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#### Abstract

This paper analyses economic developments in the Eurozone since its inception in 1999. In doing so, we document a process of economic divergence and polarization among those countries that joined the Eurozone during its first two years, which fits a typical ‘core – periphery’ pattern. We show how this polarization process first manifested in increasing current account imbalances before the crisis, before it translated onto the level of general macroeconomic development after the crisis. Empirically, we demonstrate how this divergence is tied to a ‘structural polarization’ in terms of the sectoral composition of Eurozone countries: specifically, the emergence of export-driven growth in core countries and debt-driven growth in the European periphery coincides with differences in technological capabilities and firm performance. Pushing for convergence within Europe requires the implementation of three intertwined policy programs: macroprudential financial regulation, active industrial policies aiming at a technological catch-up process in periphery countries, and progressive re-distributional policies to sustain adequate levels of aggregate demand throughout the Eurozone.

**Keywords:** polarization, European Monetary Union, industrial policy, financial regulation, growth trajectories

**JEL codes:** B5, E6, F45

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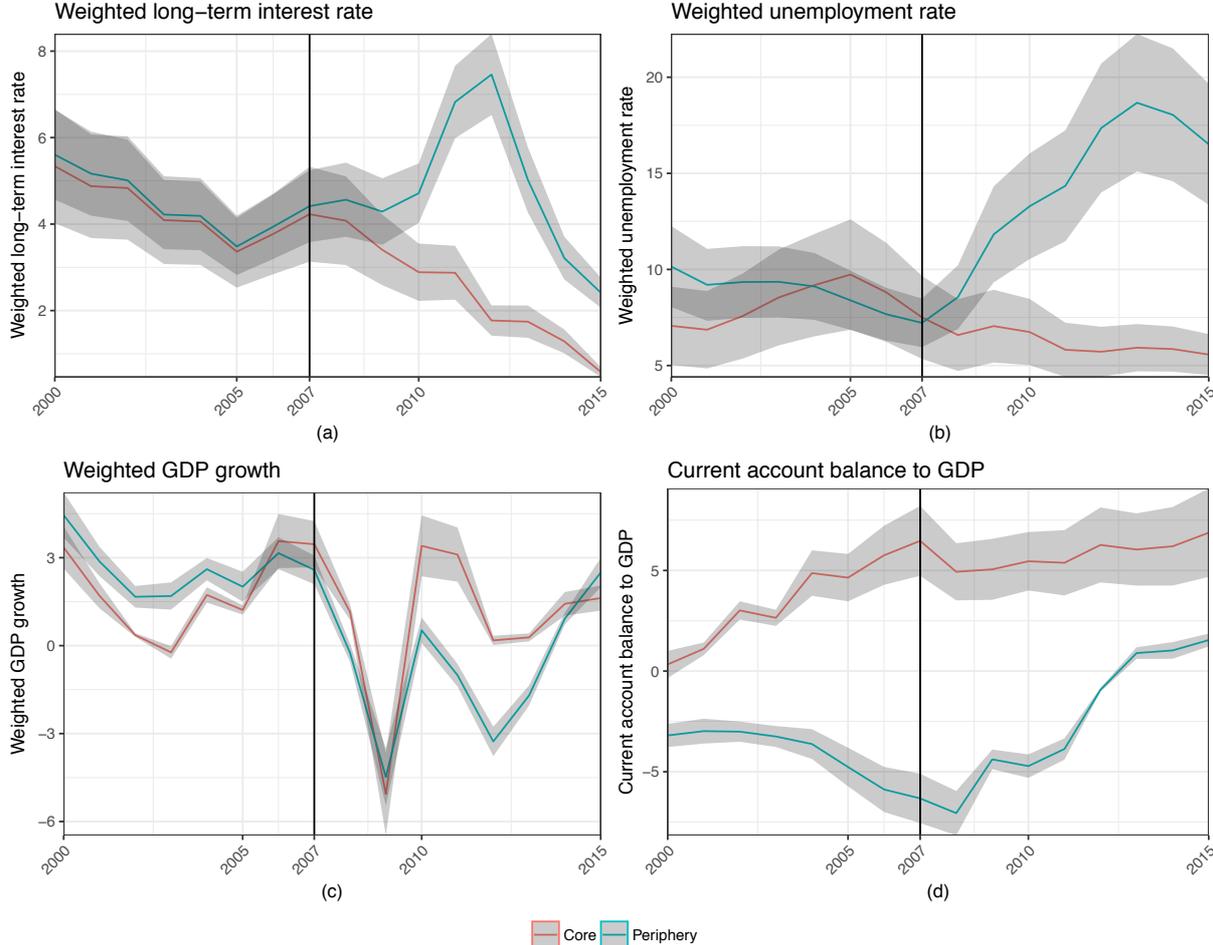
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# 1. Introduction

Nearly twenty years after the introduction of the European Monetary Union in 1999 and about ten years after the outbreak of the financial crisis of 2007/2008, economic developments within the Eurozone remain remarkably uneven. Germany, for instance, has turned from being the 1990s ‘sick-man of Europe’ to a dominant economic power of today: it has not only bounced back from the financial crisis but has also been able to accumulate large current account surpluses (Simonazzi *et al.*, 2013; Storm and Naastepad, 2015b; Stockhammer and Wildauer, 2016). Real output in Germany increased by 24.1%-points between 1999 and 2016, which stands in stark contrast to the developments in other Eurozone countries like Italy, where real output increased only by 4.6%-points, Portugal (+ 8.2%-points) or Greece (+ 1%).<sup>1</sup> Such a casual inspection of current macroeconomic statistics indicates that the Euro’s alleged role as a “convergence machine” (e.g. Gill and Raiser, 2012) has been contradicted by a reality of accelerated divergence – at least for the joining the Euro during the first two years since its inception in 1999. In this paper, we will study the mechanisms underlying this divergence.

While a large literature has studied the causes of the present crisis in Europe (e.g. Baldwin *et al.*, 2015; Stockhammer, 2015) and stressed the shortcomings of an institutional architecture in a European Monetary Union without fiscal and political union (e.g. De Grauwe, 2012; Boyer, 2013), this paper offers two novel perspectives on said issues. First, we provide a unified framework for analyzing polarization in the Eurozone with a special consideration of the impact of the financial crisis to demonstrate the continuity of the underlying polarization process. Second, we relate the emergence of divergent macroeconomic development paths across the Eurozone to technological capabilities and firm performance in different countries to gain a better understanding of developmental prospects in Europe.

