UNIVERSITÄT DUISBURG ESSEN

Open-Minded

ifso institute for socio-economics

Jonas Dominy
Claudius Gräbner-Radkowitsch
Philipp Heimberger
Jakob Kapeller

Economic Polarization in the European Union: Development Models in the Race for the Best Location

uni-due.de/soziooekonomie/wp

ifso working paper 2025 no.46

UNIVERSITÄT DUISBURG ESSEN
Open-Minded

Economic Polarization in the European Union: Development Models in the Race for the Best Location*

Jonas Dominy, Universität Duisburg-Essen
Claudius Gräbner-Radkowitsch, Europa-Universität Flensburg & JKU
Philipp Heimberger, Wiener Institut für Internationale Wirtschaftsvergleiche
Jakob Kapeller, Universität Duisburg-Essen & JKU

Abstract

This paper analyzes developmental trajectories in the EU. In doing so, it diagnoses economic polarization on two different levels: for one, we observe a divergence of average incomes across EU countries as a persistent empirical feature associated with European integration. For another, European economic integration in general and the introduction of the Euro in particular are associated with the emergence of heterogeneous developmental trajectories, which build on, and intensify differences in technological capabilities, institutional and legal setups, as well as labor market characteristics. When clustering countries with reference to similarities in terms of macroeconomic and institutional characteristics across countries, we find evidence for the existence of four distinct development models: core, periphery, and workbench economies, as well as financial hubs. Each of these groups is defined by distinct technological, institutional, and macroeconomic characteristics. Our findings point to suitable ways for extending and refining existing typological approaches, such as the Varieties of Capitalism or the growth model approach, thereby allowing us to better account for the heterogeneity of developmental pathways emerging in the course of an intensifying European race for the best location.

Keywords: Economic polarization, European integration, Development models, growth models, European Union.
JEL-Codes: B5, F6, F45.

This manuscript has been prepared for submission to the Special Issue "The Euro at 25: Economic Policy, Governance, and Global Transformations" to be published by the Review of Evolutionary Political Economy.

* Code and data for this paper is published on GitHub and can be accessed via https://github.com/dominyj/EconomicPolarizationEU2025.

1. Introduction

The formation of the Eurozone and the associated introduction of the Euro as an official means of payment (in 1999) for daily purposes (in 2002) were preceded by a period of deepening international economic integration. This rise of globalization was driven by formative events and developments such as the disintegration of the former Soviet Union, the rise of (some) East Asian economies and the establishment of the WTO in 1994. Within this overall tendency towards greater economic openness (Gräbner et al. 2021), the introduction of the Euro can be seen as a key event that contributed to both global as well as European economic integration.

In the 25 years since the Euro's inception, Europe has been hit by a series of major economic crises, including the financial crisis of 2007-2009, the Euro Crisis of the early 2010s, the Covid-19 crisis of the early 2020s and, eventually, an inflation crisis emerging from increased geopolitical conflicts that led to a decline in real incomes for large parts of the population (European Commission 2023). These recurring and heterogeneous crises have made it more difficult to assess the actual economic impact of the introduction of the Euro, especially when taking into account that the institutional architecture of the monetary union plays an endogenous role in the financial crisis and Euro crisis (e.g. Mody 2018; Tooze 2018), while later events, such as the Covid-19 crisis and the energy crisis of 2021/2022, are more exogenous shocks to the Eurozone.

Taking this complex constellation as a vantage point, one quite clear-cut empirical approach to analyzing the impact of introducing the Euro is to conceive it as a sudden increase in economic openness (in both de-facto and de-jure terms) of the participating economies. This approach rests only on the modest assumption that the introduction of an international currency will to some extent also facilitate international exchange of goods and services, international financial flows, and international mobility on labor markets, which are all relevant dimensions of 'economic openness' as a somewhat latent variable[1]. Building on such a perspective, earlier contributions by Gräbner et al. (2019, 2020a, 2020b, 2020c) show that EU economies reacted differently to the introduction of the Euro understood as an economic openness shock, which reflects heterogeneous economic trajectories taken by Eurozone countries in the last two-and-a-half decades. At the same time, existing research indicates that these countries also responded differently to specific crises as different developmental trajectories were constrained by such crises to a different extent. Overall, the introduction of the Euro, recent crises and their interaction have contributed to economic divergence and polarization within Europe (e.g. Storm and Naastepad 2015; Celi et al. 2018; Mody 2018).

Possible answers to why these crises affected European economies differently often take into account this diversity in developmental trajectories and build on different theoretical frameworks that group countries based on their perceived similarities. While much of the pioneering work on unequal developmental trajectories in political economy goes back to early attempts of regulation theorists (e.g. Aglietta 1976, Boyer 2022; see also: Amable 2023), more recent approaches for grouping countries into different types of regimes rest on

[1] See Gräbner et al. (2021) for a concise overview on different approaches towards measuring economic openness.

the Varieties of Capitalism approach (Hall and Soskice 2001, Iversen et al. 2016; Johnston and Regan 2016), studies of unequal exchange in the global economy (e.g. Hickel et al. 2022) and related approaches in World Systems Theory (e.g. Chase-Dunn et al. 2000), the differentiation between demand- and profit-led regimes in Post-Keynesian economics (Bhaduri and Marglin 1990) and related extensions such as the growth model approach in political economy (Baccaro and Blyth 2022; Behringer and van Treeck 2022; Kohler and Stockhammer 2022), or the social reproduction approach pioneered in feminist economics (Braunstein et al. 2011).

Against the background of this broader theoretical literature, our main contribution so far has been to complement these perspectives with a more data-driven approach aimed at grouping the developmental trajectories of different EU countries by exploiting similarities and differences in macroeconomic and institutional characteristics. In the past this led us to a more nuanced account on country typologies and their explanatory relevance for both crisis resilience in particular, and overall economic performance in general. These results underscored and strengthened core findings of the related literature, but, at the same time, allowed us to further illuminate blind-spots, grey areas, and contradictions between competing approaches (Gräbner et al. 2019, 2020a, 2020b, 2020c). As a consequence, we provided a broader typology that went beyond core-periphery dichotomies (e.g. Simonazzi et al. 2013; Celi et al. 2018; Gräbner and Hafele 2020), while retaining the main idea that developmental trajectories reflect power asymmetries and vice versa. More precisely, the typology proposed in earlier works consists of four groups: core, periphery, financial hubs, and catching-up countries in Eastern Europe (Gräbner et al. 2020b). This more nuanced taxonomy is also able to better categorize the impacts of financial openness on small economies and to identify intermediate cases that might undergo a regime shift or a similar transition.

In the present paper, we examine sources of divergence in developmental trajectories with a focus on technological and institutional divergence, taking more recent developments (in terms of new data) into account and using an updated and more refined methodology. We argue that the different dimensions of economic polarization – spanning institutional-legal and technological prerequisites for production, rising growth and current account differentials, and political power asymmetries – are intrinsically linked and can be understood as the common result of a European and global competition between locations. In this race for the best location, some countries continue to pull ahead, creating potentially path-dependent dynamics that further reinforce existing trajectories and inequalities. These dynamics imply that others are losing out as they are no longer able to catch up with their (former) peers.

The rest of the article is structured as follows. Section 2 revisits development models by describing their main characteristics and explores the validity of the original groupings through recent economic performance. Section 3 employs a novel data-driven approach for identifying distinct country groups in the European Union based on structural similarities between countries. Section 4 discusses patterns of divergence by focusing on two key related dimensions, technological and institutional divergence. Section 5 summarizes and concludes.

2. Revisiting development models: Main macroeconomic characteristics in the face of recent trends

The economic development of European countries since the introduction of the Euro has been characterized by persistent differences in growth trajectories and economic performance. Building on previous works (mainly Gräbner et al. 2020a, 2020b) and an updated analysis using recent data as well as a refined methodology (as discussed in Section 3), we suggest differentiating four main development models across Europe. These models, which have shaped economic developments in Europe since the inception of the Euro, build upon existing historical path-dependencies (and hence, partially reflect differences already observable well before the Euro's introduction) and continue to exert influence by shaping future developmental prospects and possibilities.

These four development models include (1) *core economies*, characterized by technological superiority, high incomes, and current account surpluses, (2) *peripheral economies*, which

Development model	Core	Periphery	Workbench	Finance
Key driver for national income	Technological superiority	Credit, intermediate production	Cheap factor prices	Regulatory setup (financial regulation, taxation)
Requirements	Foreign demand, tech. capabilities, capital outflows, trade openness	Capital inflows, de-regulated financial markets, credit supply	Price competitiveness, moderate amount of technological capabilities, trade openness	De-regulated financial markets, competitive regulations and tax rates, wealthy firms/ individuals
Central actors	Manufacturing firms	Banks, households, governments	Manufacturing firms, foreign corporations	Banks and other financial actors
Negative side effects	Net lending to foreign countries	Increasing total debt (private + public), financial instability	Potential lock-in in low-wage and dependent subcontracting activities; ecological stressors	Reliance on beggar-thy-neighbor policies
Current account implications	Positive	Negative	Positive	Negative in terms of traded goods, positive in terms of services
Typical characteristics	High GDP per capita levels; Importance of industrial production; Production of complex products; Relatively low unemployment	Lower export shares; Relatively high public debt; Tendency to current account deficits; Relatively high unemployment	Relatively low levels of wages and GDP per capita; High degree of foreign ownership; Small service sector, but (partly) important manufacturing sector	High debt levels of private firms; Important share of finance in terms of gross output; High foreign investment inflows; Large incomes from wealth taxes
Members in the EU	Austria, Belgium, Denmark, Finland, Germany, and Sweden	France, Greece, Italy, Portugal, and Spain	Bulgaria, Croatia, Czech Republic, Estonia, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia, and Slovakia	Cyprus, Luxembourg, Malta, Netherlands, and Ireland

Table 1: Development models in the EU – A cursory overview

lack technological superiority, show increased deindustrialization, and, correspondingly, fall back in terms of income and trade balance, (3) *workbench economies* in Eastern Europe that are characterized by partial and incomplete catching up processes, and, eventually, (4) *financial hubs* that are distinguished by the especially prominent role of financial and quasi-financial institutions.

In what follows, we start from this country typology, which is also summarized in Table 1. In the course of updating our analysis to include more recent data, we have made several minor adjustments to this classification. First, we have relabeled the fourth cluster from "catching-up economies" to "workbench model", as it more accurately reflects relevant structural properties (e.g. high share of manufacturing) and development (as catch-up is partial and limited) of the respective economies – moreover, the development model would still exist, even if no catch-up took place at all. Second, based on our updated cluster analysis in Section 3, France, which had previously shown characteristics intermediate between core and periphery countries (Gräbner et al. 2020a, 2020b), is now firmly classified as peripheral (as in Gräbner et al. 2020c). Additionally, Cyprus is now explicitly grouped with the financial hubs (as in Gräbner et al. 2020c). The characteristics and economic development of these country groups will be analyzed in detail in the following sections: Section 2.1 discusses more recent macroeconomic developments in the light of the suggested typology, while Section 2.2 examines key structural characteristics of the different development models implied by our analysis.

