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The Path to Convergence: Reallocation, Responsiveness, and Growth

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1. Introduction

Business dynamism – the process by which some firms enter or expand and other exit or contract, is a fundamental process in market economies. It allows for the reallocation of resources –capital and labor, from less productive and less valuable activities towards more productive and valuable ones. Estimates suggest reallocation accounts for anywhere between ½ to 2/3 of productivity growth (Lentz & Mortensen, 2016, Foster et al., 2001). In this paper we bring this analytical framework to an international cross country setting and ask whether a country's overall job reallocation and business responsiveness to changing conditions impacts their ability to catch up to more advanced economies.

Models of endogenous growth suggest technology flows across countries can lead to rapid productivity growth in laggard countries. For developing countries, further from the technology frontier, their ability to catch up will depend on their ability to: 1) attract and adopt leading technologies available in the market, and 2) facilitate the reallocation of resources towards growing firms and industries. As countries or industries get closer to the world technology frontier their ability to innovate also becomes more important (Aghion & Howitt, 1998; Acemoglu et al., 2006). Countries further from the technology frontier should experience high levels of reallocation and growth as resources flow readily to more valuable activities in response to human, capital, and technological investments. This is the nature of the catch-up process.

Frictions, or "wedges", can interfere with this process yielding a loss of productivity and an inefficient allocation of resources (Hsieh & Klenow, 2009; Hsieh et al., 2019; Decker et al., 2020). In developed economies these frictions might take the form of product or labor market regulations, firm market power, credit constraints, or limited access to technology to name a few. In developing nations these frictions might be further compounded by under developed capital markets, ineffective rule of law, poor education, or weak property rights. Whether economies can attract the necessary investments, respond to changing economic conditions, and grow depends in large part on the framework conditions that exist in the country and the ability of policy makers to facilitate productivity enhancing reallocation. This is particularly important for developing economies that lag behind the technology frontier and can potentially benefit the most.

In this paper we explore the catch up process by exploring the connection between reallocation, business dynamism, and growth in a cross country setting. For our purpose we use data from CompNet v9. These data provide a rich set of indicators for 18 European economies at different stages of development. The data are the result of a distributed data collection protocol yielding a set of rich aggregated statistics by country, industry, and size. Underlying the aggregated data are firm level confidential administrative datasets from National Statistical Agencies. The data are representative of the business population and comparable across countries.[2] Our goals is not to offer an exhaustive examination of the framework conditions of each country and their impact on growth but rather to examine whether the predictions suggested by theory hold in the data. We leave examination of particular framework conditions that might lead countries at similar states of development along different growth paths for a later date.

As suggested by theory we find reallocation is higher in less developed countries after controlling for country specific, industry, firm size, and year effects indicating these countries

[2] The CompNet makes an effort to harmonize the datasets used across different countries as much as possible.

have more opportunity for productivity enhancing reallocation. We find reallocation seems to be productivity enhancing and is positively related to per capita GDP growth. Countries with higher reallocation experience higher per capita GDP growth conditional on country specific, industry, firm size, and year effects. Finally, we find that countries that experience reallocation rates in excess of what is predicted by their per capital GDP experience faster growth.

Our results suggest countries with higher levels of reallocation experience faster per capita growth. We do not claim causation with these results. However, we also find some evidence businesses in these countries display higher responsiveness to productivity shocks consistent with gains from allocative efficiency. Responsiveness results are however not as cleanly tied to per capita growth suggesting the modulating effect of other factors. Taken together these results strongly suggest successful growth requires an environment where business dynamism and reallocation is allowed to flourish.

The rest of the paper is organized as follows. Section 2 discusses the conceptual framework. Section 3 introduces the data. Section 4 discusses our empirical strategy. Section 5 provides results. Section 6 concludes.

2. Background

Schumpeterian growth models that incorporate the dynamics of firms are based on the idea that innovation and entrepreneurship are key drivers of economic growth. In these models creative destruction – the reallocation of resources across firms, comes about from new innovations and associated entrepreneurial activities. Innovative firms bring new and cheaper products and services to market in the process replacing firms that fail to innovate. This process of continuous disruption in turn leads to overall economic growth (e.g. Klette & Kortum, 2004; Lentz & Mortensen, 2008; Akcigit & Kerr, 2018; and Acemoglu et al., 2018).

