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Global value chains, value-added generation and structural change in EU core and periphery economies : an Input-Output approach

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AGENDA

1. Motivation

(Meso-level data, Value-added, External Dependency, Global Value Chains)

2. Measurement Framework

(Vertical Specialization, Backward linkages, Classifying sectors)

3. Empirical Results

(Portugal, Germany, Check Republic, Austria, Belgium, Finland, Greece, Netherlands)

4. Conclusions

(Structural developments, EU integration, Industrial policy)

5. Policy Recommendations

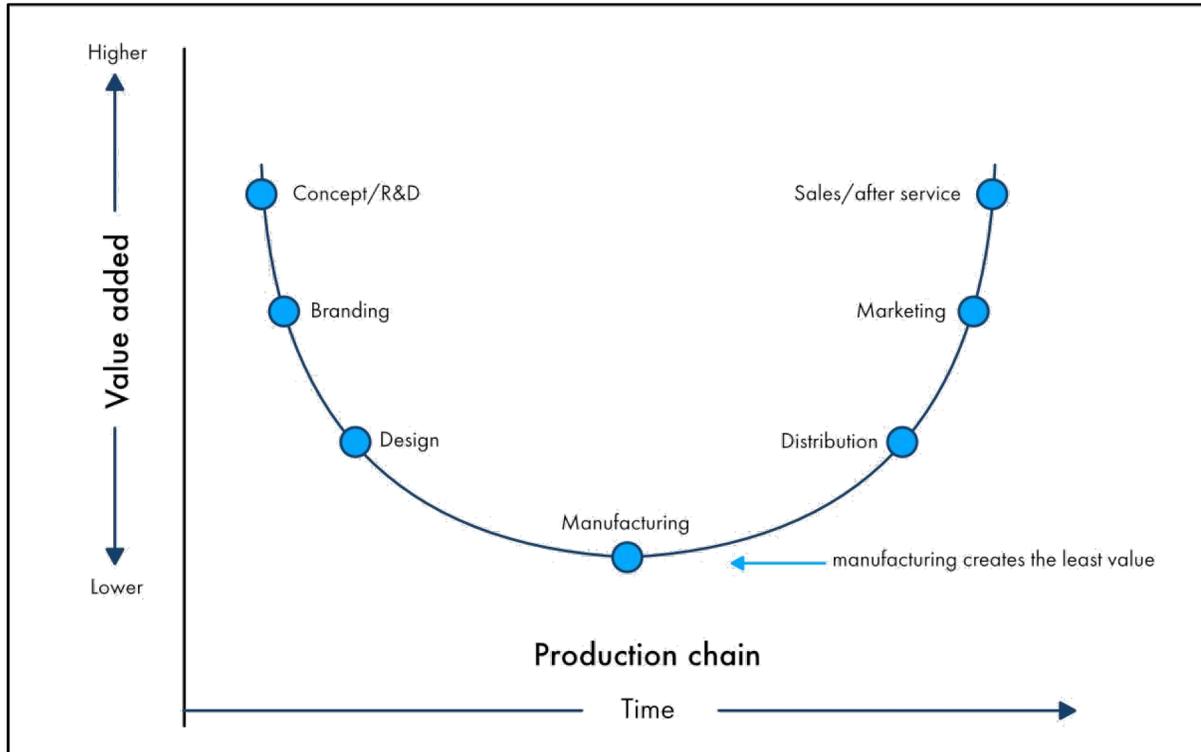(Enhancing competitive advantages and productivity, Economic complexity)

MOTIVATION

❑ Increase in international trade of **intangibles** and **intermediates**. Increasing difference between each country exports and imports in **absolute value** and the total amount of exports and imports in **value-added**.

❑ Conventional statistics on trade flows may no longer be informative enough.

❑ The disintegration in production involves **value-added sharing** during the production process among trade partners.

❑ GVCs results from **technological improvements** that enabled products and services to be transported worldwide, having small and **declining transport costs**. Secondly, it results from **increasing economic integration** and **decreasing trade barriers.**

❑ GVCs integration process depends heavily on each country's **comparative advantages** in these international production networks.