2.1. Convergence and divergence in economic performance and employment

As a first step, we examine indicators of overall macroeconomic performance across all four development models described in Table 1. Even 25 years after the introduction of the Euro, socioeconomic development within the EU remains markedly uneven. Looking at population-weighted differences in GDP per capita (in constant international dollars, PPP) across the four development models – core, periphery, financial hubs, and workbench economies – reveals that the different development models are associated with structural differences in growth performance and, hence, average real incomes (see Figure 1a). While Eastern European countries show a gradual catching-up process, we observe persistent and even increasing disparities among the remaining countries: the income gap between core and peripheral economies is widening, while financial hubs diverge strongly upwards, leaving the remainder of countries behind. Especially, the former finding is largely in line with a series of previous papers emphasizing that the financial crisis and Euro Crisis hit the development model of peripheral countries hardest (e.g., Storm and Naastepad 2015; Gräbner et al. 2020a), reflecting the increasing divergence between core and periphery countries after the financial crisis. These developments appear even more pronounced when analyzing unweighted averages as shown in Figure 1b: polarization between financial hubs, core, and periphery seems even more pronounced, while the catch-up of workbench economies proceeds more slowly. Thereby, both series are complementary: the weighted averages better represent the polarization as experienced by the average European, the unweighted average is more tailored towards assessing differences between development models *per se*.

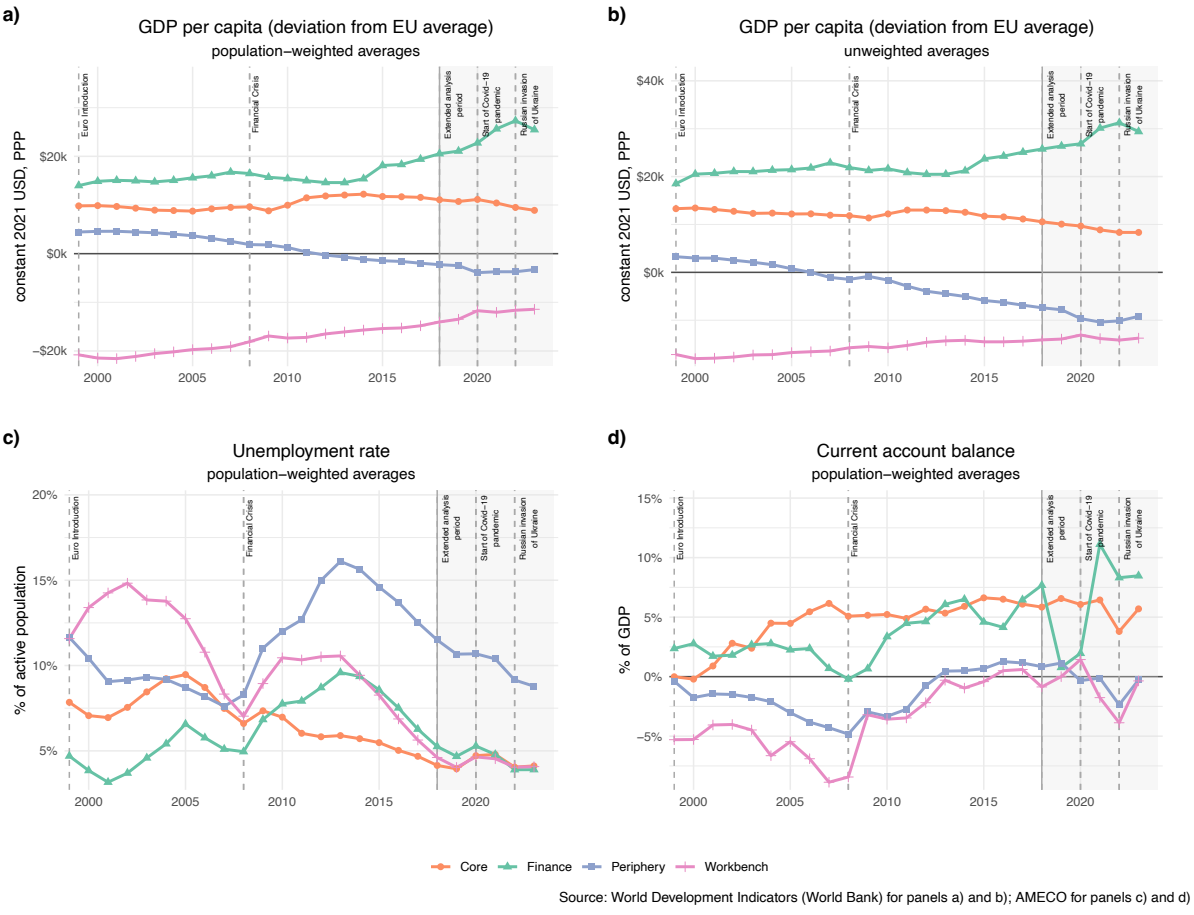


Figure 1: Macroeconomic Performance Across EU Development Models (1999-2023). The panels display key indicators for core, finance, periphery and workbench economies. See Table 1 for which EU countries belong to the separate groups. Panel a) and b) show GDP per capita deviations from EU average in constant 2021 international dollars (PPP) using population-weighted and unweighted averages respectively, panel c) displays unemployment rates as percentage of active population, and panel d) presents current account balances as percentage of GDP. Vertical lines mark major events: Euro introduction, Financial Crisis, COVID-19 pandemic, and Russian invasion of Ukraine. Data sources: World Development Indicators (World Bank) for panels a) and b); AMECO for panels c) and d).

More specifically, core economies maintain consistently above-average income levels, while peripheral countries show steady decline relative to the EU average, especially post-2008. Between 1999 and 2023, this disparity as measured by the population-weighted average increased both in absolute terms (from about $5,400 to $12,000) and relative terms – core countries' GDP per capita rose from 1.12 times that of peripheral countries in 1999 to 1.24 times in 2023. However, the core's average has slightly declined in recent years, mainly due to Germany's weak performance since the COVID-19 pandemic. Similarly, within the core countries, Finland's weak growth since the financial crisis suggests it may be falling behind other core economies.

The overall gap between the two extreme groups – finance and workbench economies – illustrates contrasting developments: while the absolute gap between them increased slightly from $34,800 to $36,900 from 1999 to 2023, it decreased in relative terms, as the GDP per capita of financial hubs declined from 2.9 times that of workbench economies to 1.9 times.

The other variables shown in the lower panels (c) and (d) of Figure 1 broadly support this general picture. First, the data shown in the lower left panel indicate a persistent gap in unemployment rates between periphery countries and all other groups. While workbench economies, following improvements during their EU accession process, and financial hubs, despite temporary crisis-related spikes, have converged towards core countries' unemployment levels, peripheral countries have maintained persistently higher unemployment rates. This gap remains stable even in times of generally decreasing unemployment rates. Moreover, in panel (d) we observe that current account deficits in periphery and workbench economies decreased in the face of the pressures associated with the financial crisis and austerity policies; both groups remained close to achieving current account equilibria for several years before the COVID-19 pandemic. As a result, a persistent gap in current accounts between core countries and all other country groups emerged, which is much larger today than it was in the earlier years of the Eurozone.

While the overall patterns appear quite robust, they also mask significant within-group heterogeneity.[2] For one, the economic core seemingly becomes more fragmented as the world technology frontier becomes increasingly contested; regarding the current account, core countries can actually be split into two distinct camps after the financial crisis: Germany, Denmark, and Sweden maintained current account surpluses above the EU's excessive imbalance threshold of 6%, while Austria, Belgium, and particularly Finland showed weaker surpluses or even deficits – with Finland's persistent deficits providing another indicator of its deviation from core characteristics.

This fragmentation of the core is also evident from a more long-term perspective for the case of France, which started at income levels well above the EU average and has converged to around average levels by 2023. Hence, it shows a structural similarity to other countries in the periphery, all of which have suffered a relative decline but from different starting positions. In conjunction with the observation that France shifted from slight current account surpluses in the early Euro years to persistent deficits since 2006, thus emerging as the EU's primary net debtor, this development has confirmed our earlier diagnosis of a transitory position between core and periphery (as emphasized in Gräbner et al. 2020a and 2020c), which by now supports the choice to assign it more firmly to the periphery group (as in Gräbner et al. 2020b).

Heterogeneity also applies to the remaining two groups. First, Eastern European countries show a steady convergence towards the EU average, although even the most advanced workbench economies (Czechia, Slovenia, Lithuania) remain $6,000-7,500 below EU average income levels by 2023, while Bulgaria, despite significant progress, still lags by $20,500. Second, the finance group shows a strong upward divergence from the EU average, with Luxembourg consistently maintaining the highest GDP per capita levels

[2] For a more general discussion of the particular challenges associated with such country taxonomies see, e.g., Gräbner-Radkowitsch (2022).

throughout, while Ireland's exceptional growth after 2014 has further amplified the group's upward trajectory[3].

2.2 Some structural differences across developmental trajectories

The persistent divergence in macroeconomic performance across EU member states, documented in the previous section, reflects deeper structural differences between distinct development models (Gräbner et al. 2020b). Before evaluating this claim through formal cluster analysis in Section 3, we first review structural patterns related to the macroeconomic idiosyncrasies of different development models. We pay particular attention to recent developments by focusing on data from 2018-2023, a period not covered in previous analyses. Against this backdrop, Figure 2 presents box-plots that illustrate the characteristic