These types of models yield several distinct predictions (see Aghion et al., 2014). First, faster innovation-led growth is associated with higher rates of job creation and destruction (job reallocation). Second, there is link between growth and firm dynamics. Business dynamism is characterized by an up-or-out dynamic; that is, entrants exit at disproportionally high rates, but those that survive grow fast on average. The most successful firms mature and get larger displacing smaller less productive firms which in turn yields a highly skewed firm size distribution. Third, growth requires appropriate institutions and policies to sustain it. Frictions and institutional failures will lead to lower productivity enhancing reallocation and economic growth.

Empirical evidence in support of these predictions is ample. Evidence for the up-or-out dynamics and productivity enhancing reallocation can be found in Davis et al., 1996, Haltiwanger et al., 2013, Akcigit & Kerr, 2018, and Haltiwanger et al., 2016 amongst other. Evidence for differences in reallocation with size can be found in Haltiwanger et al., 2013, Haltiwanger et al., 2014, and Criscuolo et al., 2014. Evidence on the pace of reallocation and innovation led productivity growth can be found in Decker et al., 2020. Evidence for a skewed size distribution is documented in Stanley et al., 1996, Axtell, 2001, Rossi-Hansberg & Wright, 2007, and Gabaix, 2009 amongst other.

Bringing Schumpeterian growth theory to a cross country setting then offers a simple framework to capture the idea that growth-enhancing policies or institutions can set countries

on alternative growth paths. It also yields powerful predictions which we seek to bring to the data.

We summarize these next:

1. Reallocation is inversely related to the level of development of the country as measured by its GDP per capital. This result is tightly related to the second hypothesis.
2. The skewness of the firm size/productivity distribution is directly related with the level of development of the country as measured by its GDP per capita.

These hypothesis can be summarized in figure 1. Economies that are at lower levels of development as captured by their GDP per capita should experience higher reallocation. The simple intuition is that there are plenty of opportunities to move resources towards higher value activities. This is the nature of the "catch-up" process that allows economies that start from a lower level of development and close the gap with economies that are further developed. At the same time as the economy develops we should see a larger share of activity shifting towards larger more productive firms.

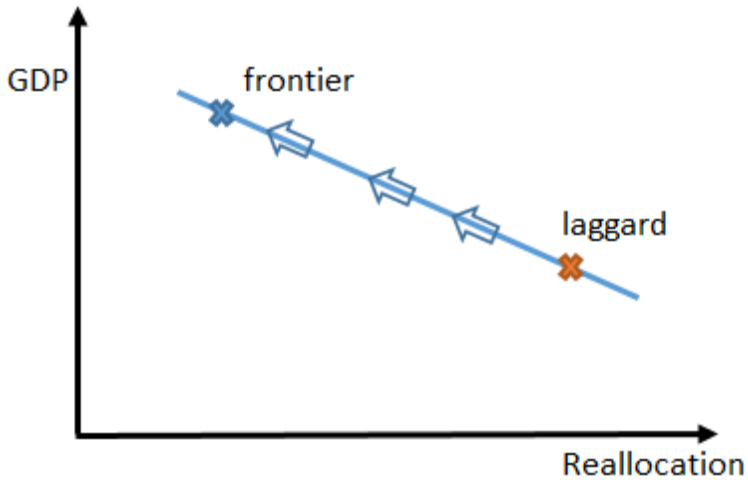

Figure 1 Catch-up Process

As indicated, institutions, and framework conditions can hinder this process and yield further predictions. Consider two economies that start from the same level of development. One of them has better initial framework conditions; $A^C > B^C$.

Then country A should experience above average reallocation given their level of development. As resource are reallocated to higher value activities faster it will experience higher productivity and GDP growth. This will in part be due to country A attracting more FDI, higher ,now-how, and technological transfer (figure 2). As a result economy A experiences fast convergence path relative to economy B while starting at the same level of development.