❑ **Multinationals maximize their production processes' efficiency by allocating the different stages of production according to the comparative advantages of each country.**

❑ Therefore, it is essential to understand, in the context of European integration, the Portuguese economy's position concerning production, value-added generation, and external dependence in the light of the Global Value Chains.
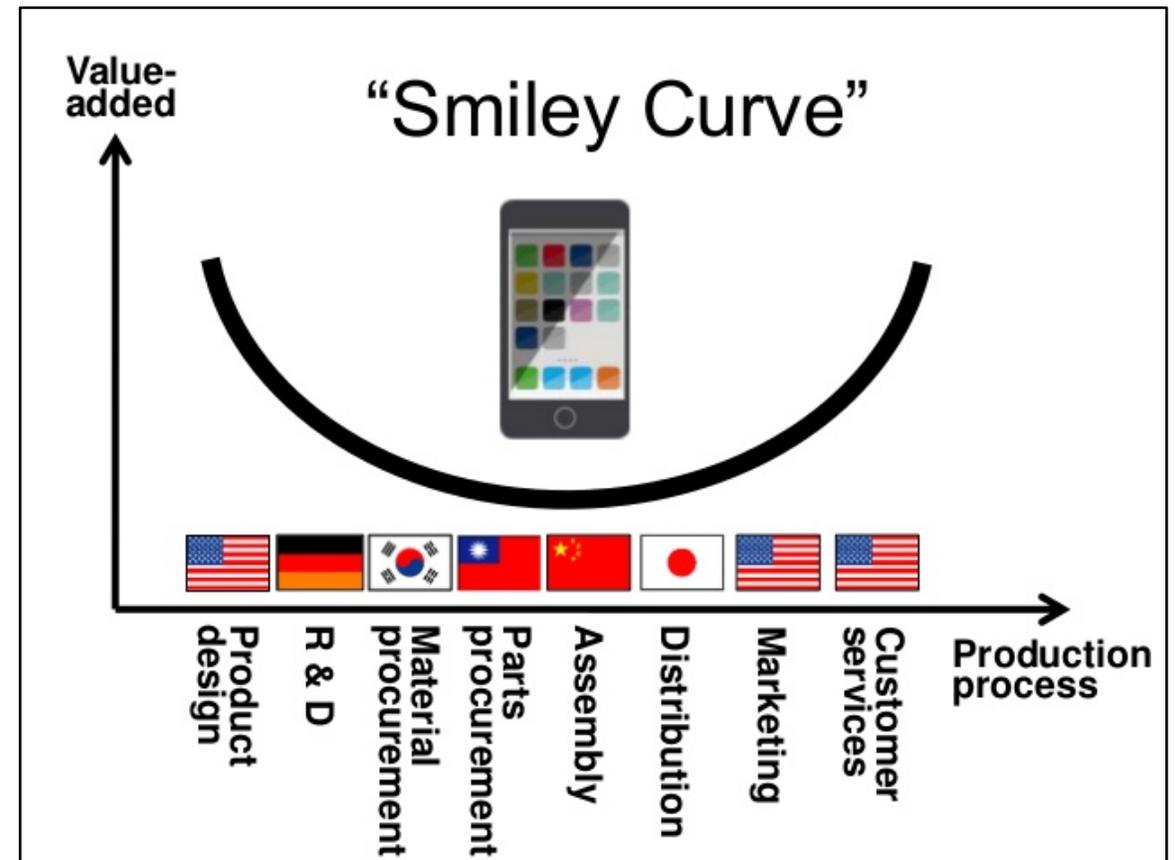
MOTIVATION

❑ Production is organized geographically according to each country comparative advantages (**efficiency gains**).

Figure 1. Value Added by Production Stage

https://iiot-world.com/industrial-iot/connected-industry/status-and-trends-in-the-global-manufacturing-sector/

Figure 2. Apple production chain

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3074988

MEASUREMENT FRAMEWORK

1. **Data**

   (Inter-industry approach)

2. **Vertical Specialization**

   (Proxy for Global Value Chains integration)

3. **Backward Linkages**

   (Value-added generation and External Dependency)

4. **Classifying sectors**

   (Insights from data visualization)

MEASUREMENT FRAMEWORK - Data

❑ The **World Input-Output Database** (WIOD) 2016 Release consists of a series of databases covering **43 countries** (28 EU countries and 15 other major countries) and **56 sectors** for the period **2000-2014**.

❑ WIOD also include the **Socio Economic Accounts (SEA)**, containing data on employment, capital stocks, gross output and value added at current and constant prices at the industry level.

❑ Country selection criteria: Population size (**8 economies**)

❑ Sector selection criteria: Tradable industries (**25 tradable sectors**)

❑ Time horizon selection criteria: Accounting for the effects of the International financial crisis of 2007-08 (**3 periods**)

MEASUREMENT FRAMEWORK - Vertical Specialization

❑ Each country specialize in "tasks" or different stages of production.

