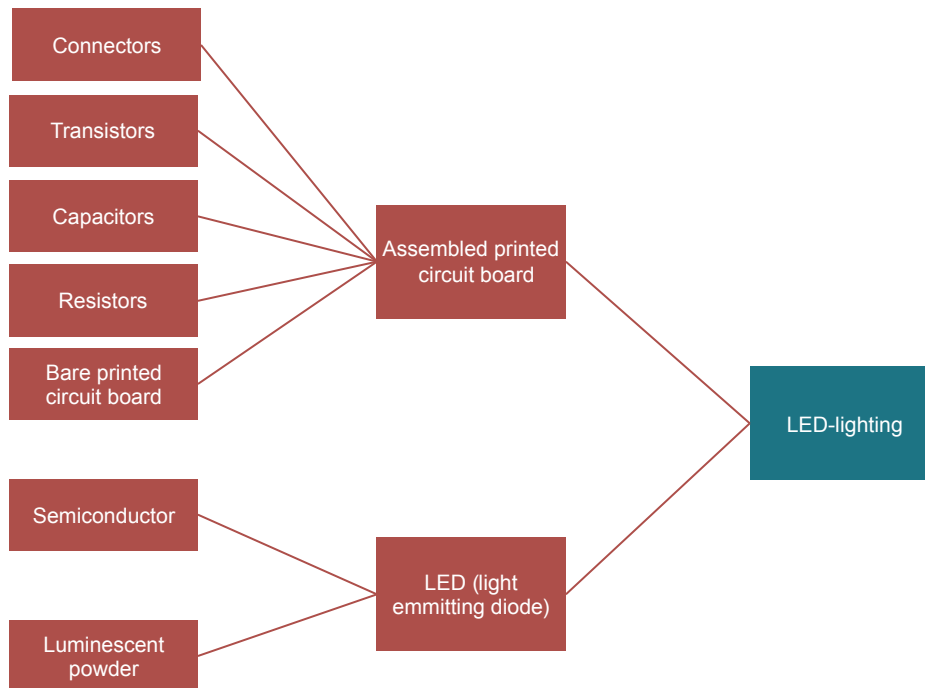
# Selection of applications for supply chain analysis