Prediction:

3. Positive correlation between Reallocation in excess of predicted value given GDP and GDP growth

It is important to note that institutions and framework conditions can deteriorate over time such that countries that were previously on a high convergence path can stall and fall behind. So an indication that a country whose path convergence has stalled or is not competitive is one that exhibits bellow average reallocation relative to their peers.

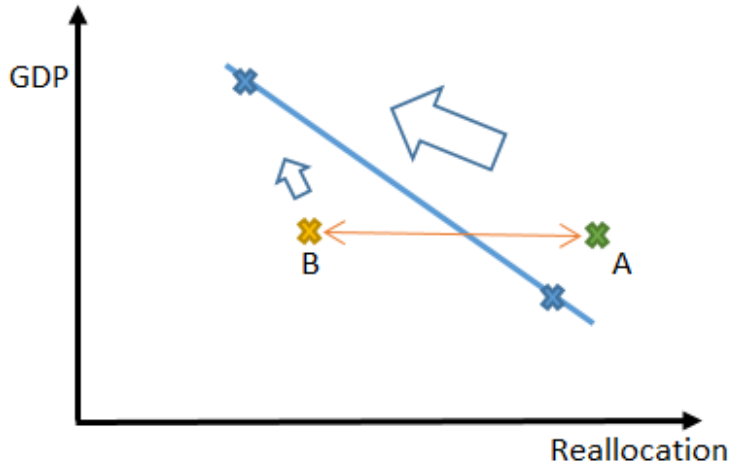

Figure 2 Framework conditions and the catch-up process.

In the next sections we bring these predictions to the data. First we discuss the data and methods.

3. Data

For our empirical analysis we make use of CompNet 9th vintage. The CompNet data are collected by the Halle Institute for Economic Research (IWH) using a distributed code architecture. Data owners (National Statistical Offices or Central Banks) run harmonized data collection protocols on the confidential administrative firm-level data in 21 European countries (the UK was included this year). IWH-CompNet then collects the disclosed aggregate output and distributions by industry, firm size and firm age. The data include rich information on business dynamism, markups, productivity, and firm growth to name a few.

The CompNet dataset covers non-financial corporations with at least one employee covering the macroeconomic sectors consistent with category S.11 in the European System of Accounts, except for sector 19, which, due to its small number of firms, is not covered by the CompNet dataset. The data includes two versions based on size cutoffs: All firms, and firms with 20 or more employees. All results in this paper are based on the sample with 20 or more employees for comparability across countries.[3] Table 1 provides a list of countries covered by CompNet.

The underlying confidential data consists of institutional units which are independent legal entities and market producers, whose main activity is the production of goods and non-financial services (excluding sole proprietors without employees). We refer to these independent legal entities as firms. Most countries in CompNet provide samples from the underlying target population. To address sampling differences within and across countries,

[3] Some countries do not collect data for small business. For example Germany in the manufacturing sector. We are in the process of supplementing with business register information. Additional Information about the data can be found here: 9th_Vintage_User_Guide_final.pdf (comp-net.org)

CompNet applies a granular reweighting procedure to generate its micro-data-based aggregate statistics for the target population as a whole.[4] Samples are on average very large often exceeding 80% of the population of businesses.

Country	All firms	20e	Time Span
Croatia	X	X	2002–2021
Czech Republic	X	X	2005–2020
Denmark	X	X	2001–2020
Finland	X	X	1999–2020
France	X[1]	X	2003–2020
Germany		X[2]	2001–2018[3]
Hungary	X	X	2003–2020
Italy	X	X	2006–2020
Latvia	X	X	2007-2019
Lithuania	X	X	2000–2020
Malta	X	X	2010-2020[4]
Netherlands	X	X	2007–2019
Poland		X	2002–2020
Portugal	X	X	2004–2020[5]
Romania		X	2005–2020
Slovakia		X	2000–2020
Slovenia	X	X	2002–2021
Spain	X	X	2008–2020
Sweden	X	X	2003–2020
Switzerland	X	X	2009–2020
UK	X	X	1997-2019