❑ **Backward** and **Forward vertical integration** are two distinct ways to quantify the integration of each sector (or economy) in the Global Value Chains (GVCs). **Backward integration** describes the import content of domestic exports. Alternatively, **Forward integration** describes the export content of imports.

(Backward) Vertical Specialization share of exports = Imports of intermediate inputs / Total Exports

❑ The total amount of value-added in final production is somehow expected to be increasingly diluted through a wide range of economies.

❑ **To benefit from the increasing participation in GVCs, the increase in imports, namely of intermediate inputs, should be followed by adequate growth in exports.**

DISCUSSION TOPIC: Should we look for higher or lower levels of integration in the Global Value Chains? Is backward integration beneficial or harmful for the national economy? Does the effect depend on the industry?

MEASUREMENT FRAMEWORK – Backward Linkages

❑ The overall effect of a unitary change in final demand is the sum of: **a) interindustry flows**, **b) value-added** and **c) imported inputs.**

❑ An important property applies: the second and last terms sum up to unity, precisely the value of the initial (exogenous) stimulus, because **in equilibrium the total value of sectoral final demand equals the gross value added plus imported inputs of all sector**.

Final Demand = Value-added + Imports (inputs)

❑ We can quantify the capacity of each sector to generate more (or less) domestic value-added by unity of final demand (what in some sense we can call an "**efficiency effect**", although a peculiar one). Also, we can compute the need to import more (or less) intermediate inputs (a certain kind of "**external dependency effect**").

❑ Having these measures, we can therefore classify each sector according to the particular combination of both effects (**Areas** A, A', B, B', C, C', D, D').

DISCUSSION TOPIC: Would it always be positive to generate high "efficiency effects" and lower "external dependency effects"? Should we expect to have many sectors located in the areas of greatest value generation? Is it realistic? Why can't we have most of the sectors located in those areas that generate the most value?

MEASUREMENT FRAMEWORK – Classifying sectors

Figure 3. County A (Δ 2000-2014)
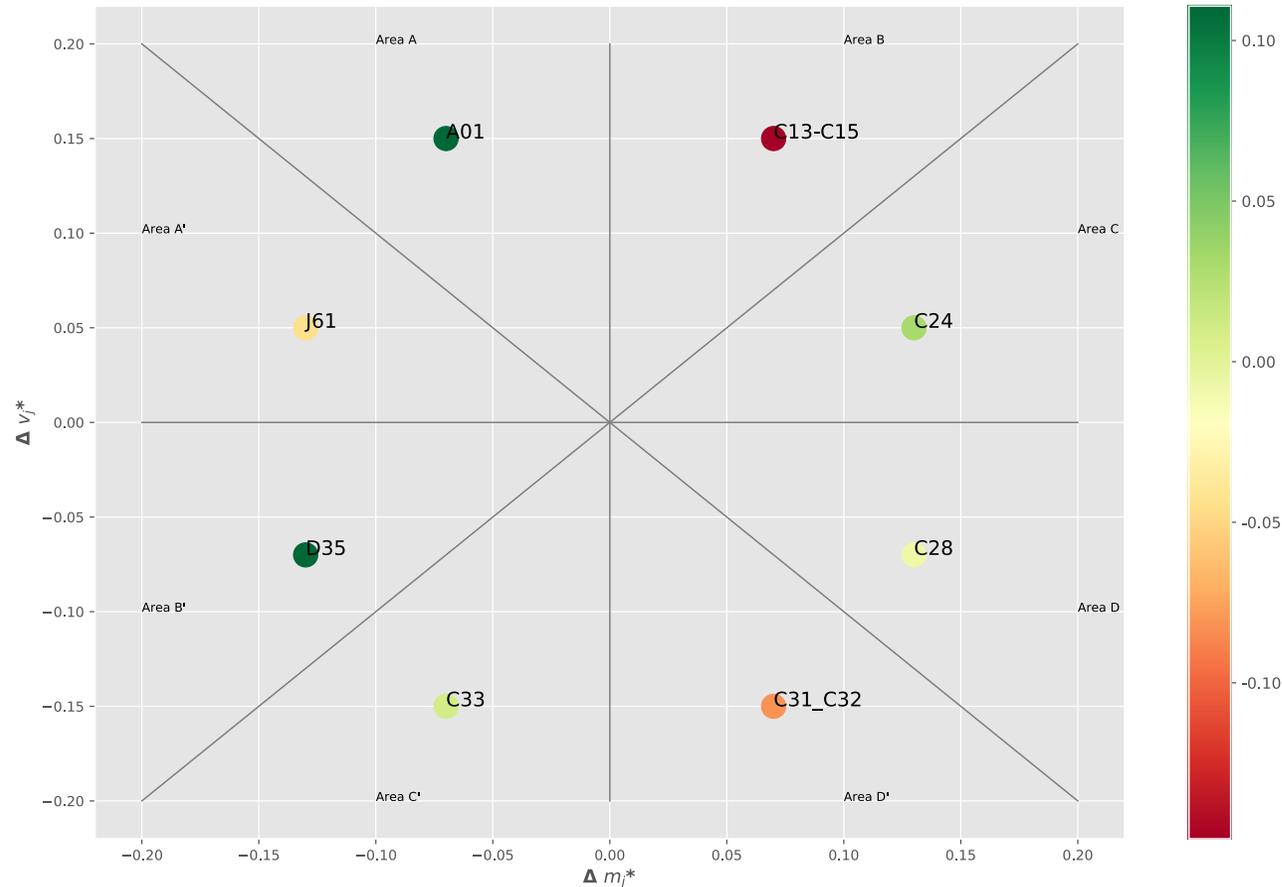
Source: Authors' computions based on WIOD