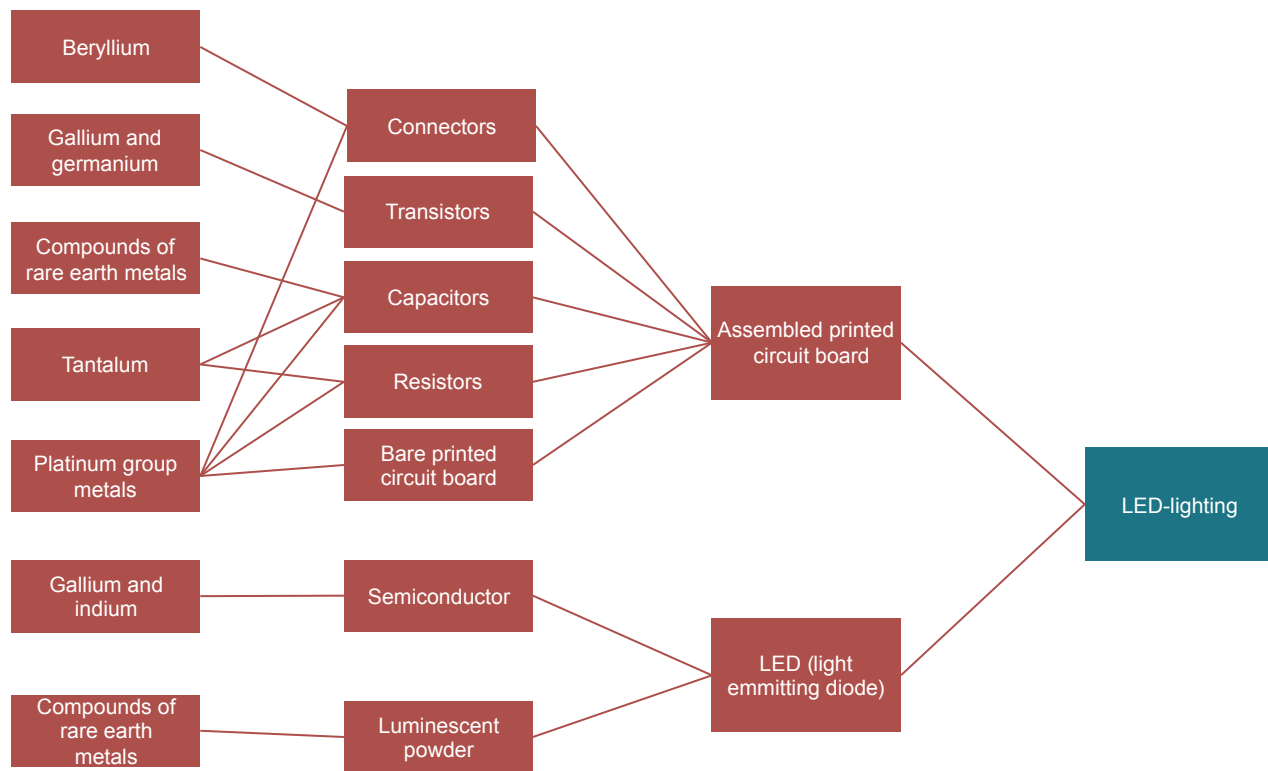


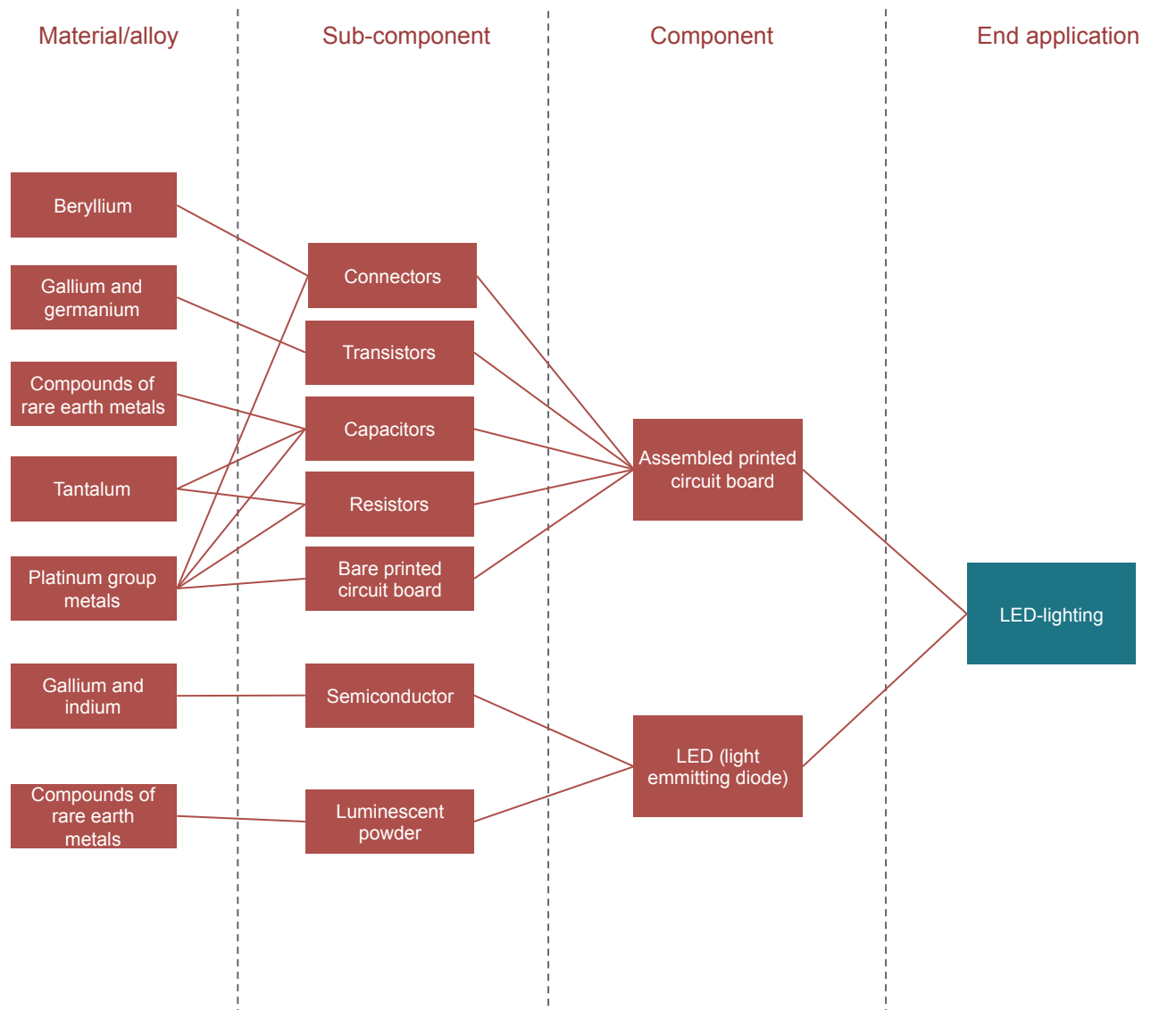
# Supply chain analysis of LED-lighting: decomposition