The importance of our first contribution derives from the fact that the polarization process in Europe has hardly been visible before the outbreak of the financial crisis in terms of commonly used macroeconomic indicators; instead interest rates, unemployment and GDP growth were all developing in a similar way in both core as well as periphery (Figure 1, Panels a,b,c). In Figure 1 as well as throughout the paper, our distinction between core and periphery follows the recent literature (e.g. Simonazzi et al., 2013; Baldwin et al., 2015; Storm, Naastepad, 2015c). Core countries include: Austria, Belgium, Finland, Luxembourg, Germany, and Netherlands; and periphery countries include: Greece, Ireland, Italy, Portugal, and Spain.<sup>ii</sup>



**Fig. 1.** *The hidden polarization in the Eurozone.*

*\*The plots show the population-weighted means with the area +/- 1 standard deviation around the weighted mean being shaded. Source: AMECO (for the economic indicators) and UN (for the population size); authors' own calculation.*

Before the crisis, only the increase in current account imbalances (Figure 1, Panel d) indicates divergence between core and periphery countries: while the population-weighted average of the current account in the core rose from about 0.3% in 2000 to more than +6.5% of GDP in 2007, the weighted average of current account deficits in the periphery more than doubled from -3.2% at the start of the Euro project to -6.3% before the financial crisis.<sup>iii</sup>

Our second contribution aims at extending past works by Simonazzi *et al.* (2013) as well as Storm and Naastepad (2015a, 2015b, 2015c), who emphasize that divergences in Eurozone industry structures are crucial for understanding the macroeconomic developments within the Eurozone. However as these studies largely focus on pre-crisis years, they do not embed their analysis in a broader account of structural polarization in the Eurozone as a process that has continued in post-crisis years. This paper closes this gap in the literature by proposing a framework that allows for linking firm performance in core and periphery countries of the Eurozone to the macroeconomic literature on ‘export-led’ and ‘debt-led’ growth models (e.g. Stockhammer and Wildauer, 2016). Furthermore, parts of our empirical analysis also shed light on the underlying reasons for the observed economic divergence, namely the unequal distribution of technological capabilities.

To identify the mechanisms underlying European polarization, we proceed as follows: The next section develops a theoretical framework that integrates the dynamics on the macro and microeconomic sphere into a consistent view on European divergence. Section 3 provides empirical evidence for the mechanisms highlighted by this framework. Section 4 summarizes our argument and discusses its policy implications.

## **2. Imbalances and macroeconomic fragility: A theoretical framework capturing structural polarization in Europe**

This section provides a theoretical framework that allows for identifying the major dynamics of structural polarization on both the micro- and macroeconomic level. In short, we argue that divergence across Eurozone countries before the financial crisis manifested itself in the emergence of two different growth trajectories – one trajectory ‘(private) debt-led’, the other one ‘export-led’. The structural ramifications arising from these two growth trajectories were hardly visible by inspecting typical macroeconomic indicators until the debt-led trajectory turned unsustainable with the unfolding of the financial crisis of 2007-2008. While the crisis has made obvious even to casual observers that European countries are diverging from a macroeconomic point of view, we argue that patterns of sectoral specialization already established before the advent of the crisis play a major role in the unfolding of imbalances within the Eurozone.

### **2.1 Main macroeconomic trends**

We start with the generally accepted stylized fact that inequality has been increasing in most Western countries, including the EU’s member countries (Atkinson *et al.* 2011). An increase in inequality leads to a decrease in effective demand, which weakens the economic outlook for the affected countries (Stockhammer, 2015). The question whether such a weakening represents an existential threat to economic development depends upon a number of other circumstances, including the reaction of the government, the impact of economic openness and the role of financial markets (see Table 1 for a summary).

First, the government could increase fiscal spending to stabilize aggregate demand by compensating the decrease in private spending. However, in much of contemporary Europe the Stability and Growth Pact restricts expansionary fiscal policies. Also, the pre-crisis roots in the Eurozone’s countries lie *not* in expansionary fiscal policies leading to excessive fiscal deficits and

public debt (Lane, 2012). Rather the inverse proposition holds, namely the costs of the crisis (related to bailing-out the banking system, decreases in tax revenues and increases in unemployment-related spending) have created sovereign debt problems from 2010 onwards (e.g. Shambaugh, 2012; Baldwin *et al.*, 2015).

Second, aggregate demand for domestic goods might nonetheless increase if firms manage to increase their exports relative to current imports to substitute domestic demand with foreign demand, leading to net capital outflows as one side-effect (Hobza and Zeugner, 2014). Germany is the archetypical example for a country with an increasing export share and net foreign lending (Simonazzi *et al.*, 2013), but the Netherlands or Austria also fall into this category. Because their current account is positive, these countries are called ‘surplus countries’ and, at least within the currency region, they are also creditor countries.

A third possibility is that the implied decrease in disposable income is compensated by an increase in the willingness of the private sector to incur debt in order to continue spending on goods in the face of rising income inequality (Barba and Pivetti, 2009; Gu and Huang, 2014). If such a demand for credit is accommodated by a corresponding credit supply, this may temporarily mask the (potential) reduction in demand that would result from the drop in disposable income; however, it comes at the price of increasing private sector debt and higher financial fragility (Kapeller and Schütz 2015). Examples for countries on this trajectory are Portugal, Spain or Greece (e.g. Drudy and Collins, 2011; Ruiz *et al.*, 2016; Heimberger and Kapeller, 2017).