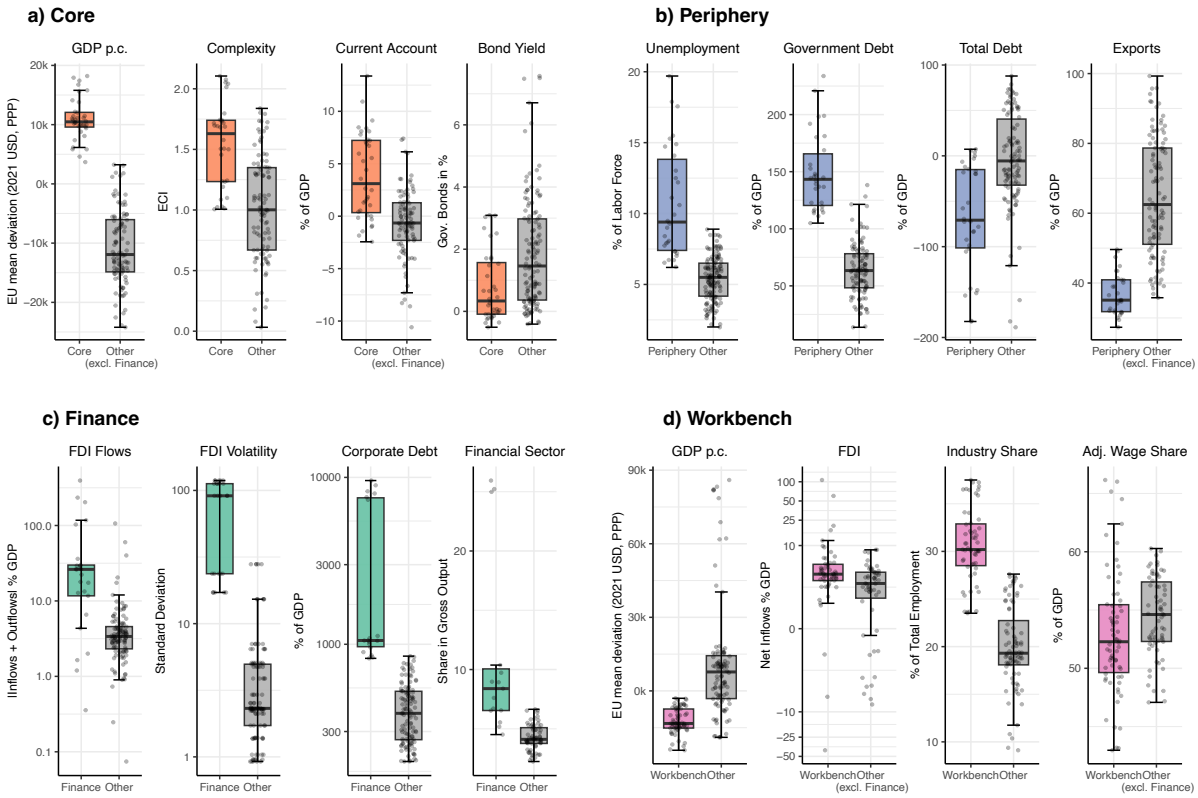


Figure 2: Structural Characteristics of EU Development Models (2018-2023). Panel a) Core features: GDP per capita (World Bank), Economic Complexity Index (Harvard Growth Lab), current account (AMECO), and bond yields (Eurostat). Panel b) Periphery features: unemployment rates (AMECO), government and total debt (OECD), and export shares (World Bank). Panel c) Financial hub indicators: FDI flows and volatility (computed from World Bank FDI data), corporate debt (OECD), and financial sector share (EU KLEMS). Panel d) Workbench characteristics: GDP per capita, FDI net inflows, industry share (all World Bank), and adjusted wage share (AMECO). Box plots with overlaid jittered data points compare each group (colored) with other EU countries (grey). See Table 1 for the country classification used.

[3] In this context, however, one has to highlight that the GDP per capita statistics of financial hubs may be distorted by accounting tricks of multinationals that artificially inflate their GDP data (Polyak 2022). More generally, the transnationalization of economic production raises concerns about the validity of balance-of-payments statistics, which has sparked debates about how meaningful GDP statistics are, especially for financial hubs like Ireland (Linsi and Mügge 2019).

features of each country group in comparison to the rest of the EU, allowing us to identify the key variables that distinguish these development models.

Overall, the distinct country groups are characterized by complementary structural features that tend to reinforce each other, leading to path-dependent development trajectories. The core countries, for instance, maintain their distinctive macroeconomic position coined by above-average living standards through a combination of high economic complexity and robust export success, where economic viability is further strengthened through low financing costs (see upper left panel of Figure 2). However, while core economies continue to maintain rather low unemployment rates, this characteristic is now shared by financial hubs and workbench economies, making high unemployment primarily a feature of peripheral economies. Additionally, peripheral countries are distinguished by high levels of government as well as private debt and export shares that are low in comparison to EU peers.

Financial hubs continue to form a distinct country group, though showing substantial within-group heterogeneity. This heterogeneity relates to different complementary positioning in terms of legal infrastructure and financial operations (see Section 4.2 for some examples). Interestingly, the 2018-2023 data reveals an important shift in FDI patterns: while previous analyses emphasized high net FDI inflows as a general characteristic, we now observe that substantial FDI outflows are typical for this group as well. These statistics are heavily influenced by a few large corporations exploiting current tax regulations for profit shifting. For instance, the end of the “double Irish with the Dutch sandwich” scheme has led to substantial outflows from the Netherlands, as this country became less relevant as an intermediary (e.g. Dyreng and Hanlon 2021). Thus, the distinguishing feature is not the direction but rather the magnitude and volatility of FDI flows relative to GDP. Such high FDI volatility is otherwise only observed in countries such as Hungary or Belgium, which share some financial hub characteristics to a lesser extent.

Workbench economies continue to be characterized by a distinctive combination of structural features: they show relatively high FDI inflows in comparison to the other groups with the exception of financial hubs. However, while extreme FDI values are driven primarily by financial operations in the case of financial hubs, they are more closely related to real investment and production activities in workbench economies. Hence, the workbench model is, in sharp contrast to financial hubs, complemented by a relatively high share of industrial employment and improved price competitiveness. In addition, the low wage share of these countries contributes to price competitiveness, but also points to the possibility of thwarting growth opportunities due to a repatriation of profits by foreign owners. Hence, while substantial within-group heterogeneity exists in this dimension, the combination of FDI inflows, strong industrial base, and competitive pricing continue to provide a coherent catch-up strategy.

3. Revisiting methodological foundations: On the inductive assessment of development models

Having documented both the persistent macroeconomic divergences and the underlying structural differences across European economies, we now turn to a formal evaluation of our

country classification. This section builds upon and refines the methodological approach developed in Gräbner et al. (2019, 2020b) for identifying distinct country groups in the European Union. Our aim is to use a largely inductive approach to cluster countries based on their structural similarities across multiple macroeconomic dimensions, and to compare its results with the more deductive reasoning so far.

This approach differs from established frameworks in two fundamental ways. First, while frameworks such as the Varieties of Capitalism approach (Hall and Soskice 2001) or the growth model perspective (Baccaro and Pontusson 2016) typically start from theoretical categorizations and then seek corresponding empirical patterns, the approach below follows is more inductive. More specifically, rather than presupposing specific institutional spheres or growth regimes, we let distinct development models emerge from the empirical patterns themselves. Second, our approach explicitly recognizes that development models manifest themselves in the combination of different macroeconomic dimensions. Instead of focusing on specific institutional domains or demand-side variables in isolation, we consider the overall structural configuration – or *structural signature* – of an economy that emerges from the interplay of both, supply and demand-side characteristics as well as goods, financial and labor markets. This makes it easier to avoid mono-causal explanations when trying to capture the complex interdependencies that characterize different development models in the European Union.

Methodologically, we build on and refine the approach we developed in Gräbner et al. (2020b). While the original paper used fixed effects estimates from local projections to assess heterogeneous responses to openness shocks, we now employ the fixed effects more directly as catch-all variables for time-invariant structural characteristics of countries, focusing more strongly on divergence with the EU (and less on the notion of an openness shock). The core idea remains the same: we first estimate fixed effects regression models for key macroeconomic variables, where country fixed effects can be interpreted as catch-all estimates for time-invariant structural characteristics specific to that macroeconomic dimension (Wooldridge 2010). In a second step we use these fixed effects estimates as inputs for a hierarchical cluster analysis using Ward's minimum variance method to inductively identify groups of countries that exhibit similar structural configurations across multiple macroeconomic dimensions.

In other words, we implement several methodological adjustments to account for the slightly different research question, which now focuses more on the effect of the Euro, and to enhance the robustness of our results. Thereby, Figure 3 traces how these methodological refinements affect the clustering results by means of a Sankey diagram. The first refinement concerns the regression models used to estimate the country fixed effects. While the original approach employed local projections with shock variables and multiple controls to analyze dynamic responses, we now use less complex two-way fixed effects models that include only country and time fixed effects. The advantage of such a specification is a focus on total effects as we avoid blocking pathways that mediate the influence of country-specific characteristics on the dependent variable. As a result, the country fixed effects can be interpreted as time-averaged country-specific levels of the respective macroeconomic variable, adjusted only for global trends captured by the time fixed effects. For example, the fixed effect for the current account reflects a country's average current account balance over

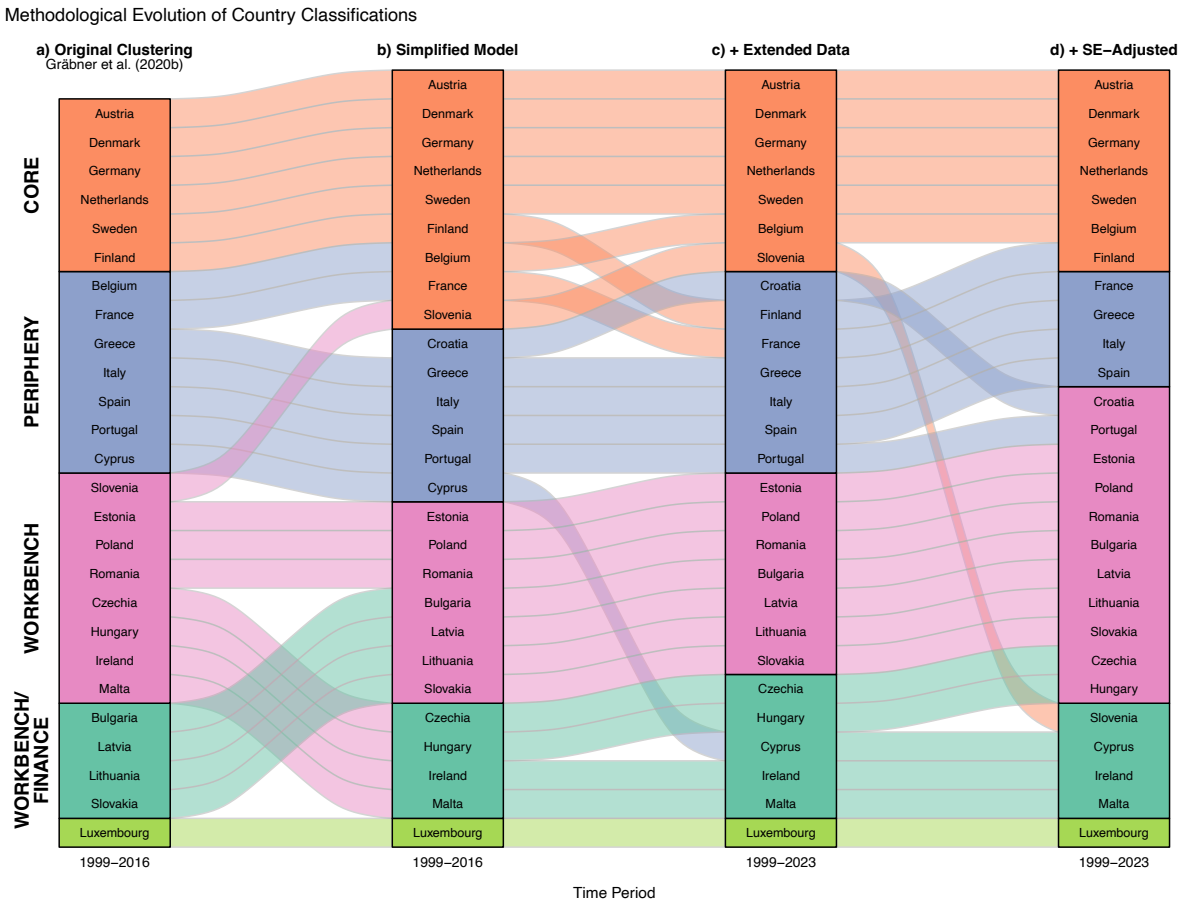


Figure 3: Methodological Evolution of Country Classifications. The Sankey diagram traces the development of our clustering approach across four methodological stages: a) the original clustering from Gräbner et al. (2020b) based on local projections, b) simplified two-way fixed effects model without control variables, c) extended dataset covering 1999-2023, and d) refined clustering using standardized distances that incorporate estimation uncertainty through standard errors. The flow of countries between clusters illustrates how methodological refinements affect country groupings. Note that while the underlying hierarchical clustering provides information about the relative proximity of countries within and between clusters, the Sankey diagram only shows the final cluster assignments.

time, adjusted for the general trend of rising surpluses across the EU. Countries with similar fixed effects for a given variable thus share structural similarities in that macroeconomic dimension.