LED-lighting

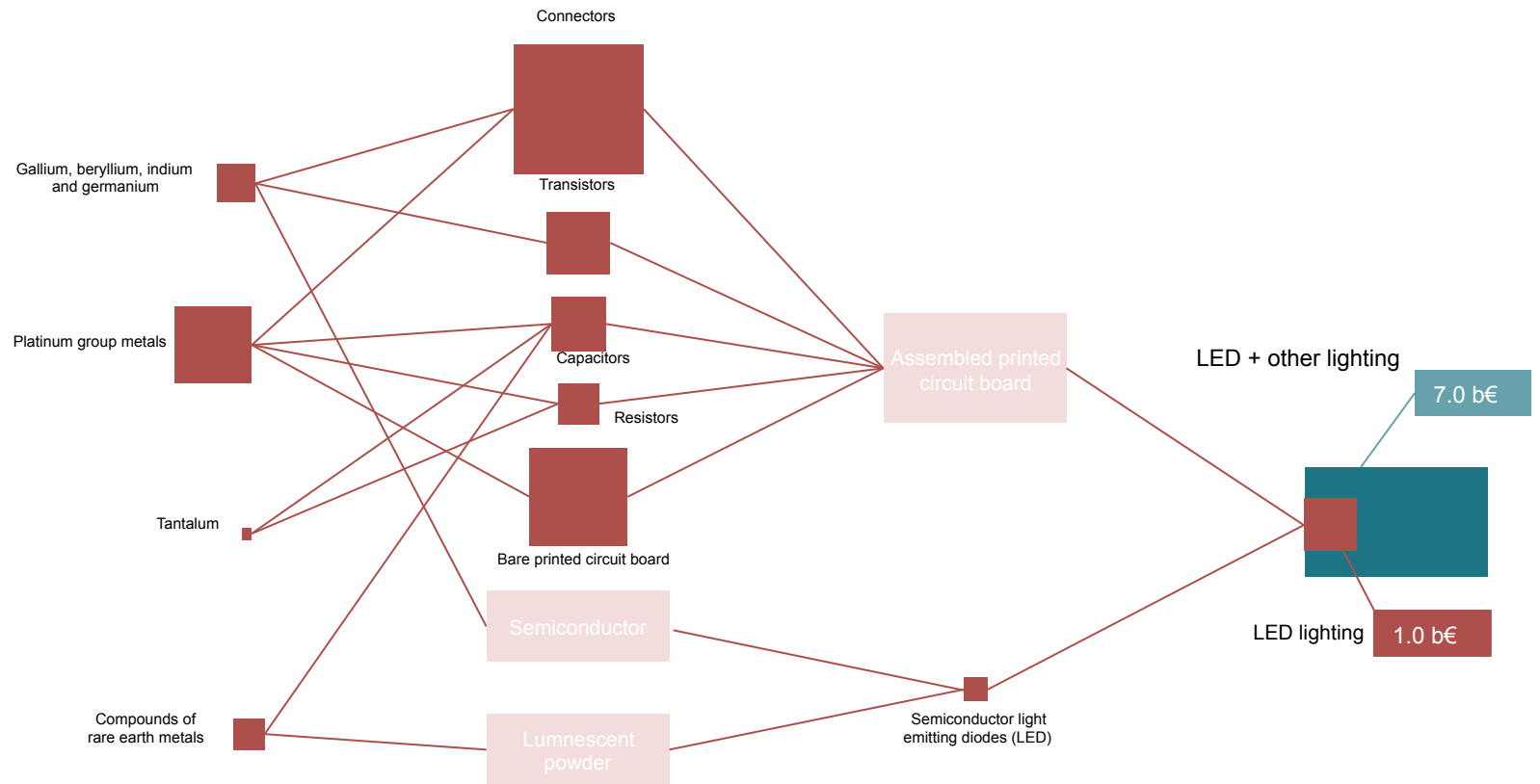




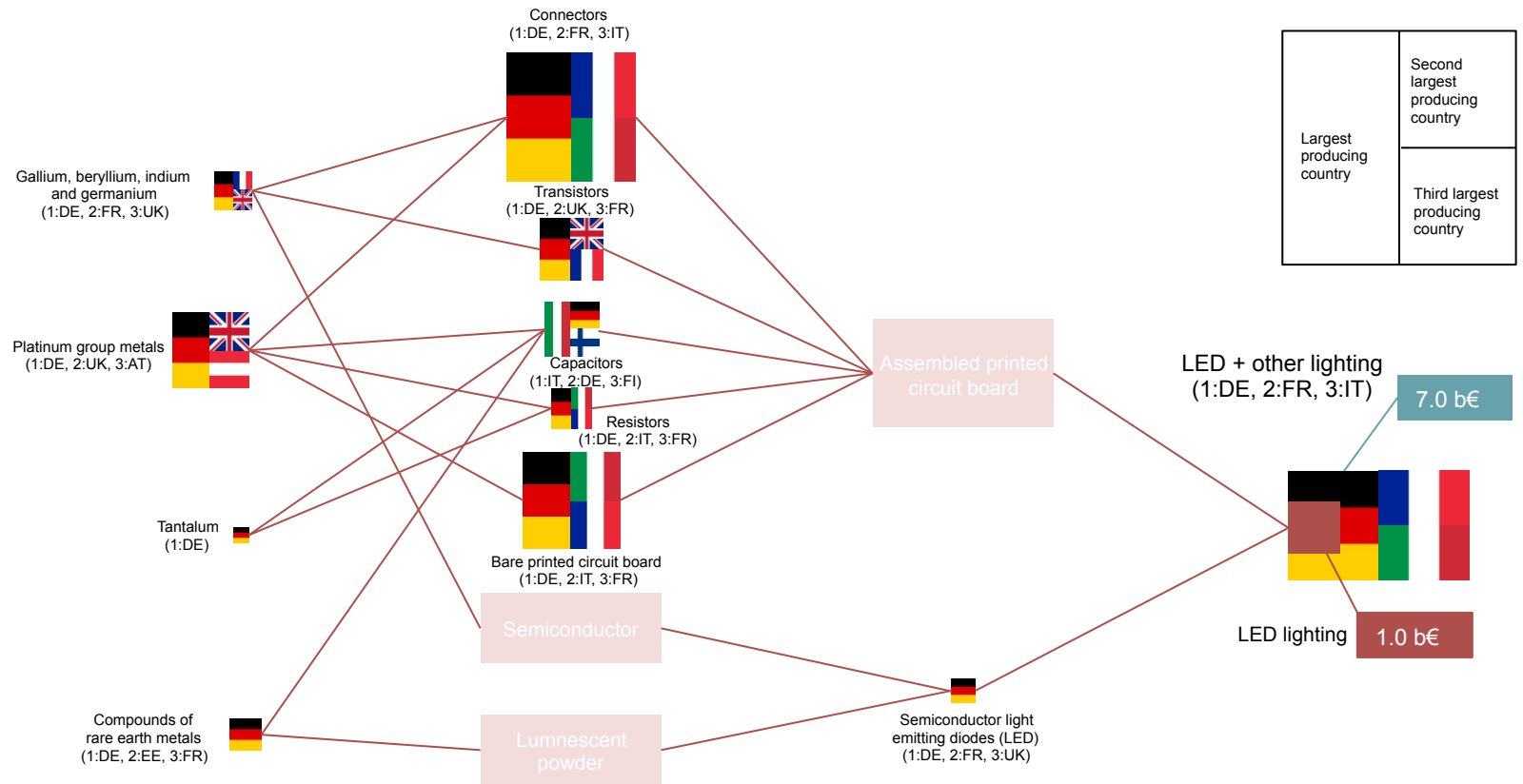




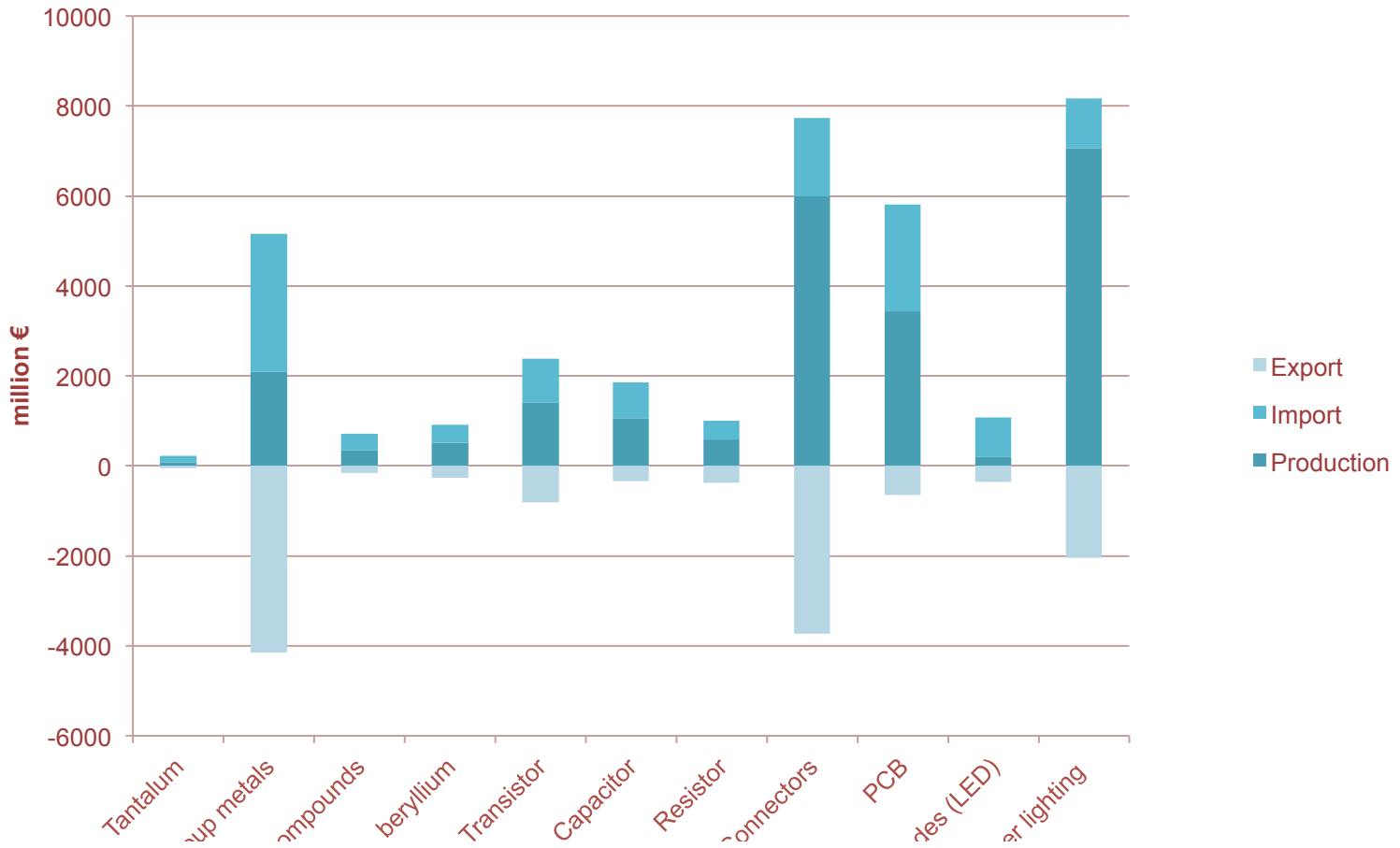
# Production distribution



# Top three producing countries



## Relationship between production, import and export values



# EU position in supply chain of display

Mining/secondary raw material

Separation

Refining or reduction

Manufacturing and component suppliers

LED companies

Recycling

• REE, In and Ga production from primary and secondary sources

• Manufacturing of Light emitting diodes (LED)

• The assembly of LED lighting systems and marketing

• Recycling end of life products

Europe

- Umicore
- Rhodia
- GEO gallium
- Johnson Matthey Ltd.



Umicore N°1 secondary Indium producer in EU

Gallium is a by-product of aluminium refining process

North America

- Nanjing Germanium Factory
- Huludao Zinc
- Zhuzhou Smelter Group
- Dow Metals & Mining Co.
- Asahi Pretec Corp.
- Mitsubishi Mat. Group
- Korea Zinc
- Teck Resources Ltd
- Xstrata Plc.
- Doe Run
- China Minmetals Corporation
- Baotou Steel
- Guangdong Zhujiang Rare Earth Co., Ltd