**Table 1.** *A summary of potential reactions to a decrease in effective demand.*

<b>Mechanisms compensating for decreasing demand</b>	<b>Expansionary fiscal policy</b>	<b>Substitution of domestic with foreign demand</b>	<b>Stabilizing demand via debt-led private sector expansion</b>
<b>Requirements</b>	Creditors (could be central bank)	Competitive advantage, foreign import demand, capital outflows	Sufficiently de-regulated financial markets, capital inflows
<b>Main Actor(s)</b>	Government	Firms	Households
<b>Side effects</b>	Increasing indebtedness of the national government	Net lending, currency re-valuation (not applicable in the Euro area)	Increasing indebtedness of private households
<b>Examples in the EU</b>	Legal institutions in the EU restrict this strategy.	Germany, Austria, Netherlands	Spain, Italy, Portugal, ...
<b>Implications for current account</b>	Negative	Positive	Negative

*Authors' illustration.*

Development regimes throughout the EU have been shaped by these mechanisms to different degrees, with export-based expansion prevailing in some countries and private debt-led compensation in others (Stockhammer and Wildauer 2016; Storm and Naastepad, 2016). This constellation of growth trajectories led to large current account imbalances and a division into *surplus* countries and *deficit* countries in pre-crisis times (e.g. Giavazzi and Spaventa, 2010).

However, while current account deficits were mostly financed by capital flows from core countries to the periphery via intra-European financial linkages (Hobza and Zeugner, 2014; Storm and Naastepad, 2015c), the periphery countries' growing trade deficits were actually *not* primarily accumulated vis-à-vis-Eurozone countries but vis-à-vis the rest of the world (Chen *et al.*, 2013; for details, see section 3.2).

While European countries had already started to drift apart well before the financial crisis, the crisis has impacted the viability of stabilizing demand via debt-led private sector expansion. The political reaction of imposing fiscal austerity from 2010 onwards has reduced demand further, especially in the Southern periphery, which led countries such as Spain, Portugal or Greece into a debt-deflationary cycle due to deficient demand. Their governments are lacking viable instruments to counter decreasing demand and these countries are trapped in a vicious cycle of increasing debt, low growth and high unemployment (Heimberger and Kapeller, 2017).

So far, we have articulated the main macroeconomic trends underlying polarization in the Eurozone, but remained silent on the question of why some countries, be it deliberately or by accident, relied more strongly on debt-led compensation, while other opted for export-based expansion. In order to identify possible reasons for this divergence and to better explain its unfolding in the pre-crisis period, we next focus on analysing the underlying polarization process on the micro and meso level.

## **2.2 Determinants of debt-driven growth**

The EU has witnessed a liberalization period with deep structural changes in the financial sector, which allowed for increasing credit supply that contributed to the emergence of debt-driven growth trajectory in a number of countries. In particular, financial deregulation allowed financial institutions already present in one member country to open affiliates in other member countries. This led to a significant increase in the size of the financial sector, going along with a rise in the supply of credit (Chmelar, 2013). Financial sector integration also facilitated the cross-border movement of capital, implying that sectors with above-average rates of return experienced a steep rise in capital inflows. During the pre-crisis period, some industrial sectors in the Southern European periphery experienced rates of return exceeding those in the core countries (e.g. the Spanish construction sector). As capital became available to these sectors, it spurred economic

expansion driven by foreign credit (Baldwin *et al.*, 2015; Storm and Naastepad 2016). In the periphery these capital flows and financial interlinkages between core and periphery countries contributed to debt-led booms and corresponding asset-bubbles (Chen *et al.*, 2013; Hobza and Zeugner, 2014). Low real interest rates in the Southern periphery were also a consequence of the monetary union. Having a common interest rate set by the ECB meant that countries with above average inflation rates (mostly the countries of the Southern periphery) nonetheless experienced declines in real interest rates (Baldwin *et al.*, 2015; Storm and Naastepad, 2015c) and corresponding inducements to increase private sector debt. Similarly, low real interest rates on mortgages stimulated real estate booms, most notably in Ireland and Spain (Storm and Naastepad 2016).

In the context of explaining the increase in the demand for debt in the Eurozone, it is well established that people's perception of what is a decent material standard of living is influenced by past consumption patterns as well as observations of peers such as neighbours, friends and relatives. Hence, falling or unequally distributed income creates an incentive to close the gap between obtained income and aspired consumption by acquiring private credit.<sup>iv</sup> Hence, increasing inequality implies a higher demand for household credit, which is exactly what we observe in the data: personal inequality has been found to be a main driver of private credit in the U.S. (Christen and Morgan, 2005) as well as in an international comparison of countries (Gu and Huang, 2014). Furthermore, and consistent with our framework, the Eurozone countries with the highest levels of national income inequality in 1995 were (in ascending order) Ireland, Italy, Spain and Greece (Hoffmeister, 2009), i.e. exactly those countries that once monetary and financial sector integration took place experienced a period of rapid private credit expansion, which allowed for an expansion of aggregate demand.

### **2.3 Export-driven growth: Competitive advantage and firm performance**

In contrast to the debt-led growth trajectory, the export-led trajectory builds on compensating losses in aggregate demand by increasing exports instead of expanding private credit. However, such an increase in net exports can hardly be realized by all European countries at the same time as increases in net exports in some countries require corresponding increases in net imports elsewhere. Hence, as long as the rest of the world does not fall into a frenzy of buying European goods, expectations of an overall export-based growth pattern for Europe are misguided. In what follows, we argue that countries populated by firms lacking in international competitiveness will find it more difficult to mitigate inadequate domestic demand by generating additional revenues from exports (see Table 1). Hence, we hypothesize that differences in firm structure contributed to the emergence of different growth trajectories across Europe.

When discussing the determinants of firm competitiveness in international trade, it seems noteworthy that only a limited share of firms actually participate in those markets (e.g. Bernard and Jensen, 2006, Bernard *et al.* 2007) and that those firms tend to exhibit higher productivity (e.g. Bernard *et al.*, 2007, van Biesebroek, 2007). Mainstream economic models relate these patterns either to a selection effect (e.g. Melitz, 2003), which asserts that only more successful firms are able to trade internationally, or to a treatment effect (e.g. Krugman, 1979), which reverses the selection argument by assuming that activity on international markets renders firms more productive.

As the mainstream approach basically equates ‘exporting’ with ‘competitive’ and thus broadly with ‘better’ (in terms of wages or productivity), it often loses sight of the question: what determines competitiveness of firms in the first place? While the existence of such a competitive advantage can take very different forms – such as the presence of natural resources, advanced technology, the provision of lower regulatory standards and specific legislation or the availability

of cheap input factors – much of the existing literature focuses on the role of (unit) labour costs for explaining competitiveness (e.g. Stockhammer, 2011; Gabrisch and Staehr, 2014), while others emphasize the importance of regulatory issues (Kapeller *et al.* 2016) and natural endowments (Dicken, 2014), especially in a global context.