In Figure 3, panels (b) and (c), we show how these first two refinements affect the clustering results. Panel (b) maintains the original time period (1999-2016) and variables[4] used so that changes in cluster assignments stemming solely from the modified fixed effects model (and potential data revisions). Panel (c) then extends the analysis to the full available time period (1999-2023).

Besides some minor changes - Belgium and Slovenia moving to the core group and Croatia (which was not included in the original analysis due to a lack of data availability) being

[4] The variables used for clustering are: adjusted wage share, unemployment rate, current account balance, public debt to GDP ratio, share of financial sector, trade exports to GDP ratio, GDP growth, and GDP per capita (measured as deviation from EU average, replacing absolute values used in Gräbner et al. 2020b).

classified as periphery – we observe a restructuring within the workbench clusters. While Gräbner et al. (2020b) identified two distinct workbench clusters, our simplified model shows a more pronounced separation into two groups, one of which includes Ireland and Malta, two countries that emerge as finance hubs in later specifications. With the extension of the time period to include more recent years, Cyprus joins this emerging finance-oriented cluster.

In addition, these first methodological refinements already highlight some interesting cases of countries positioned between different development models. France's movement between periphery and core across panels (a) to (c) (Figure 3) reflects our discussion of France as a transition case in Section 2. Similar patterns emerge for other countries: Croatia and Slovenia, while predominantly classified as workbench economies, occasionally show peripheral characteristics, and Finland, traditionally a core country, exhibits increasing similarities with the periphery when focusing on more recent years.

The third refinement concerns our approach to measuring similarity between countries. While we followed a standard hierarchical clustering methods approach in Gräbner et al. (2020b), which relies on standardized variables to achieve comparability, we now develop a more nuanced approach that more carefully leverages the statistical information from our fixed effects estimates. Traditional standardization implicitly treats all differences between countries as equally meaningful, regardless of their statistical precision. However, regression analysis provides us with both the fixed effects estimates and their standard errors (clustered at the country level to address within-country correlation), allowing us to account for estimation uncertainty in our clustering approach.

We utilize this information by measuring distances between countries using standardized differences based on the respective fixed effects estimates, which can be defined as

$$d_{ijk} = \frac{|FE_{ik} - FE_{jk}|}{\sqrt{SE_{ik}^2 + SE_{jk}^2}}, \quad (1)$$

where FE_{ik} represents country i's fixed effect in dimension k and SE_{ik} its standard error. This measure is analogous to standardized effect sizes in statistical inference that take estimation uncertainty into account (e.g. Cohen's *d*). The overall distance between two countries is computed as the mean of these standardized differences across all macroeconomic dimensions. While the concept of standardized differences is well-established in statistics, its application to cluster analysis of fixed effects offers a novel approach to identifying macroeconomic patterns, which leads the the country grouping as shown in Figure 3, panel (d).

This statistical distance measure offers two key advantages over conventional clustering methods. First, it automatically weights differences between countries by their statistical precision: Differences between precisely estimated fixed effects (small standard errors) receive greater weight than equally sized differences between imprecise estimates (large standard errors), which reduces the impact of statistical noise. Second, it provides a principled way to handle missing fixed effects estimates: By treating missing values as cases

of maximum uncertainty (effectively infinite standard errors), the distance measure naturally accommodates incomplete data without requiring ad hoc adjustments.

Building on these advantages, this method makes it easier to introduce additional variables as less meaningful and discriminatory variables automatically receive smaller weights. Hence, the inclusion of more noisy variables does not translate into noisy results to the same degree as the standard approach of clustering. On this basis, we incorporate several additional variables in the respective procedure to better account for the multifacetedness of macroeconomic development to produce a preferred specification for evaluating development models across EU countries over time.

Specifically, we extend our set of variables to better capture the distinct characteristics of different development models. This extension is particularly important for identifying finance-oriented economies: while these countries follow qualitatively similar development strategies, their considerable institutional diversity makes them difficult to identify as a distinct group without considering multiple complementary indicators (see Section 4.2). We include the absolute values of FDI net flows relative to GDP, as the magnitude and volatility of these flows, rather than their direction, has emerged as a key distinguishing feature of finance-oriented economies. Similarly, we add total corporate debt (combining non-financial and financial corporations) as a percentage of GDP, which further helps to identify financial sector dynamics. We also include government bond yields, which have become an important indicator of economic divergence across EU countries since the Eurozone crisis. At the same time, we remove GDP growth rates as GDP per capita already captures the overall level of economic development. Also, it represents the only change variable in an otherwise level-based set of structural indicators and shows comparatively little discriminatory power.

This standardized distance approach also provides an intuitive way to assess the relative importance of different variables in distinguishing country groups. From equation (1), we can derive scaling factors for each variable k as the inverse of the mean combined standard errors across all country pairs (i,j):

$$w_k = \frac{1}{\binom{N}{2}} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (\sqrt{SE_{ik}^2 + SE_{jk}^2})^{-1} = \frac{2}{N \cdot (N-1)} \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} (\sqrt{SE_{ik}^2 + SE_{jk}^2})^{-1}, \qquad (2)$$

These factors are then normalized across dimensions k to sum to one, i.e.,

$$\tilde{w}_k = \frac{w_k}{\sum_{k=1}^{K} w_k}, \qquad (3)$$

which provides insight into how strongly different variables contribute to the overall distance measure.

Figure 4 presents the results of our cluster analysis based on the extended variable set and standardized distances as just explained. The dendrogram (top panel) shows the hierarchical structure of country similarities, identifying five distinct groups: core, periphery, workbench, finance, and Luxembourg as a separate category. The factor maps below provide additional

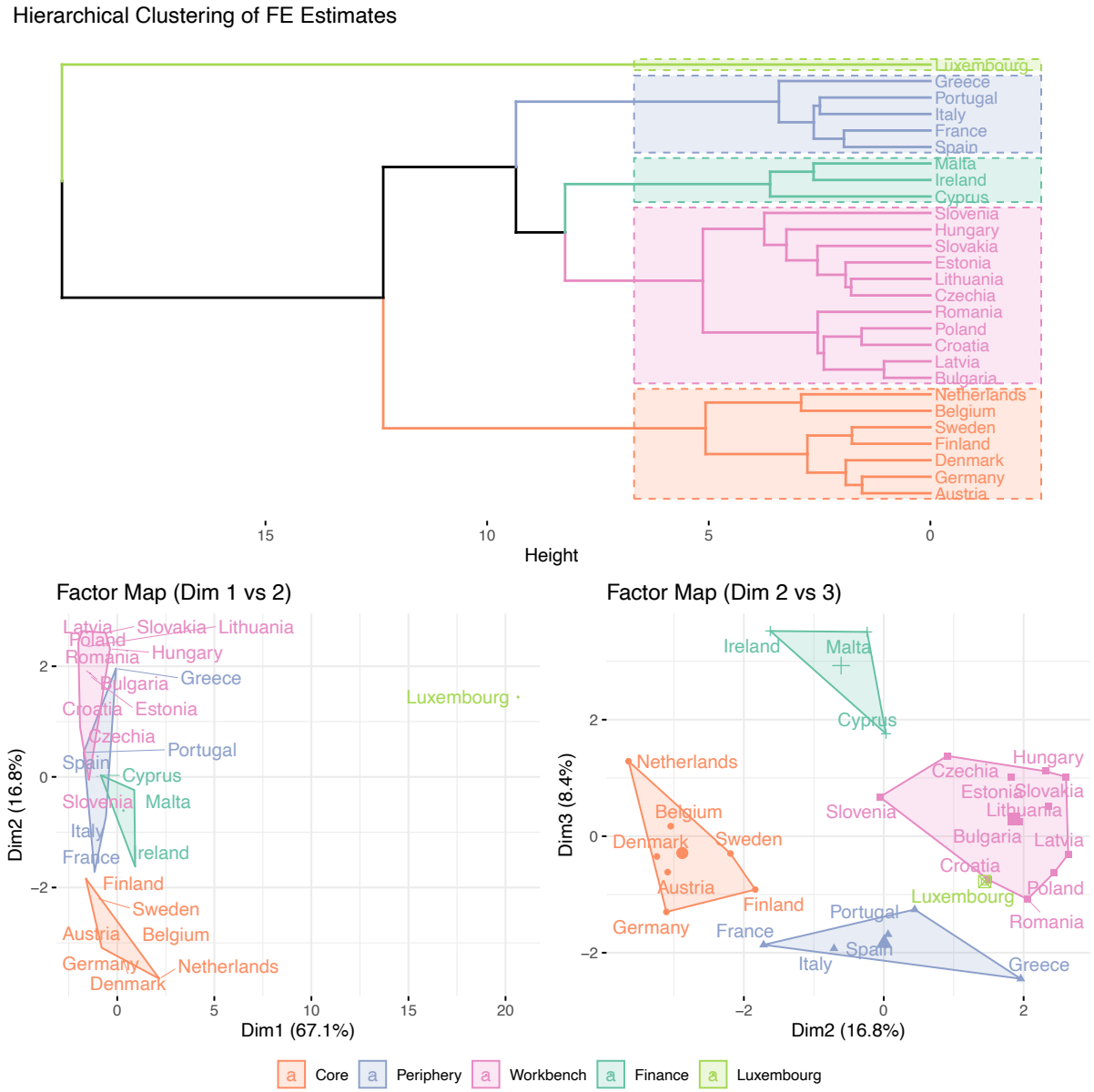


Figure 4: Hierarchical Cluster Analysis of Fixed Effects Estimates for European Union Member States. The figure shows clustering results based on country-specific fixed effects coefficients for EU member states. The top panel presents a dendrogram of the hierarchical clustering. The bottom panels show two factor maps: Dim1 vs Dim2 (left, accounting for 83.9% of variance) and Dim2 vs Dim3 (right, with Dim3 explaining an additional 8.4%). Countries are color-coded by their cluster assignment: Core, Periphery, Workbench, Finance, and Luxembourg.

insight into the relative positioning of countries in the reduced dimensional space. The left panel shows the first two dimensions, which together explain 83.9% of the total variance. Here, Luxembourg's distinct position dominates the first dimension (67.1%), reflecting its unique development model characterized by extreme values particularly in finance-related indicators. While this makes Luxembourg's distinctiveness very clear, it compresses the visualization of differences between other countries. Nevertheless, we can observe that other finance-oriented economies (Cyprus, Malta, Ireland) and some smaller economies with partial finance hub characteristics (Netherlands, Belgium) show some similarity to Luxembourg along this dimension, albeit to a much lesser degree.