- Chinalco
- Sumitomo Chemicals
- Dow Mining
- Indium Corporation



Over 95% of REE production is in China

China produces 55% of In production in 2012

Asia

- Osram Opto Semiconductor
- Optogan
- Valtavalo



- Phillips Lumileds
- Nichia Corporation
- Seoul Semiconductor Co., Ltd
- Cree
- LVX
- Edison Opto Corporation
- Epistar Corp
- Everlight Electronics Co. Ltd.
- Kingbright
- Optogan



Asia produced 78% of diodes in 2011

- Osram
- Phillips Lighting
- Havells-Sylvania
- GE Lighting
- Megaman
- Tridonic Atco
- Valtavalo



Osram, Phillips lighting and Havells-Sylvania accounted 62% of EU sales in 2012

- GE Lighting
- Samsung LED
- Nichia Corporation
- Epistar
- Toyoda Gosei
- Cree
- Toshiba Corporation
- Sharp corporation
- LG Electronics



- REE production concentrated in China
- Umicore (Indium) & Rhodia (REE) recyclers



- Only one large diode manufacturer in EU



- Two EU companies in TOP 5 global LED lighting manufacturers



- No LED recycling yet in EU



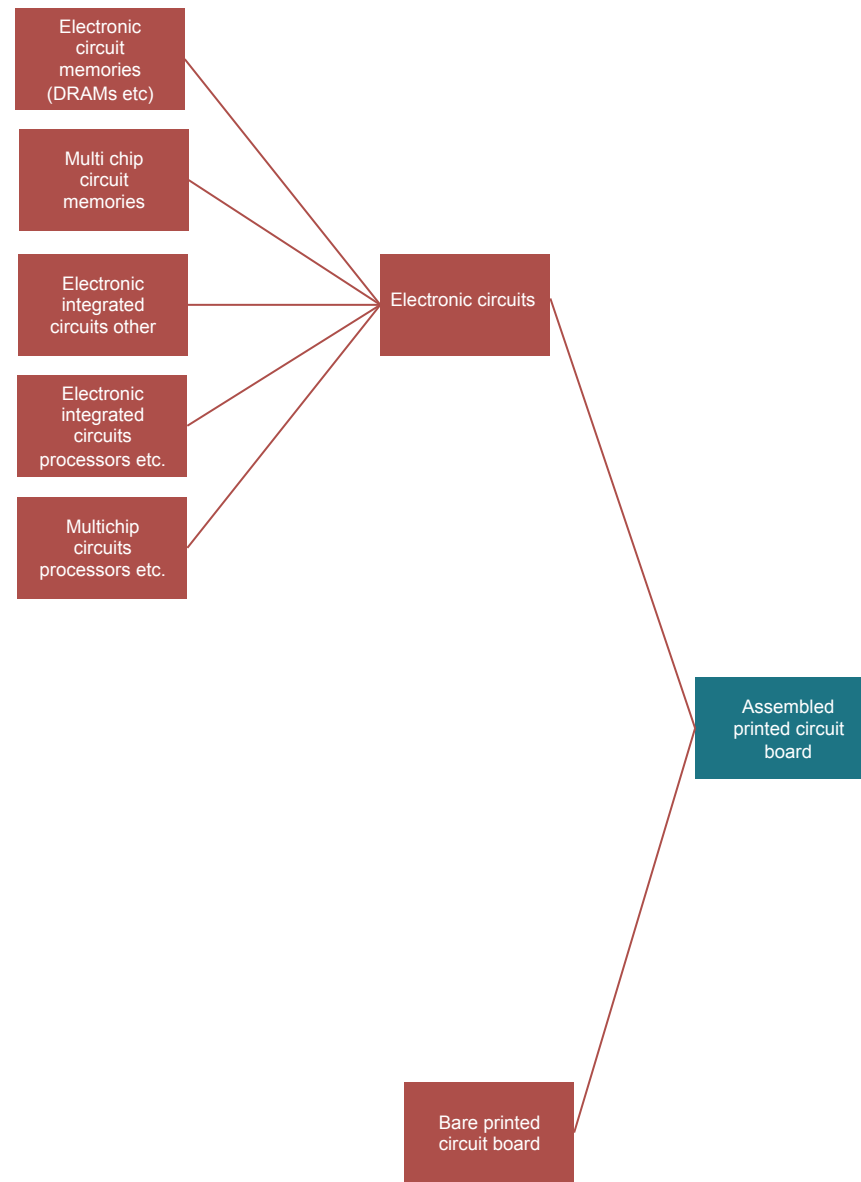
# Supply chain analysis of printed circuit assembly: decomposition