- ❑ Identity equation $\qquad$ $\mathbf{1} = \boldsymbol{b}_{0j}\,(\boldsymbol{v}_{j}* + \boldsymbol{m}_{j}*)$

- ❑ If Δ $\boldsymbol{b}_{0j}$ < 0 (Δ $\boldsymbol{b}_{0j}$ > 0) then in order to satisfy a unitary increase in sector $\boldsymbol{j}$ final demand, a smaller (greater) increase in the global production of the economy is needed. We must have $\Delta \boldsymbol{m}_{j}* + \Delta \boldsymbol{v}_{j}* > \mathbf{0}$ ($\Delta \boldsymbol{m}_{j}* + \Delta \boldsymbol{v}_{j}* < \mathbf{0}$), and so 8 situations are possible:

- ❑ If Δ $\boldsymbol{b}_{0j}$ < 0 then:
  - Area A: $\Delta \boldsymbol{v}_{j}* > \mathbf{0}$ and $\Delta \boldsymbol{m}_{j}* < \mathbf{0}$.
  - Area B: $\Delta \boldsymbol{v}_{j}* > \mathbf{0}$, $\Delta \boldsymbol{m}_{j}* > \mathbf{0}$ and $\Delta \boldsymbol{v}_{j}* / \Delta m_{j}*\ \boldsymbol{j} > \mathbf{1}$
  - Area C: $\Delta \boldsymbol{m}_{j}* > \mathbf{0}$, $\Delta \boldsymbol{v}_{j}* > \mathbf{0}$ and $\Delta \boldsymbol{v}_{j}* / \Delta m_{j}*\ \boldsymbol{j} < \mathbf{1}$
  - Area D: $\Delta \boldsymbol{m}_{j}* > \mathbf{0}$ and $\Delta \boldsymbol{v}_{j}* < \mathbf{0}$.

- ❑ If Δ $\boldsymbol{b}_{0j}$ > 0 then:
  - Area A': $\Delta \boldsymbol{v}_{j}* > \mathbf{0}$ and $\Delta \boldsymbol{m}_{j}* < \mathbf{0}$, with $\Delta \boldsymbol{v}_{j}* < |\Delta \boldsymbol{m}_{j}*|$
  - Area B': $\Delta \boldsymbol{v}_{j}* > \mathbf{0}$, $\Delta \boldsymbol{m}_{j}* > \mathbf{0}$ and $\Delta \boldsymbol{v}_{j}* / \Delta m_{j}* > \mathbf{1}$, with $|\Delta \boldsymbol{v}_{j}*| < |\Delta \boldsymbol{m}_{j}*|$
  - Area C': $\Delta \boldsymbol{m}_{j}* > \mathbf{0}$, $\Delta \boldsymbol{v}_{j}* > \mathbf{0}$ and $\Delta \boldsymbol{v}_{j}* / \Delta m_{j}* < \mathbf{1}$, with $|\Delta \boldsymbol{v}_{j}*| > |\Delta \boldsymbol{m}_{j}*|$
  - Area D': $\Delta \boldsymbol{m}_{j}* > \mathbf{0}$ and $\Delta \boldsymbol{v}_{j}* < \mathbf{0}$, with $|\Delta \boldsymbol{v}_{j}*| > \Delta \boldsymbol{m}_{j}*$

- ❑ We additionally include a third dimension (beyond delta $\Delta \boldsymbol{v}_{j}*$ and $\Delta \boldsymbol{m}_{j}*$) representing the results for the vertical specialization measure (represented by $\Delta \boldsymbol{VS}_{j}*$) that were included in color scales.