While these studies focus on the country level, a significant body of literature has analysed the sources of competitiveness by looking at the importance of factor costs and technological capabilities on the sectoral level. In this context, the level of technological capabilities is found to be more important than differences in factor costs (echoing Kaldor 1978), especially in sectors are characterized by higher degrees of technical sophistication (e.g. Carlin *et al.*, 2001; Storm and Naastepad, 2015b). In these circumstances, relative unit labour costs only play a minor role in determining *current* export performance in comparison to technological capabilities. However, low unit labour costs might serve to attract foreign investment and, hence, may facilitate technological upgrading.<sup>v</sup>

Other studies disaggregate the data further to study the role of cost and technological competitiveness at the firm level. The results do not differ fundamentally from those at the sector level: there is no clear evidence that lower labour costs are a significant determinant for international competitiveness across firms, while technological capabilities and innovativeness are key (Dosi *et al.* 2015). These results align well with those of Manova and Zhang (2012) who argue that products of higher quality can enter foreign markets more easily, and that it is more important for single firms to participate in those markets than to be cost-efficient. Finally, the result that labour costs play a marginal role in determining international competitiveness in many sectors and contexts is well in line with the fact that changes in unit labour costs have a negligible impact on gross output prices for internationally marketed goods (Storm & Naastepad 2015b).

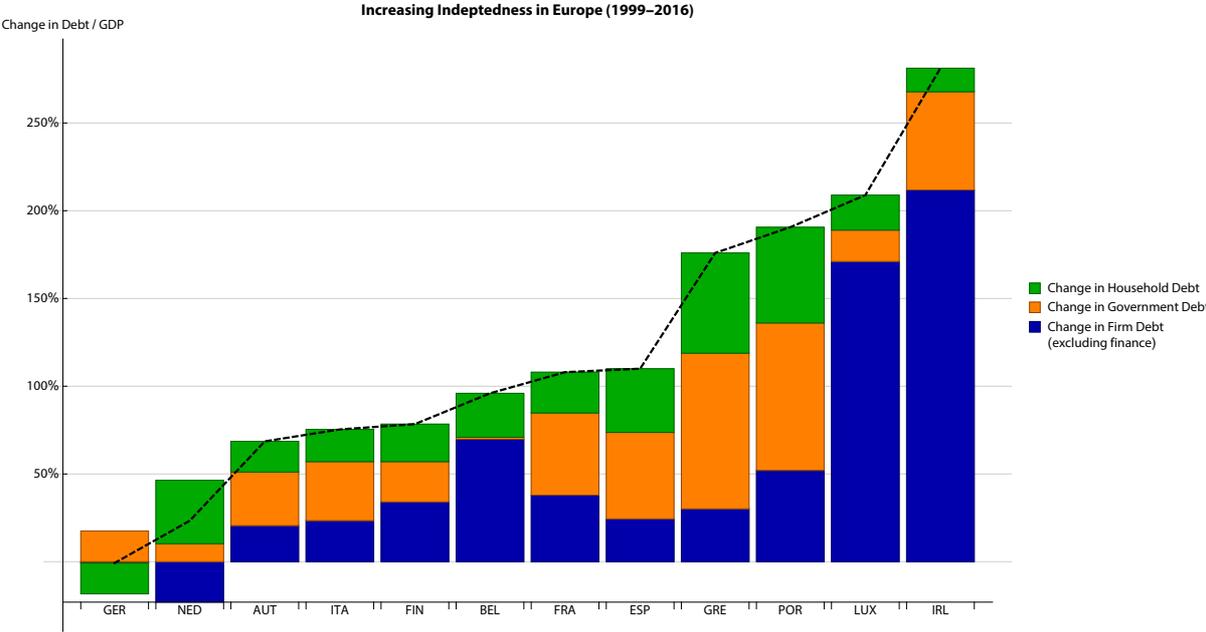
Summing up, while low factor costs cannot guarantee for the success of firms on international markets, technological capabilities are of key importance: the competitiveness of a country's population of firms is determined by its relative technological capabilities rather than by its relative unit labour cost (Dosi et al. 1990; Dosi et al. 2015). This result is largely supported by evidence from the Eurozone: Germany's export success, for instance, is not primarily a consequence of relatively low wages; instead, it is due to superior 'non-price competitiveness' by German firms, while the Eurozone's periphery countries have stayed behind in terms of their technological capabilities (Simonazzi *et al.*, 2013; Storm, Naastepad, 2015a, 2015c). The role played by wage restraint is important in a different way: it has been crucial in terms of keeping consumption demand and thereby import demand in check. Thus, low wage growth has contributed to Germany's 'current account success' without providing much of a boost to exports (Simonazzi *et al.*, 2013; Storm, Naastepad, 2015b). However, as the countries under study – those, which joined the Eurozone in the first two years since its inception – are rather homogenous, the finding of a technological priority in determining international competitiveness seems only appropriate for the case at hand and should also be taken with a grain of salt as its applicability to a more heterogeneous set of (advanced and/or developing) countries should not be taken for granted.

### **3. Dimensions of structural polarization in the Eurozone**

Against the background of this framework for analysing polarization in the Eurozone, we now turn to the empirical dimensions of divergence between core and periphery. Keeping in mind that economic polarization largely remained concealed before the advent of the financial crisis (Figure 1), we empirically illustrate the role of private-debt dynamics and the production and export structures.