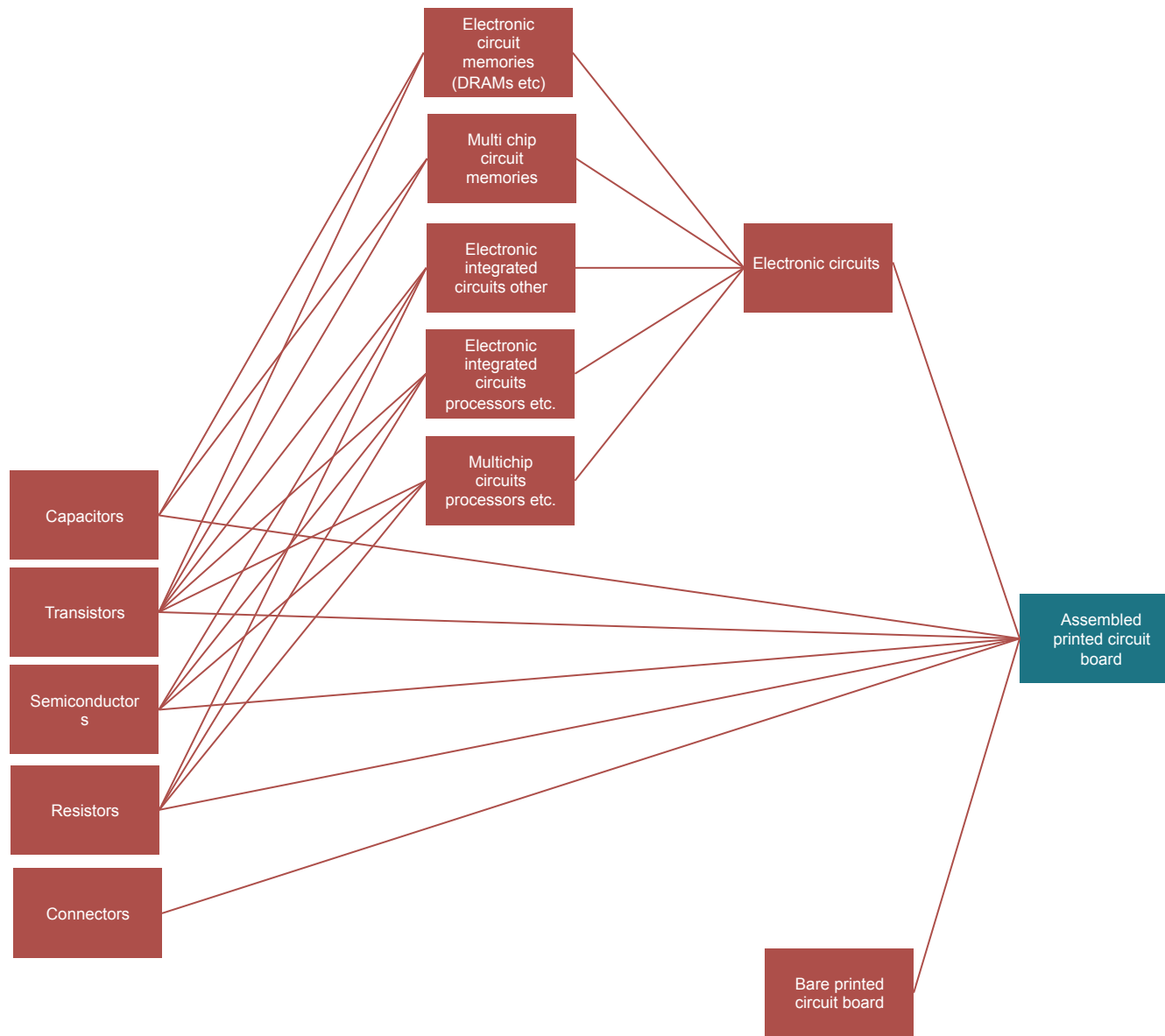
Assembled  
printed circuit  
board

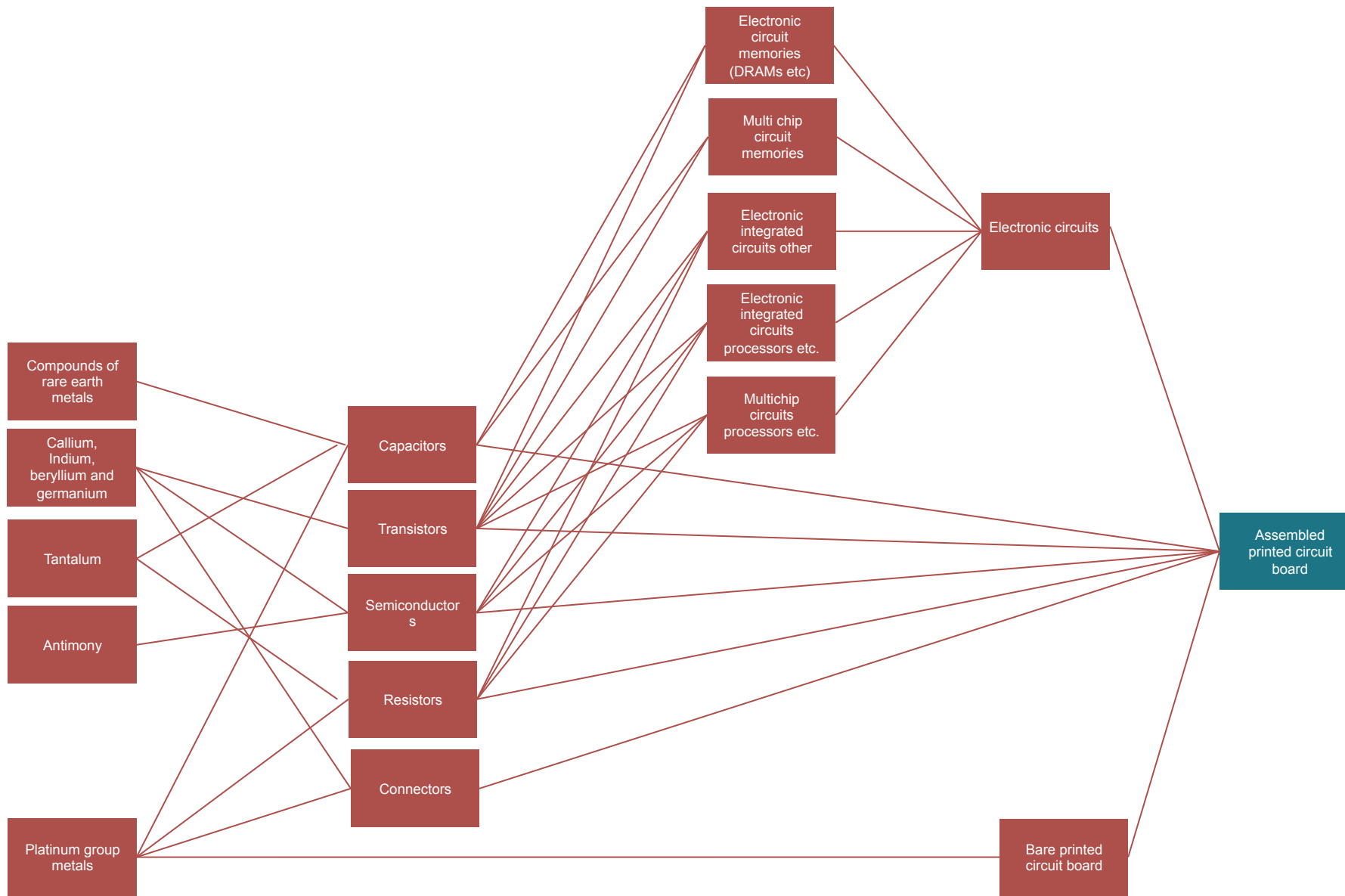
Electronic circuits

Assembled printed circuit board

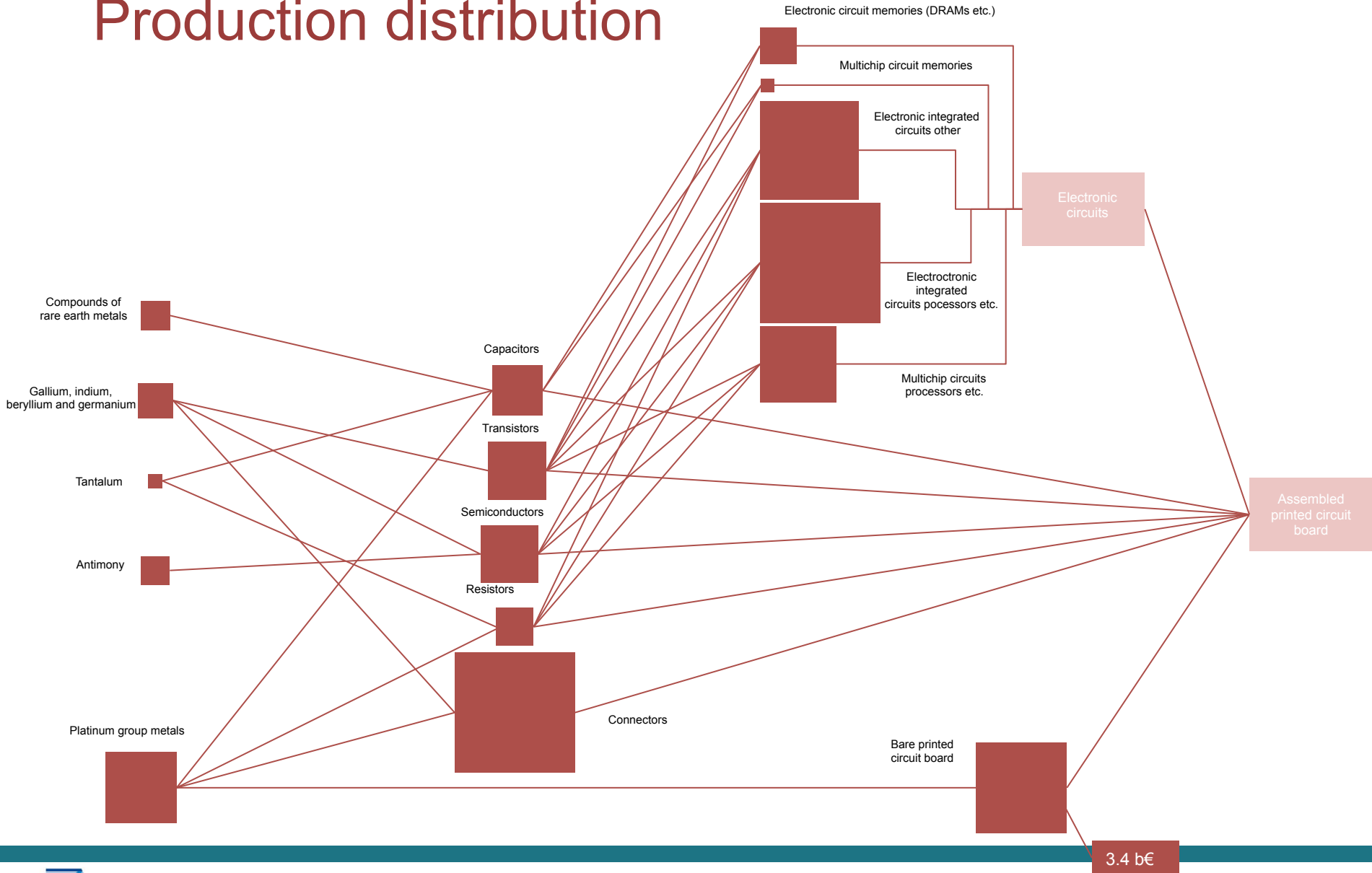
Bare printed circuit board



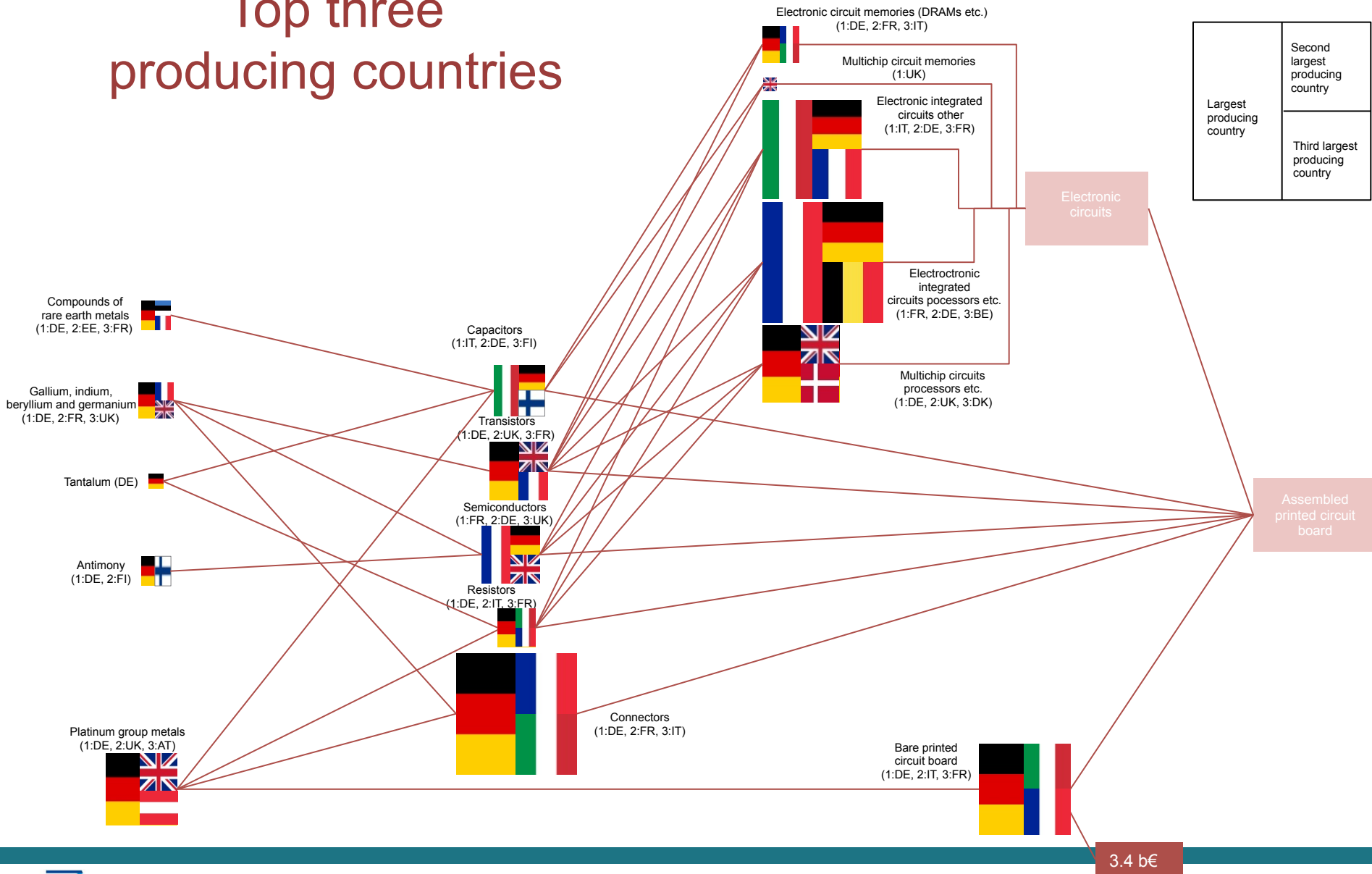




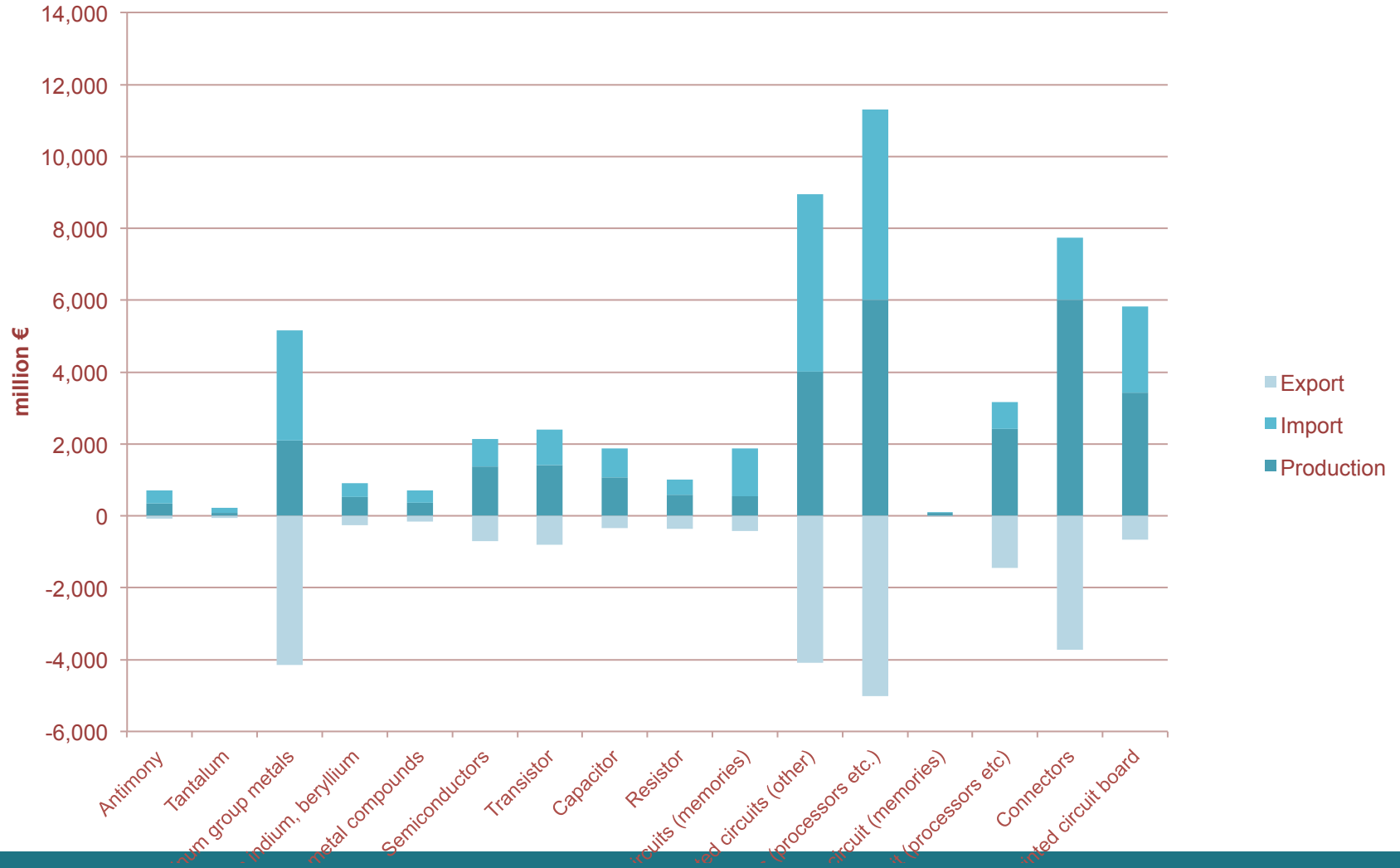