The right panel presents dimensions 2 and 3 (explaining 16.8% and 8.4% of variance respectively), which better reveals the structure among the remaining countries. The core cluster appears relatively compact, with smaller countries like Belgium and the Netherlands showing slight tendencies toward finance-oriented characteristics. Finland is positioned near the more dispersed periphery group, which stretches from France and Italy (closer to the core) to Greece at the opposite end, reflecting France's and Finland's ambiguous positioning between core and periphery as noted in earlier analyses (see Figure 3). The finance-oriented economies occupy a middle position when considering all three dimensions. Similarly, the workbench cluster forms a cohesive group, with Slovenia and Croatia at the periphery, reflecting their cluster transitions observed in Figure 3.

With respect to the methodological refinements introduced, Table 2 presents these scaling factors for all variables used in the specification shown in Figure 4. These scaling factors reveal the relative importance of different variables in our cluster analysis. In this analysis, GDP per capita and financial sector value added emerge as the most discriminatory variables, followed by trade openness and corporate debt. Note, however, that a low scaling factor does not necessarily indicate less importance for final cluster assignments if the variable captures unique characteristics not reflected in other indicators.

Variable	Scaling Factor	Data Source	Data Availability
GDP per capita (deviation from EU average)	0.207	WDI	1999-2023
Share of financial sector value added	0.175	EU KLEMS	1999-2020
Trade exports to GDP ratio	0.154	WDI	1999-2023
Total corporate debt (% of GDP)	0.125	OECD	1999-2023
Public debt to GDP ratio	0.084	AMECO	1999-2023
Adjusted wage share	0.062	AMECO	1999-2023
Unemployment rate	0.049	AMECO	1999-2023
Absolute FDI flows to GDP ratio	0.049	WDI	1999-2022
Current account balance	0.048	AMECO	1999-2023
Government bond yields	0.047	Eurostat	1999-2023

Table 2: Variables, Scaling Factors and Data Coverage. The table presents the variables used in the hierarchical cluster analysis, their scaling factors, and data sources. The scaling factors indicate each variable's discriminatory power in distinguishing between country groups, normalized to sum to 1. A higher scaling factor suggests the variable contributes more strongly to the measured distances between countries. For each variable, the table also shows data availability and sources.

While we generally adopt the cluster groupings as shown in Figure 4, the Netherlands constitutes a notable exception. Its classification as a finance hub is primarily motivated by institutional features resembling Ireland's finance growth strategy (see Section 4.2). Additionally, its relative positioning in the reduced-dimensional space provides supporting evidence: among all countries, the Netherlands is closest to Luxembourg along the first

dimension, and it consistently occupies an edge position within the core cluster, nearest to the finance-oriented economies across dimensions.

To examine the stability of our cluster assignments and potential structural changes over time, Figure 5 presents the same clustering analysis for rolling 10-year windows with 5-year overlaps from 1999 to 2023. This dynamic perspective shows that both the Netherlands and Belgium shift towards the finance cluster in the most recent period (2014-2023). While both countries occupy intermediate positions between core and finance-oriented economies, we classify the Netherlands as part of the finance cluster due to its more prominent historical role as a financial center (notably Amsterdam) and its explicit strategic orientation towards financial services (e.g., the well-known “Dutch sandwich” structure; see Section 4.2 for details). Though somewhat arbitrary, this classification primarily serves to highlight the hybrid character of both countries, with Belgium's potential role as a finance hub warranting attention in future analyses.

More generally, Figure 5 reveals a gradual expansion of the finance cluster over time, reflecting the increasing importance of finance-oriented development strategies in the European Union. The changing composition of this cluster also highlights the challenges in

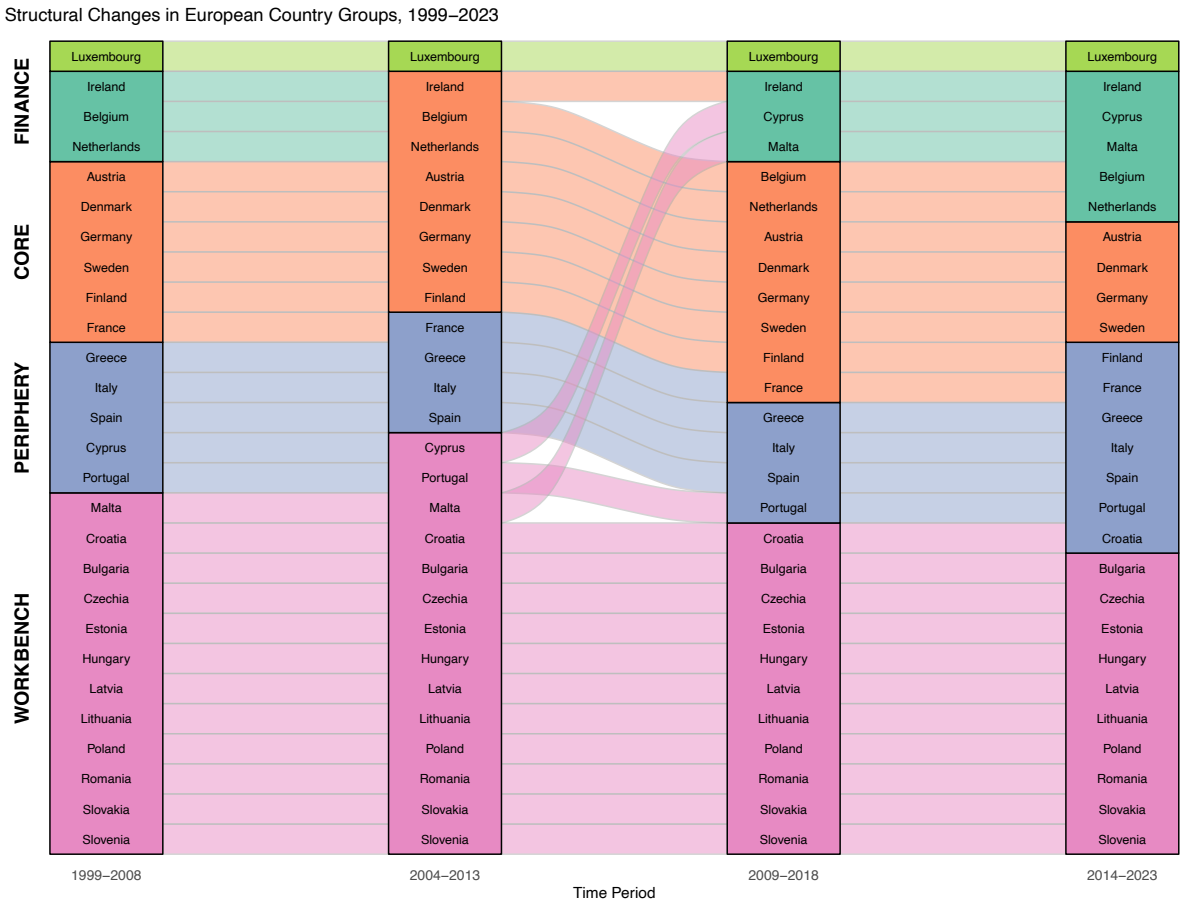


Figure 5: Cluster Membership Dynamics of EU Member States in Rolling 10-Year Windows, 1999-2023. The figure shows cluster assignments of 27 EU member states across four overlapping 10-year periods (1999-2008, 2004-2013, 2009-2018, 2014-2023). Countries are organized vertically by their initial cluster membership (Finance, Core, Periphery, Workbench). The flow diagram indicates changes in cluster membership across time periods, with countries' movements between clusters shown by connecting bands. Different clusters are distinguished by colors.

identifying finance hubs as a coherent group, given the heterogeneous and flexible nature of finance-oriented growth models that continuously adapt to new circumstances.

The previously discussed ambiguous positions of several countries between different development models are particularly pronounced in recent years. France's classification oscillates between core and periphery throughout the observed period, with an increasing tendency towards peripheral characteristics in recent years. Finland exhibits a similar, albeit more recent shift: after being consistently classified as a core country for most of the observed period, it moves to the periphery group in the latest period (2014-2023). Croatia's development presents a different dynamic: its recent shift from the workbench to the periphery cluster (2014-2023) potentially reflects an ambiguous development trajectory: contrasting with the cases of France and Finland, Croatia's transition indicates a gradual catching-up process in terms of income, but also a decoupling from the manufacturing dynamics associated with the workbench model.