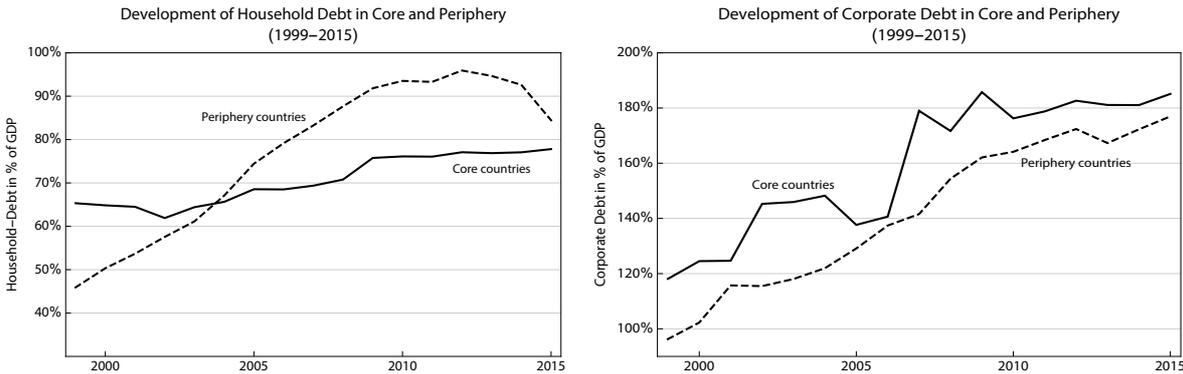
### 3.1 Diverging trends in private debt

The recent years have seen a steady increase in debt across Europe. This increase, however, has been shared unequally. Considering the development of debt held by the real sector, i.e. excluding the financial sector, we see that from 1999 until 2016 several countries (Ireland, Luxemburg, Portugal and Greece) saw their non-financial sector debt rise to more than 170% of GDP, whereas Germany more or less managed to keep its level of debt at the 1999 level (see Figure 2). Moreover, despite the heavy emphasis in the public discourse on the rise in government debt as the alleged root of the crisis, it was instead private sector debt of households and non-financial firms that contributed substantially to the rise in debt in nearly all Eurozone countries. Additionally, while the major part of the increase in government debt occurred post-crisis (due to financial sector bailouts, unemployment benefits, tax losses and fiscal stimulus programs), the rise in household debt occurred before the crisis (Figure 3).



**Fig. 2.** Change in debt relative to initial GDP between 1999 and 2016. Source: OECD, data set 'FIN\_IND\_FBS', retrieved July 2017; author's own calculation.

Figure 3 shows that, beside the fact that the levels of household debt peaked around the crisis, the rise in household debt was much more pronounced in the periphery compared to the core and was concentrated in the pre-crisis phase, while non-financial corporate debt does not show the same pattern, but rather increases constantly across time in both, core and periphery.



**Fig. 3.** Average evolution of household-debt as a percentage of GDP among core and periphery countries. Source: OECD, data set 'FIN\_IND\_FBS', retrieved July 2017; authors' calculations.

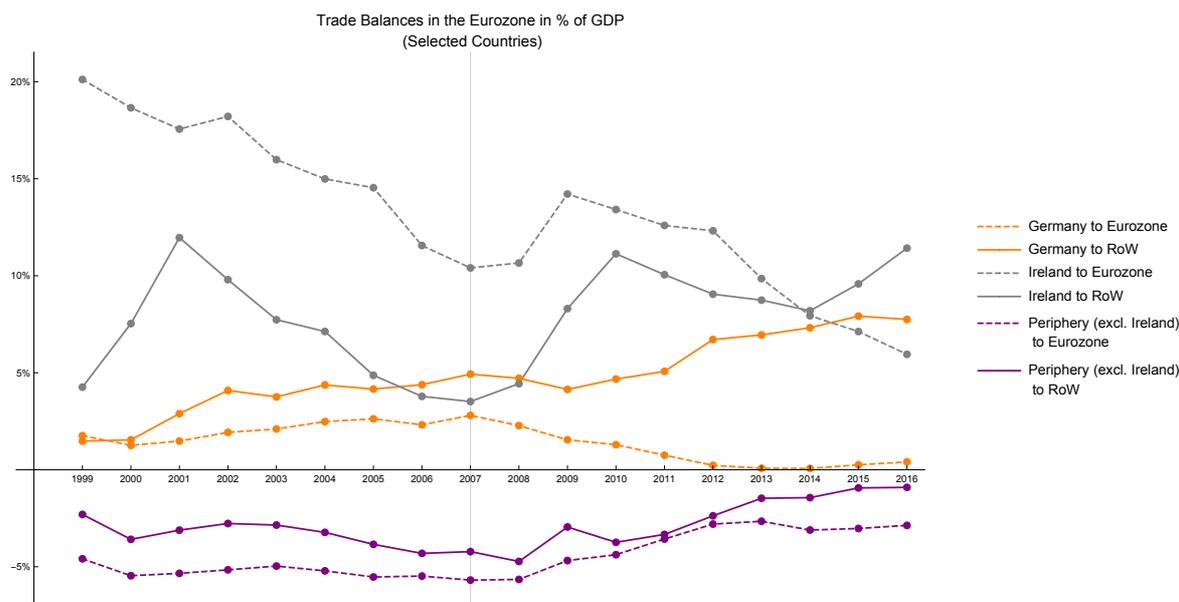
While periphery countries initially started out with significantly lower levels of household debt, they surpassed core country levels in 2005, while the periphery never surpassed the core in terms of corporate debt. In this view, household indebtedness emerges as a prime indicator for detecting and understanding unsustainable debt-based growth models, which marked pre-crisis developments in the Eurozone.<sup>vi</sup> With household debt at historically high levels and a financial sector unwilling to lend during crisis, after the start of the crisis a sharp decline in private demand was the inevitable consequence in the periphery. In conjunction with EU's fiscal regulatory framework (e.g. Lane, 2012), there was no way to avoid deep recessions and economic stagnation in the periphery.

## **3.2 Divergence of product diversification and trade flows with the rest of the world**

In this section, we show that there are two main channels of polarization in terms of production and export structures: one related to the destination of exports, the other to the kind of products being exported.