# Production distribution



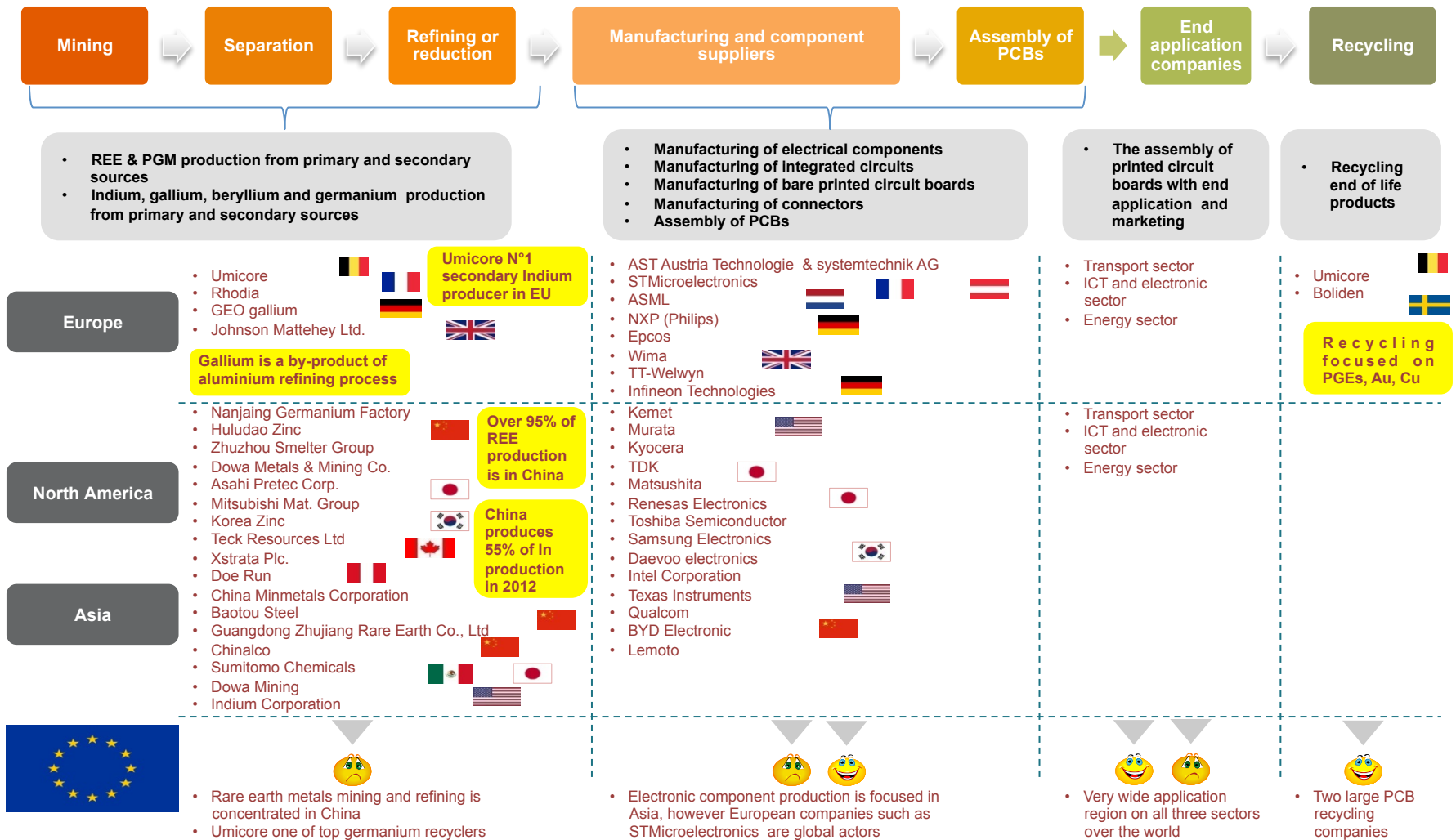
# Top three producing countries



## Relationship between production import and export values



# EU position in supply chain of assembled printed circuit board



# Conclusions

- European strength – creative applications of electronics, industrial and professional electronics
- EU production is mainly focused on end products (Display, LED-lighting), exception of electronic component production
- EU exports mainly end products
- European companies are still significant players in global markets even though production has shifted to Asia

**TNO** innovation  
for life

Knowledge  
Transfer  
Network  
Chemistry Innovation

**D'APPOLONIA**



RINA  
GROUP



PNO



AeroSpace and Defence  
Industries Association of Europe



Knowledge  
Transfer  
Network  
Environmental  
Sustainability



FROM RESEARCH TO INDUSTRY  
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Inspiring  
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University of  
Technology

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