EMPIRICAL RESULTS

1. Time

(Periods: 2000-2014; 2000-2007; 2007-2014)

## 2. Countries

(Portugal, Check Republic, Germany)

3. Sectors

(25 tradable industries)

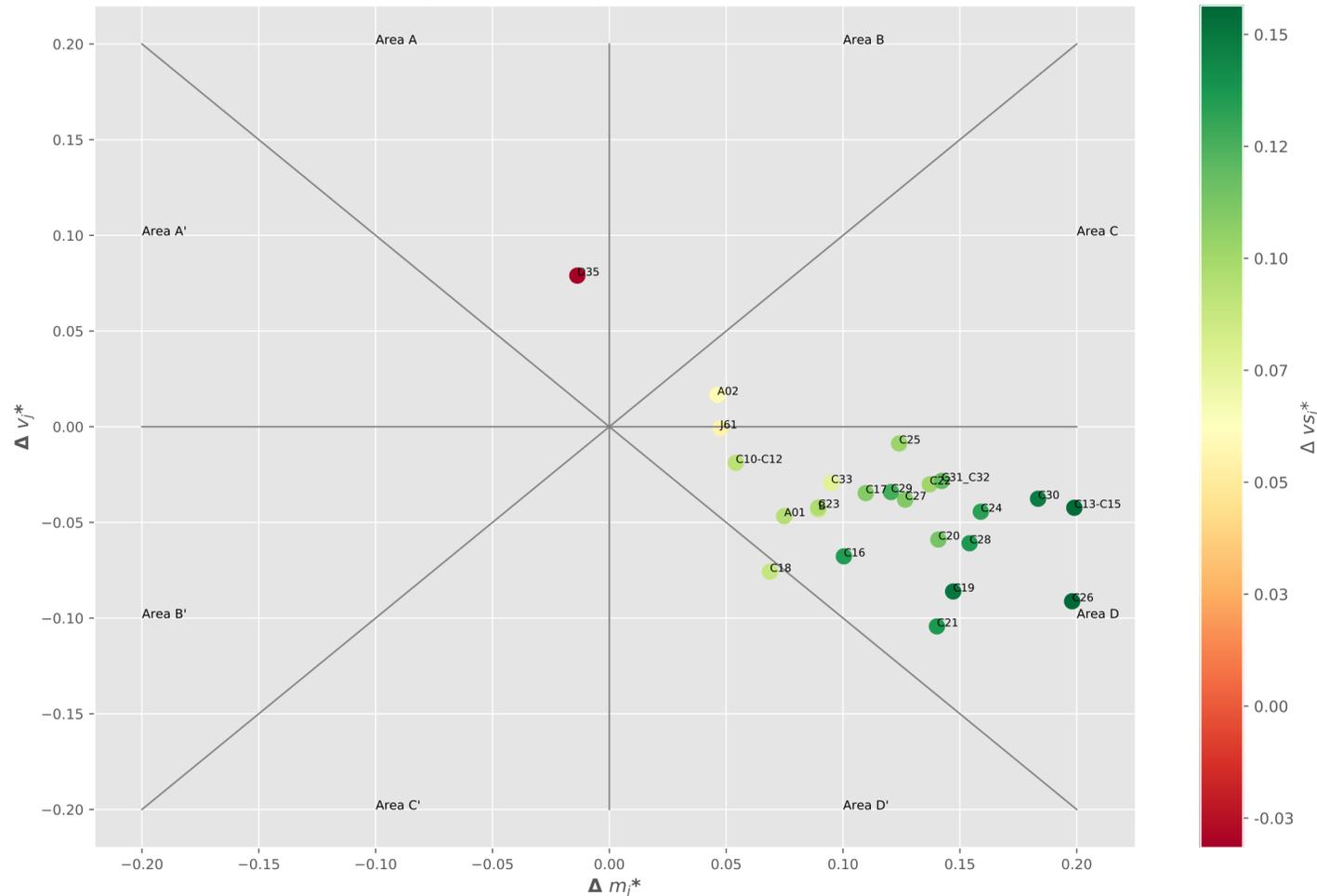| ISIC code	Sector
A01	Crop and animal production, hunting and related service activities
A02	Forestry and logging
A03	Fishing and aquaculture
B	Mining and quarrying
C10-C12	Manufacture of food products, beverages and tobacco products
C13-C15	Manufacture of textiles, wearing apparel and leather products
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
C17	Manufacture of paper and paper products
C18	Printing and reproduction of recorded media
C19	Manufacture of coke and refined petroleum products
C20	Manufacture of chemicals and chemical products
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
C22	Manufacture of rubber and plastic products
C23	Manufacture of other non-metallic mineral products
C24	Manufacture of basic metals
C25	Manufacture of fabricated metal products, except machinery and equipment
C26	Manufacture of computer, electronic and optical products
C27	Manufacture of electrical equipment
C28	Manufacture of machinery and equipment n.e.c.
C29	Manufacture of motor vehicles, trailers and semi-trailers
C30	Manufacture of other transport equipment
C31_C32	Manufacture of furniture; other manufacturing
C33	Repair and installation of machinery and equipment
D35	Electricity, gas, steam and air conditioning supply
J61	Telecommunications