### **3.2.1 Polarization in terms of export markets**

We now turn to an analysis of whether polarization is also visible in trade data. Figure 4 is based on bilateral trade flows of Germany, Ireland, Italy, Portugal, Greece and Spain from 1999 to 2016. The data depicted in Figure 4 clearly indicate a polarization process between Germany and the periphery countries (excluding Ireland).<sup>vii</sup> Several points are worth highlighting. First, the periphery countries' trade balances were already on a path of deterioration well before the outbreak of the crisis, mainly due to rising imports (e.g. Chen et al., 2013). Second, the periphery countries' trade balances improved from 2007 to 2016, but this development is to a large extent due to the slump in imports, caused by fiscal consolidation and deflationary wage policies after the crisis (e.g. Stockhammer and Sotiropoulos, 2014). Third, Germany's trade surplus was already increasing before the start of the crisis; between 1999 and 2007, the trade balance vis-à-vis the rest of the world increased much more than vis-à-vis the Eurozone. In fact, Germany's trade balance vis-à-vis the Eurozone has declined by more than 2 percentage points since reaching a peak in 2007; in fact, the German trade balance vis-à-vis the Eurozone has recorded values close to zero since 2012. At the same time, however, Germany's trade balance vis-à-vis the rest of the world has continued to grow since the start of the crisis, standing at 7.8% of GDP in 2016. Hence, an important part of Germany's growth story seems to be that over the last 20 years, German firms have managed to diversify their export markets, thereby recording strong export growth in regions with sub-par economic growth. At the same time, the periphery countries have clearly not managed to do the same, as can be seen from the evolution of the periphery's trade balance vis-à-vis the rest of the world since 1999.



**Figure 4.** The evolution of trade balances in Germany and in the periphery of the Eurozone (in % of GDP).

Source: Direction of trade (IMF), World Economic Outlook (IMF); own calculations; ROW: Rest of the world.

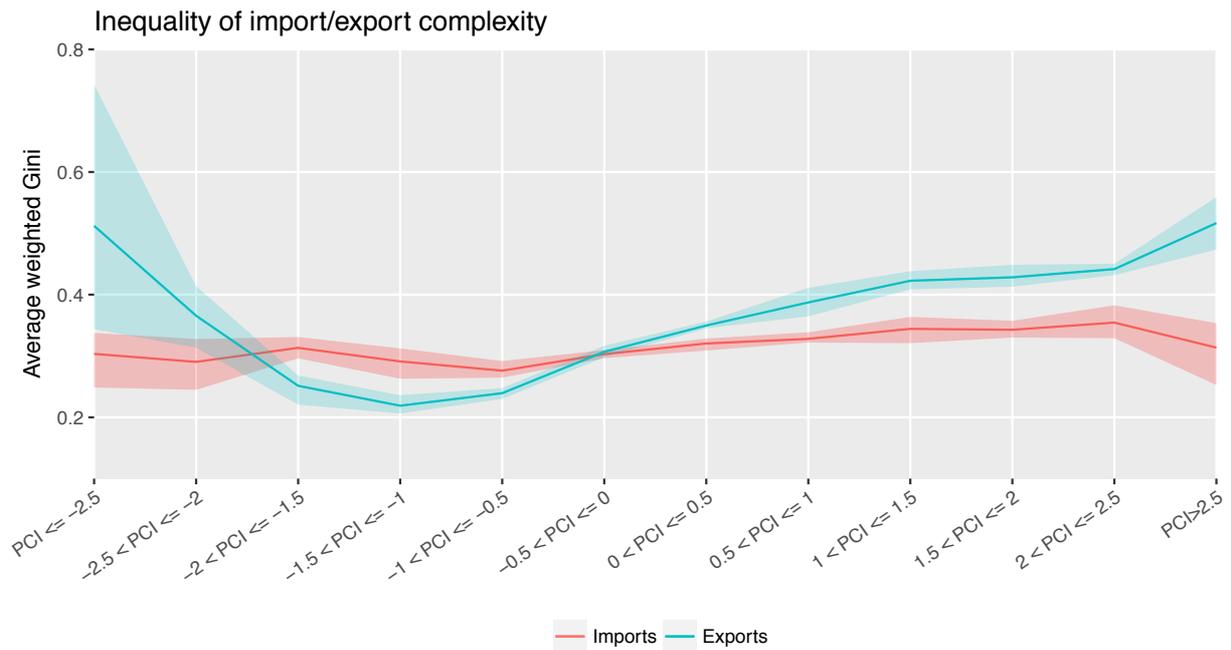
Data includes only goods and no services.

### 3.2.2 Polarization in terms of exported products

The previous section has highlighted that while the periphery countries' trade balance had already started to deteriorate well before the financial crisis, German firms have managed to diversify their export destinations over the last 20 years: a significant share of German trade relationships are with emerging, fast-growing economies, particularly in Asia. But we do not only observe polarization with respect to export destination, but also a persistent difference with regard to the kinds of products exported by core and periphery countries. This is important because “what a country exports matters” (Hausmann *et al.*, 2006). More specifically, quantitative measures such as indices of economic complexity (Hidalgo *et al.*, 2007, Hidalgo and Hausmann, 2009, Tacchella *et al.*, 2012) suggest that countries that are able to produce and export more complex products generally enjoy a favourable development in terms of rising incomes (Hidalgo *et al.*, 2007, Hidalgo and Hausmann, 2009, Cristelli *et al.*, 2015). Figure 5 is based on import and export data for the period 2000-2015; it illustrates that the capabilities to produce complex products is distributed

very unequally among European countries, a persistent fact that we suggest to be a major root of the polarization patterns we observe at the macro level.

To make this argument precise we compare the export baskets of various countries and measure their diversity with the Gini index. We observe that the export of those products with very low and very high complexity is distributed unevenly among the countries, whereas the export of products of medium complexity is more equally distributed. This finding implies that while virtually all Eurozone countries export products of medium complexity— represented by a low Gini index for products with a product complexity index (PCI) between -1.5 and 0.5 –, the export of very simple products (PCI below -1.5) and very complex products (PCI above 1.0) is more concentrated. Given that such inequality cannot be observed with regard to imported products, this fact underscores important differences with regard to the production structure and technological capabilities in different Eurozone countries – with the largest differences between Germany and the periphery. Specifically, this asymmetry not only explains why high degrees of technological capabilities come with competitive advantage (fewer competitors, but constant demand), but also allows to align volatile macroeconomic trends with persistent differences in technological capabilities: indeed, the emergence of some form of economic polarization is no surprise in an economic regime that relies on fostering international competitiveness, if one main source of competitiveness is distributed so unequally.