To complement our structural clustering, Figure 6 analyzes similarities in countries' dynamic adjustment patterns. While maintaining our fixed effects specification for capturing structural differences, we additionally estimate country-specific Common Correlated Effects (CCE) by including interaction terms between country dummies and cross-sectional averages. We then cluster only these CCE coefficients that capture how individual countries respond to common changes and shocks across the EU. A coefficient of 1 indicates that a country moves in line

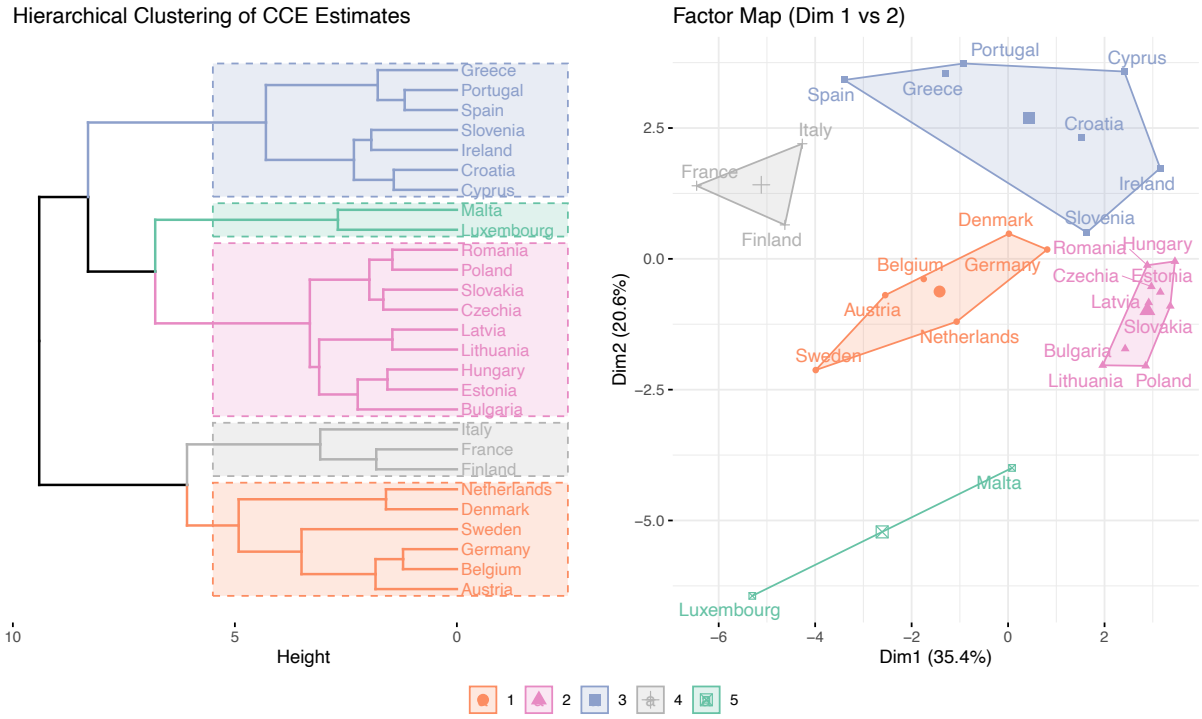


Figure 6: Hierarchical Cluster Analysis of Common Correlated Effects (CCE) for EU Member States. The figure shows clustering results based on country-specific CCE coefficients that capture dynamic adjustment patterns. The left panel presents a dendrogram of the hierarchical clustering. The right panel shows the factor map of Dim1 vs Dim2, which together explain 56% of the variance (35.4% and 20.6% respectively). Countries are color-coded by their cluster assignment.

with the EU average, while higher values suggest amplified responses and negative values indicate movements in the opposite direction.

France, Italy, and Finland form a distinct cluster, positioned between the core and periphery groups but closer to the core cluster. This pattern might reflect their greater autonomy in adjustment processes due to their economic size and political weight, particularly during the Euro crisis. Similarly, the clustering of dynamic responses confirms the intermediate position of Slovenia and Croatia, which show adjustment patterns more similar to peripheral countries, supporting our previous finding of their gradual movement towards the periphery cluster.

To assess the robustness of our cluster assignments from our preferred specification using standardized distances and the extended variable set, we systematically analyze how the exclusion of individual variables affects results.[5] Overall, the cluster structure is remarkably stable: many variables, including the wage share, current account balance, corporate debt, and unemployment rates, have no effect on the final cluster assignments when excluded, while government bond yields show only minimal impact (shifting Portugal to the workbench cluster). Moreover, changes in cluster membership primarily occur for countries previously identified as occupying intermediate positions, particularly affecting the finance hub classification: excluding financial value added or FDI shifts Cyprus to the workbench cluster, while removing trade exposure leads to a less clear distinction between finance hubs and workbench economies like Czechia and Slovenia. More substantial changes emerge only when excluding variables that prove constitutive for specific clusters: the exclusion of public debt particularly affects the composition of the periphery cluster, while removing GDP per capita – our most discriminatory variable according to the scaling factors – produces notable shifts: several countries move to the finance hub cluster due to their financial characteristics (Netherlands, Belgium, Hungary, Slovenia), some changes reflect previously identified intermediate positions (Croatia to periphery), while others appear less systematic (Romania to core).

4. Patterns of divergence

While the previous sections documented the existence of heterogeneous developmental trajectories across European countries and discussed their derivation as well as how they map onto differences in relative income, the underlying notion of distinct development models implies that this distinctiveness is also reflected in other socio-economic dimensions. This assumption is in line with the notion of circular and cumulative causation in economic development (Myrdal 1968; Kaldor 1980)- This concept not only emphasizes the path-dependent characteristics of economic development (‚cumulative'), but also points to the fact

[5] We also examine how adding the Economic Complexity Index (ECI) affects our clustering results. While this additional dimension of productive capabilities could potentially provide valuable insights, its inclusion alongside GDP per capita leads to an overemphasis on production capacities in our distance measure, as both variables carry high scaling factors while capturing similar structural characteristics. This results in France and Italy being classified as core countries and a less distinct finance cluster, with several workbench economies joining the finance group. While these alternative clusters reveal similar general patterns, the double weighting of productive capabilities through two highly weighted variables reduces our ability to identify nuanced differences between development models. Our preferred specification therefore relies on GDP per capita as the sole indicator of productive capabilities, ensuring a more balanced weighting of different structural dimensions.

that such development is multi-faceted because it is embedded in broader processes of social change, where mutual feedback between different dimensions relevant for driving and assessing socio-economic development regularly occurs. Following this intuition, we hypothesize that the underlying European race for the best location influences not only core economic outcomes, such as unemployment and GDP, but also shapes related socioeconomic aspects that bear relevance for economic performance in times of increasing economic openness. Hence, in what follows, we discuss two key related dimensions – technological and institutional divergence – that are also strongly impacted by global competition and the associated "race for the best location" across countries (Rodrik 2011, Palan 2002).

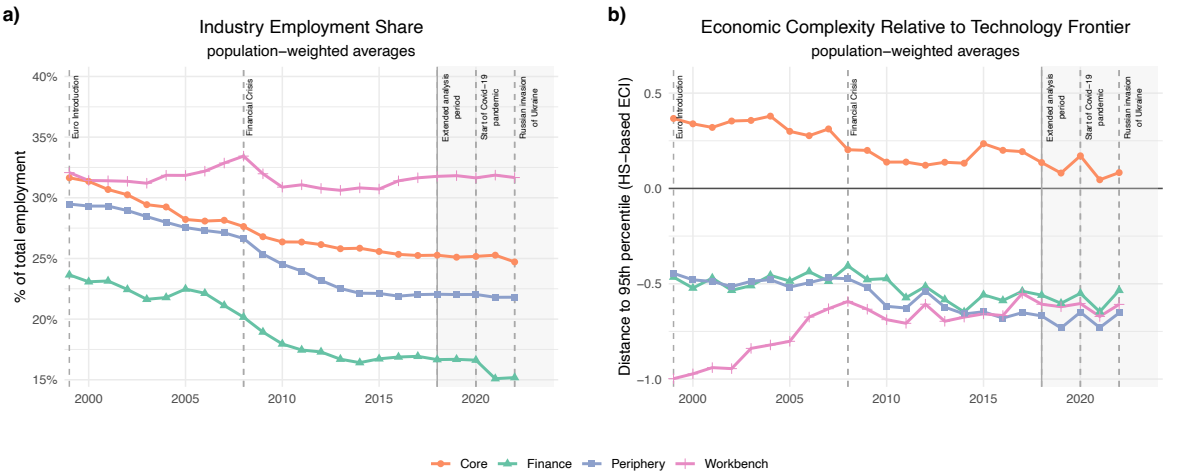
4.1 Persistent and increasing differences in technological capabilities

Technology has been long recognized as a key factor in international trade and development as it is a source for providing absolute and comparative advantages in terms of product availability, quality, as well as price (Dosi et al. 2015). Being positioned at the world technology frontier is, thereby, advantageous for economies as they can reap additional benefits – however, per definition only a few countries can enjoy such a position and, even if so, these positions are highly contested.[6]

Figure 7 provides some indication that European countries generally struggle to maintain their relative technological position in the world economy: one somewhat rough indicator for this development is given by a dwindling employment share in manufacturing that shapes overall developments in European economies (left panel in Figure 7). The underlying mechanisms and the relevance of this indicator differs, however, significantly for the distinct development models: while financial hubs and peripheral economies already had the comparatively lowest employment share when the Euro was introduced, they also experienced more intense deindustrialization afterwards. While this is less of a problem for the financial hubs, whose main source of development is the service-based financial sector, and not a strong industrial base, it is more troublesome for the periphery. It is, however, also an issue for core countries, which, while starting from a much higher level, are also struggling to maintain their position in quantitative terms. This pattern indicates that competition at the world technology frontier has become more intense in recent decades. This increased competition, however, has not affected Eastern workbench economies to the same extent as these occupy a different function within global value chains that depends less on exceptional technological capabilities, but rather on a cheap and comparably well-educated workforce highly suitable to produce standardized manufacturing goods dedicated for sale on European markets.

These insights are further reinforced by the inspection of time-series data on economic complexity as an indicator for the (overall) technological sophistication of a country (Hidalgo

[6] For an overview on the mechanisms through which technological capabilities are accumulated see, e.g., Aistleitner et al. (2021),



Source: World Development Indicators (World Bank) for panel a); own calculations based on Atlas of Economic Complexity, Harvard Growth Lab for panel b)

Figure 7: Indicators of technological competitiveness across country groups from Table 1. Panel a) depicts the share of total employment in manufacturing industries, population-weighted, for core, finance, periphery, and workbench economies. Panel b) shows the economic complexity index (ECI) of each country group as a deviation from the 95th percentile of the global ECI distribution for each year. Vertical lines mark significant events: Euro introduction, Financial Crisis, COVID-19 pandemic, and the Russian invasion of Ukraine. Data sources: World Development Indicators (World Bank) for panel a) and the Atlas of Economic Complexity (Harvard Growth Lab) for panel b).

and Hausmann 2009; Cristelli et al. 2015).[7] As complexity data are calculated on a yearly basis following the same algorithm the overall distribution of the so assigned values stays constant across countries, which is why we normalized the relative position of countries to be shown relative to the top 5% percentile of countries for every year (see the right panel in Figure 7). When doing so we again observe a struggling core that is, on average, nonetheless able to maintain its position at the world technology frontier. In contrast, all other European developmental models have converged towards a shared position that is persistently far behind both, the world technology frontier as well as the technological capabilities of the core. We also observe that this pattern is quite persistent and also includes Eastern workbench countries, which underscores the specific role these countries play in global value chains (Stöllinger 2016). Finally, after the financial crisis, we observe a shared trend, where all country groups were affected by a further decrease in technological competitiveness.

In sum, we observe a general, but slow downward trend in technological competitiveness and, especially, manufacturing employment with some notable exception in core and workbench countries, which plausibly aligns with the general characteristics of these models as discussed in Section 2.

[7] The ECI is based on an algorithm that starts from the assumption that technologically capable countries can produce a great(er) variety of goods and evaluates the relative technological difficulty by considering the number of countries showing a revealed comparative advantage for some good. If this number is small a good is considered as rare – if such rare goods are predominantly exported by countries with a diverse production portfolio they are considered as high-tech (and vice versa).