Figure 5. Portugal (Δ 2000-2014)
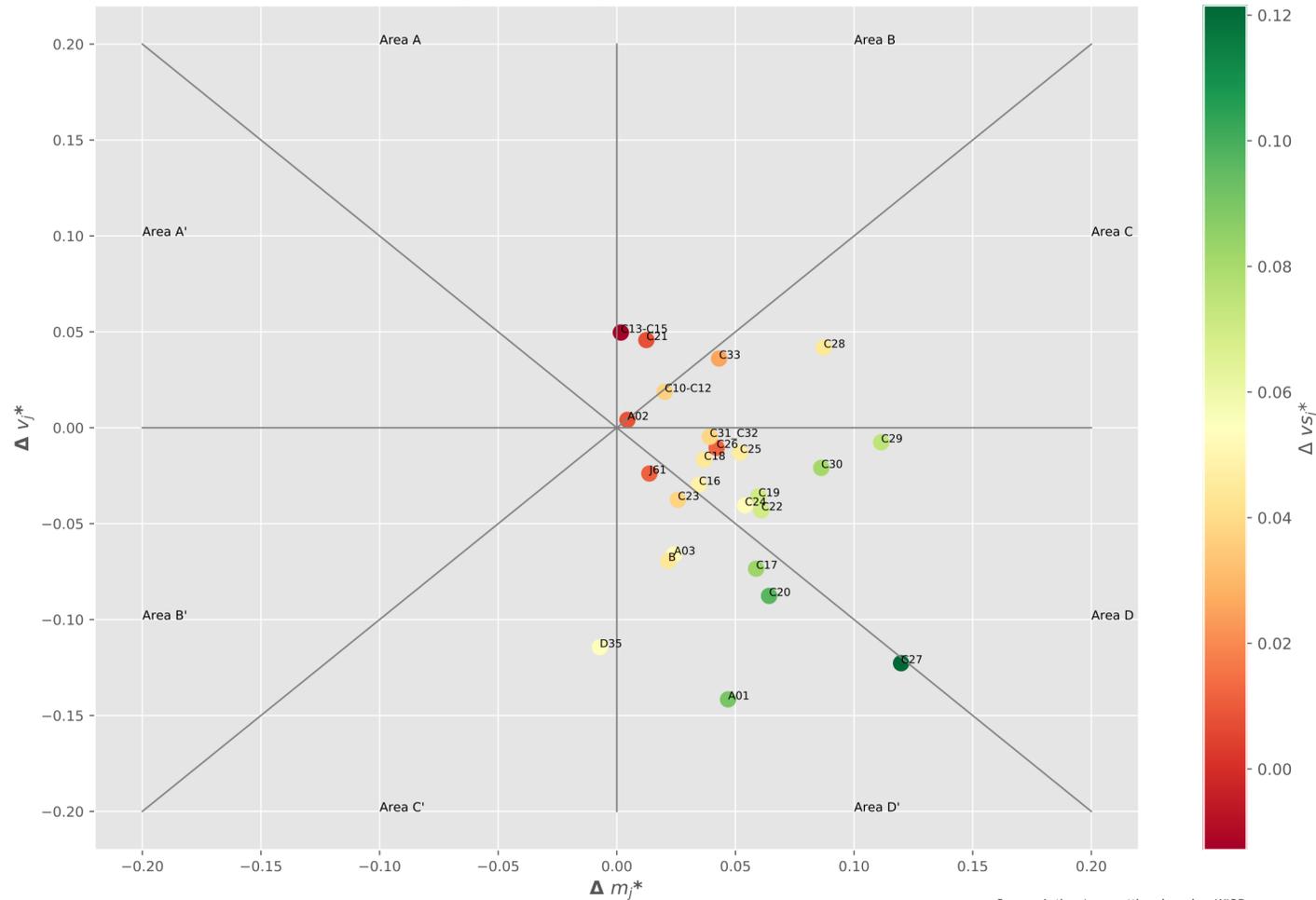
Source: Authors' computations based on WIOD