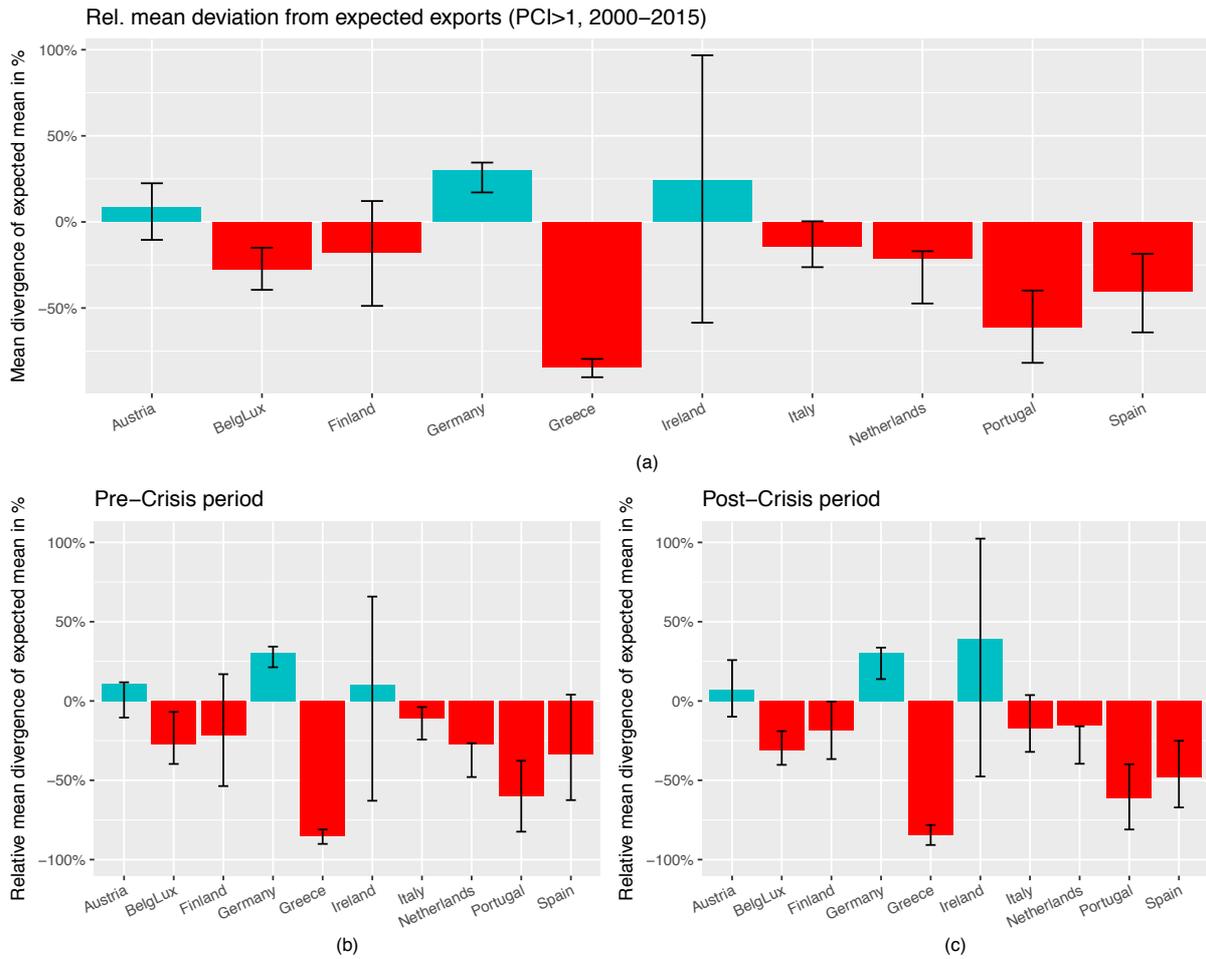
**Fig. 5.** *Inequality in terms of the complexity of the products exported by the Euro countries between 2000 and 2015. Inequality is measured by the Gini index, which has been weighted by the total exports of the countries. The shaded areas indicate the 25 and 75 percentile of the yearly Ginis. Source: Simoes and Hidalgo (2011) in its 07-2017 version; authors' own calculation.*

In order to gain a more nuanced view of these persistent level differences we can look at the different countries explicitly. Panel a) of Figure 6 highlights the deviations of actual exports of 10 Eurozone countries from the exports that we would expect based on the respective country's total export activity if exports of a certain complexity type were distributed equally amongst all exporters.<sup>viii</sup>

In the period 2000-2015 about 38.9% of total exports in the EU came from Germany, only 7.9% from Spain. In addition to the difference in the *amount* of goods exported, there is an important difference with regard to the *kind* of products exported. While during this period the share of German exports of products with a complexity index above 1 was much larger than 38.9%, Germany's export share for simpler products was substantially smaller than 38.9%. With regard

to more complex products (here: products with a PCI above 1.0), Germany exports on average 30% more than we would have expected based on the share of Germany's exports of EU exports. For Spain we can observe the exactly opposite pattern: for products with a PCI below 1, Spain exports much more than we would expect based on its export share, and for more complex products Spain exports 40 % less than we would expect. Thus, the Spanish economy is comparatively "good" in producing simple goods, but comparatively "bad" in producing complex products. Panels (b) and (c) of figure 6 indicate that there has not been any qualitative change in these level differences before and after the crisis: Ireland is the only country that has managed to break the export dominance of Germany in the category of the most complex products. The observation that a persistent gap on the level of production structures causes a growing polarization on the macro structure is consistent with the evidence discussed by Hidalgo and Hausmann (2009), who conclude that "countries tend to approach the level of income associated with the capability set available in them" (p. 10570).

In total, these developments illustrate the persistent level differences in diversification of the manufacturing structure across European countries, with Germany dominating as a highly diversified export economy even within the group of core countries. As indicated by our empirical analysis, structural polarization is rooted in an unequal distribution of technological capabilities that manifests in striking core-periphery patterns in terms of the product complexity of exported products.



**Fig. 6.** Deviations from the export volume of countries with a product complexity index (PCI) above 1 that would be expected based on the total export share of the countries. The y-axis shows the aggregated divergence of the expected mean in relation to the exports of the country we would have expected for products with a PCI above one (i.e.  $\sum_y \left[ \eta_{cy}^{PCI>1} / \mathbb{E}(EX_{cy}^{PCI>1}) \right]$ ). The whiskers indicate the 25 and 75 percentile of the data. Source: Simoes and Hidalgo (2011) in its 07-2017 version; authors' own calculation.