4.2 Institutional divergence and the peculiarities of financial hubs

All development models discussed so far are typically complemented by regulatory and institutional aspects that help to embed and stabilize the respective developmental trajectories: economies in the core, for instance, benefit from a well-funded and extensive academic sector that underpins its technology-dependent developmental trajectory. High wages paid in these countries' leading industries further increase technological competitiveness by spurring innovativeness of workers (Kleinknecht 2020) and by creating incentives for migration (Dorn and Zweimüller 2021) while, at the same time, some core countries create low-wage segments in labor markets (e.g. they rely on labor market dualization) to boost competitiveness in less sophisticated sectors (Eichhorst and Marx 2011). Similarly, peripheral economies experience strong tendencies of labor market dualization, where quite extensive labor regulation applies to an increasingly smaller part of the population (Picot and Tassinari 2017). An important dampening factor in these contexts is increasing household size (as younger generations do not move out of their parent's home or do so later than in the past; Di Stefano 2019), which implies productivity gains in household production (Nelson 1988) that partly offset income losses. Finally, weak labor market regulations in Eastern Europe and strong investor protection complement the workbench development model based on attracting foreign capital into the respective countries' manufacturing sectors (Bohle and Greskovitz 2006; Pula 2020).

Hence, institutional divergence is to some extent a ubiquitous phenomenon that accompanies all developmental models under consideration and is at the heart of some classic approach towards grouping and clustering capitalist economies (Iversen et al. 2016; Esping-Andersen 1990). However, institutional divergence is most pronounced in terms of extent and impact when it comes to the closer inspection of financial hubs, which occupy a prominent role in understanding institutional polarization and related dynamics of regulatory arbitrage. Institutional and regulatory development in financial hubs is thereby often driven by the rationale to conform with the demands and interests of multinational financial and non-financial corporations, that is, to create an environment that is conducive to the business interests of such corporations. Luxembourg exemplifies this development by becoming what Garcia-Bernardo et al. (2017) term a 'sink-OFC' (Offshore Financial Center) - a major hub for all sorts of financial corporations, like real-estate firms, international bank holdings, wealth management and investment firms. These firms concentrate primarily on administrative and support activities while enjoying favorable regulation and tax rulings, and unrestricted access the European market (Dörry 2015, 2016).

Malta and Cyprus aim to follow the Luxembourgian archetype on a smaller scale, with Cyprus particularly serving as a gateway for Russian companies linked to the British Virgin Islands (Garcia-Bernardo et al. 2017). Ireland's model is more tailored to the needs of (non-financial) multinational corporations, that make use of Irish tax regulation to avoid the payment of corporate tax in Europe by means of profit-shifting, which is, again, much to the benefit of financial hubs in general and Ireland in particular (Egan 2023, Nerudova et al. 2023). A different approach is taken by the Netherlands. Classified as a prime example of a 'conduit-OFC' facilitating the movement of capital between different jurisdictions (Garcia-Bernardo et al. 2017), it occupies an intermediate position trying to attract financial corporations while at the same time offering specific tools – e.g. patent boxes (Mohnen et al.

2017) or extensive bilateral tax treaties (Weyzig 2013) – and instruments to aid companies in profit-shifting. The specific role of these countries in international profit-shifting and their related tailor-made tax regulations have led some scholars in law to label these countries as "tax-hubs" (Baistrocchi 2024) or "tax planning hubs" (Milogolov 2020).

While this overall description has some merits for illustrating the general dynamics, it also indicates that the development of financial hubs is, first, directly impacting other, less financialized countries, and, second, quite heterogeneous and entangled from an in-group-perspective. This pattern arises because different financial hubs position themselves in specific ways often trying to complement infrastructures and modes of operations established by other hubs. Due to these complementarities, institutional developmental and, relatedly, growth patterns across financial hubs are often linked. An illustrative example for this entangled heterogeneity and its impact on recorded GDP growth can be seen in the now-historical tax avoidance strategy known as the "Double Irish with the Dutch Sandwich", which was widely used by multinational corporations until it was phased out by regulatory changes in the mid-2010s. This strategy involved routing profits through a chain of subsidiaries in Ireland and the Netherlands to tax havens. In a typical setup, a company would establish two Irish subsidiaries, one holding intellectual property rights and the other earning income. The first Irish company was structured to be tax-resident in a tax haven such as Bermuda or Mauritius. Profits were shifted from high-tax jurisdictions to the second Irish company, which then transferred them to the Dutch subsidiary acting as a conduit, sending the profits to the first Irish company in the tax haven, avoiding taxation along the way (e.g. Beebejaun 2021).

Beyond these complementarities, another general feature of the financial hubs is the peculiar beggar-thy-neighbour character of their development model (Tørsløv et al. 2023). This makes them particularly relevant for understanding overall capitalist dynamics in the 21st century as some countries "commercialize" their "sovereignty" (Palan 2002) to effectively aid multinational corporations to better exploit their position as multinational actors that are able to make use of different jurisdictions and legal setups. Such models have become quite successful, especially for smaller countries and, indeed, becoming a financial hub can be understood as a historically rather new opportunity for becoming a rich country next to being industrialized or rich in fossil resources. Thus, the emergence of these financial hubs can hardly go unrecognized in any comprehensive analysis aiming to cover a large part of relevant countries. Against this background, it does not come as a surprise that recent publications by the European Central Bank on the subject closely mimic existing results from a more heterodox perspective on developmental trajectories (ECB 2024; see also Beck et al. 2024).

These outputs emphasize the emergence of these financial hubs and illustrate that analyzing the size and composition of the financial sectors allows for a quick and quite robust identification of possible candidates for such financial hubs: first, the financial sector in such hubs is over-proportional in size as measured relative to GDP – especially in comparison to other countries, but also in absolute terms (e.g., when portfolios held in the financial sector are several times the value of a country's GDP; ECB 2016). Second, the composition of the financial sector in financial hubs will include a greater share of funds associated with quasi-banks, like investment funds, wealth management firms, financing vehicles for firms and the like, which will be reflected in statistics on the composition of the financial sector. While both

of these aspects have already been emphasized by Gräbner et al. (2020c), Beck et al. (2024) point to an additional, third feature of financial hubs, namely that they intermediate large parts of the financial interlinkages across Europe, i.e. these countries serve as regular mediators for European citizens and firms wanting to buy some financial asset, that is not tied to their own, domestic jurisdiction (see also ECB 2024). Hence, these countries effectively organized European financial integration, which seems much less tight and interconnected as soon as this intermediation role of financial hubs is accounted for.

These observations indicate that the institutional specialization undergone by financial hubs is effective insofar as these countries play a crucial role in organizing international financial mediation, facilitating ownership structures as well as by servicing multinational corporations with a specific legal infrastructure that allows for managing effective tax burdens. Notwithstanding the fact that these countries are often rather small in terms of population and, hence, also GDP, they occupy a key role for economic openness, increased globalization and related competitive pressures on countries and domestic policy-makers.

5. Conclusions

This paper presents an updated perspective on the socio-economic divergence among European Union member states over recent decades, a period that has been marked by increasing economic openness, partially facilitated through the introduction of the Euro, as well as several major crises. Building on Gräbner et al. (2020b), we develop a refined methodology to assemble a nuanced typology of different developmental trajectories. Our categorization identifies four development models — core, periphery, workbench economies, and financial hubs — each defined by distinct technological, institutional, and macroeconomic characteristics. Our refined approach accounts for the structural underpinnings of polarization and emphasizes path-dependent dynamics and the compounded effects of major events such as the financial crisis of 2007-2008, the Euro Crisis and the COVID-19 pandemic, which reinforced disparities in income, unemployment, and technological capabilities across the European Union.

Such a take allows for consolidating, extending and refining existing typological approaches in the Varieties of Capitalism and growth model literature (e.g. Iversen et al. 2016; Baccaro and Blyth 2022). The main aim is to capture the heterogeneity of developmental pathways that has emerged in an intensifying European race for the best location. In this race, some core countries, historically defined by high incomes and technological superiority, have found it hard to keep up with the world technology frontier – with cases like France and Finland demonstrating a clear shift toward peripheral characteristics. The shifts uncovered in our paper highlight the dynamic nature of development models and corresponding clusters in the EU, where factors such as crisis-induced vulnerabilities, institutional rigidity, and competitive pressures in the race for the best location affect historical trajectories.

Our analysis of the increasingly important role of financial hubs highlights how their fiscal and regulatory practices exacerbate polarization within the EU, suggesting a need for coordinated policies to mitigate harmful tax competition as well as other beggar-thy-neighbor policies to avoid a race-to-the-bottom in regulatory standards. Future research could provide more in-

depth theoretical and empirical work on how the developmental model of financial hubs relates to other growth models in the context of globalization and European integration.

References

Aglietta M (1976) Régulation et crises du capitalisme: l'expérience des Etats-Unis. Calmann-Lévy, Paris

Aistleitner M, Gräbner C, Hornykewycz A (2021) Theory and Empirics of Capability Accumulation: Implications for Macroeconomic Modelling. Research Policy 50(6):104258. https://doi.org/10.1016/j.respol.2021.104258

Amable B (2023) Nothing new under the sun: the so-called 'growth model perspective.' European Journal of Economics and Economic Policies Intervention 20(3):444-460. https://doi.org/10.4337/ejeep.2023.0098

Baccaro L, Blyth M (2022) Diminishing returns: the new politics of growth and stagnation. Oxford University Press, Cambridge

Baccaro L, Pontusson J (2016) Rethinking Comparative Political Economy: The Growth Model Perspective. Politics & Society 44(2):175-207. https://doi.org/10.1177/0032329216638053

Baistrocchi EA (2024) Global Tax Hubs. Florida Tax Review 27(2):407-477. https://doi.org/10.2139/ssrn.4544786

Beck R, Coppola A, Lewis A, Maggiori M, Schmitz M, Schreger J (2024) The Geography of Capital Allocation in the Euro Area. NBER Working Paper No. w32275. https://doi.org/10.2139/ssrn.4779849

Beebeejaun A (2021) The Double Irish and Dutch Sandwich strategies and tax avoidance in Mauritius. Journal of Money Laundering Control 24(4):737-751. https://doi.org/10.1108/JMLC-09-2020-0103

Behringer J, van Treeck T (2022) Varieties of capitalism and growth regimes: the role of income distribution. Socio-Economic Review 20(3):1249-1286. https://doi.org/10.1093/ser/mwab032

Bhaduri A, Marglin S (1990) Unemployment and the real wage: the economic basis for contesting political ideologies. Cambridge Journal of Economics 14(4):375-393. https://doi.org/10.1093/oxfordjournals.cje.a035141

Bohle D, Greskovits B (2006) Capitalism without compromise: Strong business and weak labor in Eastern Europe's new transnational industries. Studies in Comparative International Development 41(1):3-25. https://doi.org/10.1007/bf02686305