1 France: all firms sample covers the period 2008-2020.
2 Germany: Only weighted version is available.
3 Germany: Macro-sector coverage: Manufacturing (2001-2018), Wholesale and Retail Trade and Accommodation and Food Service Activities (2005-2018), other macro-sectors (2003-2018).
4 Malta: The macro-sector: Real Estate Activities in the 20e sample covers the period 2017-2020.
5 Portugal: A significant number of indicators could not be calculated for the period 2004-2009

Table 1 *CompNet country, year, and sample coverage*

A. Description of Job Flow Variables

Metrics for job flows available through the CompNet dataset are described in the user manual and are computed following the standard Davis et al., 1998 methodology. These measures are based on firm-level measures of employment growth defined for firm *i* as follows:

$$g_i = (E_i - E_{i-1})/\ ,\ X_i = 0.5 \cdot (E_i + E_{i-1})$$

where X_i is the firm average employment; E_i and E_{i-1} are the employment in current and previous time point for a particular firm, respectively; and g_i is the firm-level growth rate of employment.[5] Job creation, destruction, and reallocation rates for different levels of aggregation *a* at time *t* are defined as follows:[6]

1. Job Creation Rate: $JCR_{at} = \sum_{i \in a} \left(\frac{X_{iat}}{Xat}\right) g_{iat}$ iff $g_i >= 0$

[4] Sample weights are produced by industry and size from official Eurostat statistics. We refer the reader to the documentation for additional details.
[5] This measure has become standard in the literature. It has desirable properties of being bounded, allowing for integral treatment of entry and exit, being symmetric about expansion and contractions, and is a second order Taylor approximation to changes in logs.
[6] In the CompNet dataset, the job creation and destruction rates are estimated at the industry 2-digits, macro-sector, NUTS2, macro-sector-size-class, country, firms' age, and technological intensity dimensions.

2. Job Destruction Rate: : $JDR_{at} = \sum_{i \in a} \left(\frac{X_{iat}}{Xat}\right) |g_{iat}|$ iff g_i if $g_i < 0$
3. Job Reallocation Rate: : $JRR_{at} = \sum_{i \in a} \left(\frac{X_{iat}}{Xat}\right) |g_{iat}| = JCR_{at} + JDR_{at}$

Where the employment share of firm *i* at time *t* in aggregation cell *a* is given by X_{iat}/ X_{at}. Job Reallocation is the sum of job creation and the absolute value of job destruction. It is a measure of the jobs being created or destroyed across the cell/economy.