In this context, we cannot expect a natural convergence process to happen as the emergence of a structural advantage in terms of technological capabilities (e.g. in Germany's case) rests on increasing returns to production, which itself have their roots in – *inter alia* - geographic specialization (Fujita et al. 1999), the presence of business communities and social ties among entrepreneurs and managers (Banerjee & Munshi 2004), and trust and innovation clusters (Elsner et al. 2015). All the mentioned factors have been at the heart of the classical arguments on

circular cumulative causation and backwash effects (Myrdal 1958), and cumulative causation and export-led growth (Kaldor 1970; Thirlwall 1980). Given the path dependency that is usually implied by increasing returns, it is likely that the current trajectory represents a ‘lock-in’ in terms of industrial specialization and, thus, economic development, which cannot be broken without coordinated policy interventions.

## 4. Conclusions

We have introduced a theoretical framework that sheds light on the mechanisms underlying the polarization in the Eurozone by integrating both micro and macroeconomic perspectives into a systemic view. Based on the framework we have shown empirically that macroeconomic divergence between core and periphery countries is driven by the co-existence of two different growth trajectories, which themselves are the result of a ‘structural polarization’ in industrial structures manifesting in level differences in technological capabilities: the emergence of export-driven growth in the core and debt-driven growth in the periphery is linked to the micro level of technological capabilities and firm performance.

A number of important policy implications follow from our findings. First, as long as core and periphery countries remain mired in structural polarization and follow two different growth trajectories, macroeconomic divergence will continue. Second, a set of active policy interventions is required to change the underlying export-led and debt-led growth patterns. Against the background of our framework, such policies should *simultaneously* address (i) the lack of financial regulation through macro-prudential policies, (ii) the divergence of production structures and export regimes through European industrial policies, and (iii) the increasing inequality in European economies through a macroeconomic policy program based on public investment and redistribution.

With regard to financial sector policy, our framework suggests the promotion of macro-prudential regulation (see e.g. Fischer 2014) by improving the international cooperation of national supervisors, ensuring an interdisciplinary approach to financial supervision and increasing the regulation of insufficiently regulated financial institutions (e.g. investment funds).

Overcome polarization in terms of production structures in Europe requires an active industrial policy that aims at fostering a catching-up process in terms of innovative activity and technological capabilities for firms in the European periphery (Mazzucato, 2013; Bahar *et al.*, 2014; Cimoli and Dosi 2017; Noman and Stiglitz 2017). These policies must provide incentives for technological capabilities to diffuse more freely from the European core to the periphery, and they must entail investments into knowledge policies that support technological, organizational and institutional innovations in the periphery. Such policies could, for example, subsidize entrepreneurs, which are the players that help an economy to discover its cost and opportunity space (Hausmann and Rodrik 2003). Since this discovery process leads directly to public knowledge and production techniques that can be imitated by others, entrepreneurial activity in the face of true uncertainty represents a social learning process that should be facilitated by government policies. Finally, macroprudential regulation of the financial sectors and industrial policies should be accompanied by public investment and redistribution policies (Noman and Stiglitz 2017) to counteract the rise in income inequality, which is the ultimate root of polarization mechanisms in Europe.

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## Endnotes

<sup>i</sup> Source: AMECO data on real GDP; authors' calculations.

<sup>ii</sup> Notably, our definitions of core and periphery countries include all Eurozone members, which joined during the first to years of the European Monetary Union with the exception of France.

<sup>iii</sup> Mainstream economists and European policy-makers overwhelmingly interpreted these imbalances as a positive side-effect of an on-going convergence process triggered by the Euro (e.g. Blanchard and Giavazzi, 2002; Giavazzi and Spaventa, 2010)

<sup>iv</sup> This tendency is further supported in case of increasing asset-prices and the existence of corresponding wealth-effects (Stockhammer and Wildauer 2016).

<sup>v</sup> This case seems to apply for the CEE-countries (Popescu 2014, Stögmüller 2016), but is largely outside the scope of this paper as the CEE countries joined the Eurozone rather late (Slovenia and Slovakia) or not at all.

<sup>vi</sup> In addition, the growth of non-financial corporate debt is most probably partly due to processes of financialization, as investment did not increase in the same proportion. Its impact on aggregate demand is, therefore, more dubious.

<sup>vii</sup> Note that the line for the periphery countries in Figure 4 excludes Ireland, as Ireland's model of attracting large multinationals by introducing low corporate taxes comes with a spike in exports that should be contrasted with a corresponding rise in income attained by foreign firms and individuals. However, this latter task cannot be performed with the data at hand.

<sup>viii</sup> More precisely: If we take  $EX_{cy}^{PCI}$  as the total exports of country  $c$  in year  $y$  of products with a particular *product complexity index*

(PCI) we can write  $\delta_{cy} = \frac{EX_{cy}^{PCI>1} + EX_{cy}^{PCI\leq 1}}{\sum_c EX_{cy}^{PCI>1} + \sum_c EX_{cy}^{PCI\leq 1}}$  as the share of exports by country  $c$  from EU-wide exports in year  $y$ . Based on these numbers, we would expect the export share of country  $c$  for products with a PCI above/below 1 to be  $\mathbb{E}(EX_{cy}^{PCI>1}) = \delta_{cy} \cdot EX_{EU,y}^{PCI>1}$  and  $\mathbb{E}(EX_{c,y}^{PCI\leq 1}) = \delta_{yc} \cdot EX_{EU,y}^{PCI\leq 1}$  respectively. The absolute difference between the expectation and absolute exports, i.e.  $\eta_{cy}^{PCI>1} = \mathbb{E}(EX_{cy}^{PCI>1}) - EX_{cy}^{PCI>1}$  and  $\eta_{cy}^{PCI\leq 1} = \mathbb{E}(EX_{cy}^{PCI\leq 1}) - EX_{cy}^{PCI\leq 1}$ , of this class of products tells us to what extent the country 'over-performs' (if  $\eta_{cy}^{PCI>1} > 0$ ) or 'under-performs' (if  $\eta_{cy}^{PCI>1} < 0$ ) in terms of the complexity of the products it exports. To make the numbers more comparable, we use  $\eta_{cy}^{PCI>1} / \mathbb{E}(EX_{cy}^{PCI>1})$ , i.e. we divide by what we would have expected the countries to export. Figure 6 plots the sums of this once we aggregate over time.