- We see an **apparent global deterioration of the Portuguese productive system between 2000 and 2014**, with very few sectors locating in virtuous areas A, A', B, and B'.

- However, there are some exceptions. We highlight sectors **C13_15** (Textiles and shoes) and **C21** (Pharmaceutical products) due to their very favorable structural evolution since 2000. **These industries can be considered as strategic sectors to the national production of the Portuguese economy.**

- Additionally, sectors **A01** (Crop and animal production), **C20** (Chemical products), and **C27** (Electrical equipment) experienced high growth rates in exports during the period of analysis. Despite a tendency to locate in areas with the lower value-added generation, **these sectors were able to benefit from growing participation in the GVCs.**

Figure 6. Check Republic (Δ 2000-2014)

Source: Authors' computtions based on WIOD

- **The Czech Republic represent a particular case within the EU.**

- The vast majority of activity sectors are located in **area D**, which means that their production shows increasing levels of external dependency.

- The only exception was sector **C35** (<u>Electircity and gas supply</u>) that were located in Area A.

- The increasing levels of external dependency can be detected by the high levels of vertical specialization, which indicates that the Czech Republic has **made considerable progress in terms of insertion in the Global Value Chains**.

- Moreover, considering that all sectors of activity in the Czech Republic show **significant growth in their exports**, we can conclude that such integration has been beneficial for the Czech Republic's economy.

- **However, there is a future risk of high external dependency, namely from Germany.**

Figure 7. Germany (Δ 2000-2014)
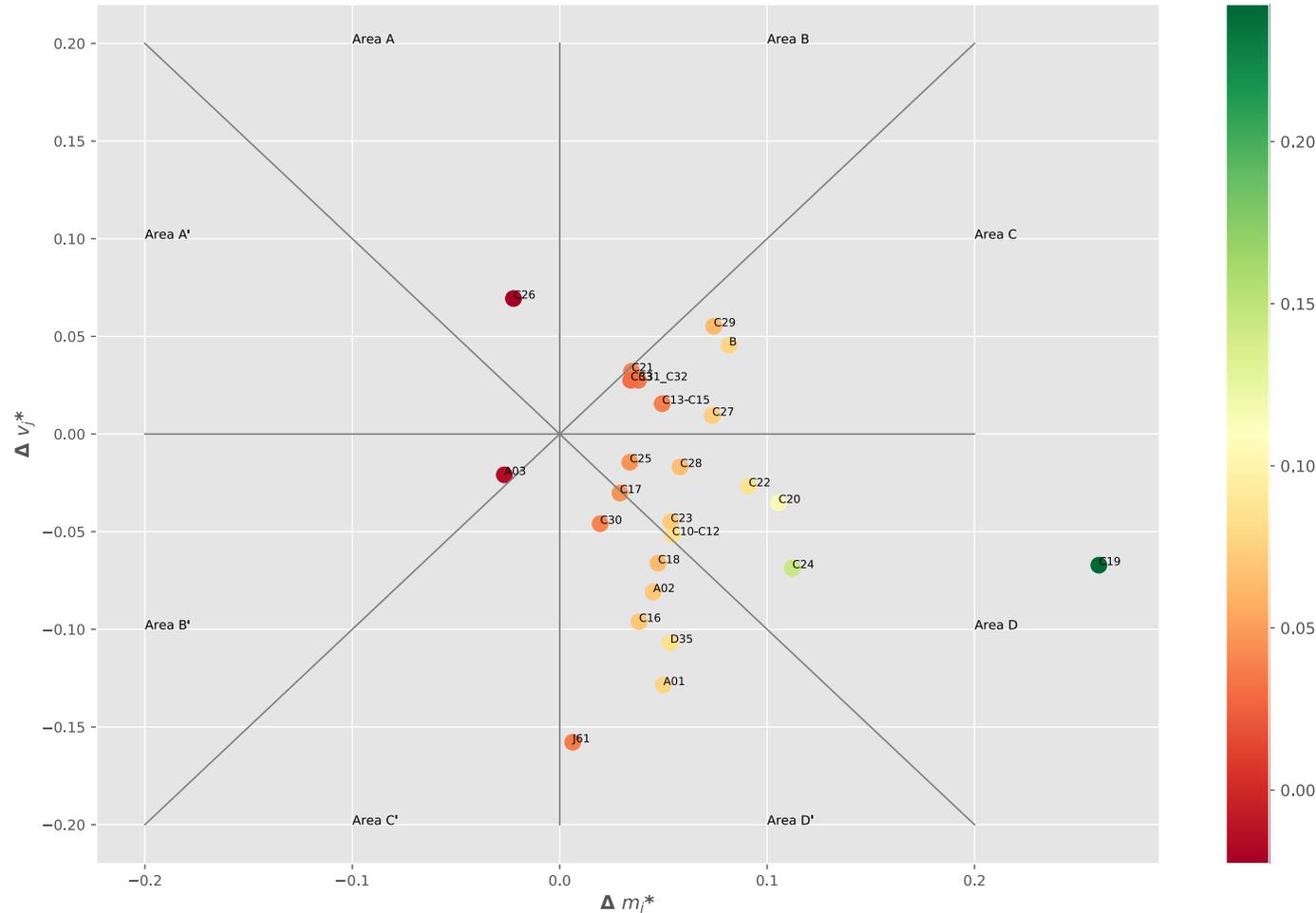
Source: Authors' computtions based on WIOD