Boyer R (2022) Political Economy of Capitalisms. Palgrave Macmillan, Singapore

Braunstein E, van Staveren I, Tavani D (2011) Embedding Care and Unpaid Work in Macroeconomic Modeling: A Structuralist Approach. Feminist Economics 17(4):5-31. https://doi.org/10.1080/13545701.2011.602354

Celi G, Ginzburg A, Guarascio D, Simonazzi A (2018) Symmetry and convergence in the European Monetary Union: a core-periphery perspective. Routledge, London

Chase-Dunn C, Kawano Y, Brewer BD (2000) Trade Globalization since 1795: Waves of Integration in the World-System. American Sociological Review 65(1):77-95. https://doi.org/10.2307/2657290

Cristelli M, Tacchella A, Pietronero L (2015) The Heterogeneous Dynamics of Economic Complexity. PLoS ONE 10(2):e0117174. https://doi.org/10.1371/journal.pone.0117174

Di Stefano E (2019) Leaving your mamma: why so late in Italy? Review of Economics of the Household 17(1):323-347. https://doi.org/10.1007/s11150-017-9392-y

Dörry S (2015) Strategic nodes in investment fund global production networks: The example of the financial centre Luxembourg. Journal of Economic Geography 15(4):797-814. https://doi.org/10.1093/jeg/lbu031

Dörry S (2016) The role of elites in the co-evolution of international financial markets and financial centres: The case of Luxembourg. Competition & Change 20(1):21-36. https://doi.org/10.1177/1024529415623715

Dorn D, Zweimüller J (2021) Migration and Labor Market Integration in Europe. Journal of Economic Perspectives 35(2):49-76. https://doi.org/10.1257/jep.35.2.49

Dosi G, Grazzi M, Moschella D (2015) Technology and costs in international competitiveness: From countries and sectors to firms. Research Policy 44(10):1795-1814. https://doi.org/10.1016/j.respol.2015.05.012

Dyreng S, Hanlon M (2021) Tax avoidance and multinational firm behavior. In: Foley F, Hines J, Wessel D (eds) Global Goliaths: multinational corporations in the 21st century economy. Brookings Institution Press, Washington DC, pp 361-436

ECB (2016) Report on financial structures, October 2016. European Central Bank. https://www.ecb.europa.eu/pub/pdf/other/reportonfinancialstructures201610.en.pdf. Accessed 4 Feb 2024

ECB (2024) Financial Integration and Structure in the Euro Area. European Central Bank. https://www.ecb.europa.eu/pub/pdf/fie/ecb.fie202406~c4ca413e65.en.pdf. Accessed 4 Feb 2024

Egan M (2023) 'The mystery of Dublin': Corporate profit-shifting and housing crisis in twenty-first century Ireland. Economy and Society 52(3):531-553. https://doi.org/10.1080/03085147.2023.2187997

Eichhorst W, Marx P (2011) Reforming German labour market institutions: A dual path to flexibility. Journal of European Social Policy 21(1):73-87. https://doi.org/10.1177/0958928710385731

Esping-Andersen G (1990) The three worlds of welfare capitalism. Princeton University Press, Princeton

European Commission (2023) Labour market and wage developments in Europe 2023. Publications Office of the European Union. https://doi.org/10.2767/1277

Garcia-Bernardo J, Fichtner J, Takes FW, Heemskerk EM (2017) Uncovering Offshore Financial Centers: Conduits and Sinks in the Global Corporate Ownership Network. Scientific Reports 7(1):6246. https://doi.org/10.1038/s41598-017-06322-9

Gräbner C, Heimberger P, Kapeller J (2019) Economic Polarisation in Europe: Causes and Policy Options. ICAE Working Paper #99. https://www.jku.at/fileadmin/gruppen/108/ICAE_Working_Papers/wp99.pdf. Accessed 4 Feb 2024

Gräbner C, Heimberger P, Kapeller J, Schütz B (2020a) Is the Eurozone disintegrating? Macroeconomic divergence, structural polarisation, trade and fragility. Cambridge Journal of Economics 44(3):647-669. https://doi.org/10.1093/cje/bez059

Gräbner C, Heimberger P, Kapeller J, Schütz B (2020b) Structural change in times of increasing openness: assessing path dependency in European economic integration. Journal of Evolutionary Economics 30(5):1467-1495. https://doi.org/10.1007/s00191-019-00639-6

Gräbner C, Heimberger P, Kapeller J (2020c) Pandemic pushes polarisation: the Corona crisis and macroeconomic divergence in the Eurozone. Journal of Industrial and Business Economics 47(3):425-438. https://doi.org/10.1007/s40812-020-00163-w

Gräbner C, Hafele J (2020) The emergence of core-periphery structures in the European Union: a complexity perspective. ZOE Discussion Paper 6. https://hdl.handle.net/10419/224134. Accessed 4 Feb 2024

Gräbner C, Heimberger P, Kapeller J, Springholz F (2021) Understanding economic openness: a review of existing measures. Review of World Economics 157(1):87-120. https://doi.org/10.1007/s10290-020-00391-1

Gräbner-Radkowitsch C (2022) Elements of an evolutionary approach to comparative economic studies: Complexity, systemism, and path dependent development. In: Dallago B, Casagrande S (eds) Routledge Handbook of Comparative Economic Systems. Routledge, London, pp 81-102. https://doi.org/10.4324/9781003144366-6

Hall PA, Soskice D (2001) Varieties of capitalism: The institutional foundations of comparative advantage. Oxford University Press, Oxford

Hickel J, Dorninger C, Wieland H, Suwandi I (2022) Imperialist appropriation in the world economy: Drain from the global South through unequal exchange, 1990-2015. Global Environmental Change 73:102467. https://doi.org/10.1016/j.gloenvcha.2022.102467

Hidalgo CA, Hausmann R (2009) The building blocks of economic complexity. Proceedings of the National Academy of Sciences 106(26):10570-10575. https://doi.org/10.1073/pnas.0900943106

Iversen T, Soskice D, Hope D (2016) The Eurozone and political economic institutions. Annual Review of Political Science 19:163-185. https://doi.org/10.1146/annurev-polisci-022615-113243

Johnston A, Regan A (2016) European Monetary integration and the incompatibility of national varieties of capitalism. Journal of Common Market Studies 54(2):318-336. https://doi.org/10.1111/jcms.12289

Kaldor N (1980) The Foundations of Free Trade Theory and their Implications for the Current World Recession. In: Malinvaud E, Fitoussi JP (eds) Unemployment in Western countries. Palgrave-Macmillan, London, pp 85-100

Kleinknecht A (2020) The negative impact of supply-side labour market reforms on productivity: an overview of the evidence. Cambridge Journal of Economics 44(2):445-464. https://doi.org/10.1093/cje/bez068

Kohler K, Stockhammer E (2022) Growing differently? Financial cycles, austerity, and competitiveness in growth models since the Global Financial Crisis. Review of International Political Economy 29(4):1314-1341. https://doi.org/10.1080/09692290.2021.1899035

Linsi L, Mügge DK (2019) Globalization and the growing defects of international economic statistics. Review of International Political Economy 26(3):361-383. https://doi.org/10.1080/09692290.2018.1560353

Milogolov N (2020) The Emergence of the 'Technological Tax Hub': Digitally Oriented Trajectories of Reforms in Tax Planning Hub Jurisdictions. Intertax 48(12):1105-1124. https://doi.org/10.54648/taxi2020112

Mody A (2018) EuroTragedy: A drama in nine acts. Oxford University Press, Oxford

Mohnen P, Vankan A, Verspagen B (2017) Evaluating the innovation box tax policy instrument in the Netherlands, 2007-13. Oxford Review of Economic Policy 33(1):141-156. https://doi.org/10.1093/oxrep/grw038

Myrdal G (1968) Asian Drama – An Inquiry Into the Poverty of Nations. Pantheon, New York

Nelson JA (1988) Household Economies of Scale in Consumption: Theory and Evidence. Econometrica 56(6):1301-1314. https://doi.org/10.2307/1913099

Nerudova D, Dobranschi M, Solilová V, Litzman M (2023) Onshore and offshore profit shifting and tax revenue losses in the European Union. Economic Modelling 119:106111. https://doi.org/10.1016/j.econmod.2022.106111

Palan R (2002) Tax Havens and the Commercialization of State Sovereignty. International Organization 56(1):151-176. https://doi.org/10.1162/002081802753485160

Picot G, Tassinari A (2017) All of one kind? Labour market reforms under austerity in Italy and Spain. Socio-Economic Review 15(2):461-482. https://doi.org/10.1093/ser/mww042

Polyak P (2022) Ireland's multinationals-dominated economy in the pandemic: did big tech and big pharmaceutical companies save the day? International Journal of Political Economy 51(1):65-76. https://doi.org/10.1080/08911916.2022.2046347

Pula B (2020) Disembedded Politics: Neoliberal Reform and Labour Market Institutions in Central and Eastern Europe. Government and Opposition 55(4):557-577. https://doi.org/10.1017/gov.2018.41

Rodrik D (2011) The Globalization Paradox. Norton & Company, New York

Simonazzi A, Ginzburg A, Nocella G (2013) Economic relations between Germany and southern Europe. Cambridge Journal of Economics 37(3):653-675. https://doi.org/10.1093/cje/bet010

Stöllinger R (2016) Structural change and global value chains in the EU. Empirica 43:801-829. https://doi.org/10.1007/s10663-016-9349-z

Storm S, Naastepad CWM (2015) Europe's Hunger Games: Income Distribution, Cost Competitiveness and Crisis. Cambridge Journal of Economics 39(3):959-986. https://doi.org/10.1093/cje/beu037

Tooze A (2018) Crashed: How a decade of financial crises changed the world economy. Viking, London

Tørsløv T, Wier L, Zucman G (2023) The Missing Profits of Nations. Review of Economic Studies 90(3):1499-1534. https://doi.org/10.1093/restud/rdac049

Weyzig F (2013) Tax treaty shopping: structural determinants of Foreign Direct Investment routed through the Netherlands. International Tax and Public Finance 20(6):910-937. https://doi.org/10.1007/s10797-012-9250-z

Wooldridge J (2010) Econometric analysis of cross section and panel data, 2nd edn. MIT Press, Cambridge

ifso working paper

ifso working papers are preliminary scholarly papers emerging from research at and around the Institute for Socio-Economics at the University of Duisburg-Essen.

All **ifso working papers** at uni-due.de/soziooekonomie/wp

ISSN 2699-7207

UNIVERSITÄT DUISBURG ESSEN

Open-Minded

ifso institute for socio-economics

Institute for Socio-Economics
University of Duisburg-Essen

Lotharstr. 65
47057 Duisburg
Germany

uni-due.de/soziooekonomie
wp.ifso@uni-due.de