- **Germany's productive structure is quite different from the Portuguese one.** The main conclusion drawn from our results is that despite having most sectors located in less virtuous areas, they all **exhibit low vertical integration shares**.

- **Production in Germany is much less dependent on the outside.**

- We highlight sector **A03** (Fishing and aquaculture) and sector **C26** (Computer and electronic products). These two sectors experienced an increase in the "net growth effect" and so were able to **generate higher shares of national value-added in production.**

- In contrast, from areas D and D' we emphasize sectors **C19** (Coke and Refined Petroleum) and **C24** (Metals). The main conclusion for this group of sectors is that they experienced a structural deterioration. **Compared to 2000, each euro of exports implies a smaller national value-added content which also translates in higher levels of vertical specialization.**

CONCLUSIONS

❑ Our main conclusion is the apparent global **deterioration of the Portuguese productive system between 2000 and 2014**, with few sectors locating in virtuous areas A, A', B, and B'. However, we highlight the positive evolution of **C13_15** (textiles and shoes), **C21** (Pharmaceutical products), **A01** (Crop and animal production), **C20** (Chemical products), and **C26** (Computer and electronical products)**.**

❑ **When analyzing the remaining EU economies, our results point to a mixed pattern**.

❑ **External dependency is not necessarily harmful**. It may be the result of increased benefits from the international division of production.

❑ Additionally, the **impact on climate change** of these tendencies is potentially harmful because of growing needs of transportation of physical goods.

❑ **The COVID-19 pandemic has reinforced the appetite for a reshaping of Global Value Chains**. Especially in peripheric open economies like Portugal, it is essential to ensure that national production is not entirely replaced by imports, and so an effort must be made to preserve a set of strategic industries in order to ensure the sufficient generation of domestic value-added.

POLICY RECOMENDATIONS

❑ **Given this information, how can public policies contribute to higher domestic value-added generation, less external dependency, and to more virtuous integrations in the Global Value Chains?**

❑ **Lets look at the fundamentals**! What are the main comparative advantages of Portugal?

• <u>Capital</u>: Weak banking system (high NLP ratios); Several financing issues (lack of alternative financing sources).

• <u>Labor</u>: Portugal has a huge deficit in human capital qualifications. High labor taxation is also an issue.

• <u>Context Costs</u>: Context costs in Portugal remain too high, whether due to inefficiency of the legal system, excessive bureaucracy or government burden.

❑ **Modern approaches to support business and policymakers:**

• Atlas of Economic Complexity – Harvard

• The Observatory of Economic Complexity - MIT

Q&A

❑ Thank you very much for your attention!

❑ Any further questions/suggestions you may have, fell free to reach me (m20190413@novaims.unl.pt).

DISCUSSION