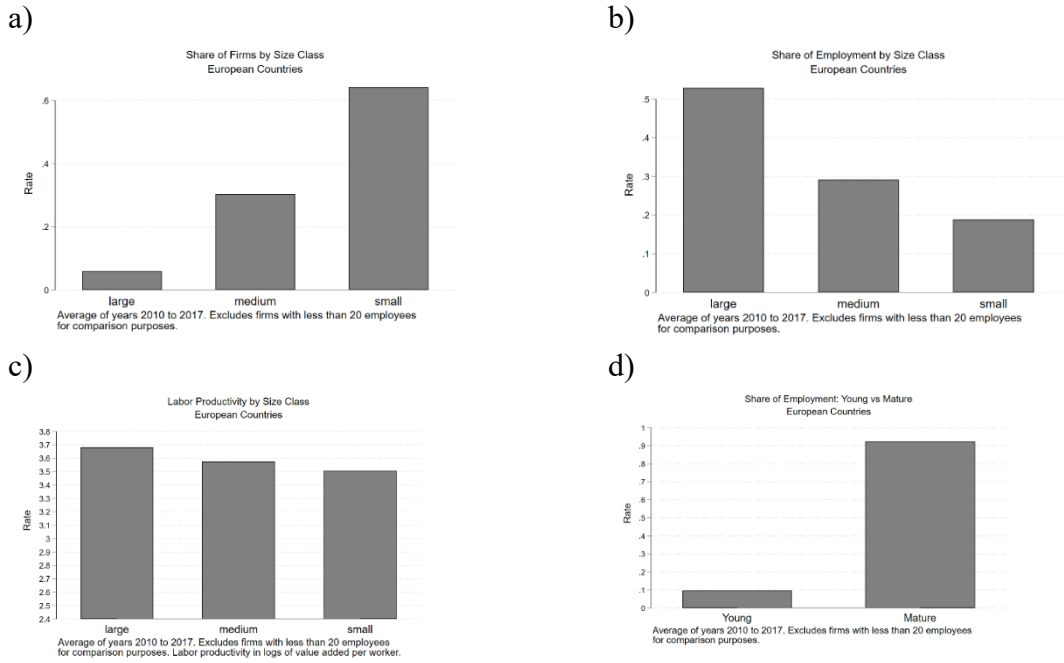

Figure 3 *Panel a) Share of firms by size class. Panel b) Share of employment by size class. Panel c) Labor productivity by size class. Panel d) Share of employment by firm age.*

Notes: *Firm size include: Small (20-49 empl.), Medium (50-249 empl.), and Large (>249 empl.). Firm age class include: Young (less then age 5), and Mature (5+).. Labor productivity is defined as value added per worker. Results are the average of years 2010 through 2017. Small firms less with less than 20 employees are excluded to allow consistency across countries and sectors.*

Source: *own calculations based on CompNet data, firms with at least 20 employees. Countries include BE, HR, CH, CZ, DK, FI, FR, DE, HU, IT, LV, LT, NL, MT, PO, PT, RO, SK, SI, SV, ES, SE.*

Figure 3 shows basic facts that emerge from these data for Europe as a whole. These facts are well known and have been documented in other datasets (e.g. Haltiwanger et al., 2014; Criscuolo et al., 2014). To wit, in Europe, like in the US, the size activity is highly skewed. Most firms are small and mature (figure 1a, 1d) but large firms account for most of the jobs in the economy (figure 1b). These firms are also more productive (figure 1c). Figure 4 shows large firms (which also are disproportionally old) experience less job reallocation (the sum of job creation and destruction) as suggested by models of learning by doing and selection (e.g. Hopenhayn, 1992; Jovanovic & Nyarko, 1996).

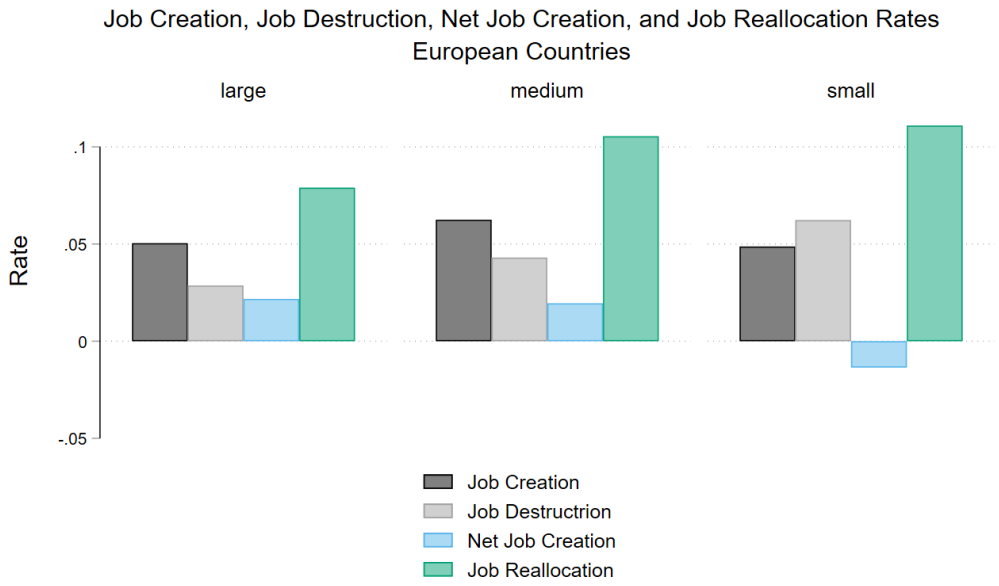

***Figure 4** Job Creation Rate, Job Destruction Rate, Net Job Creation Rate, and Job Reallocation Rate, by size class.*

***Notes:** Firm size include: Small (20-49 empl.), Medium (50-249 empl.), and Large (>249 empl.). Small firms less with less than 20 employees are excluded to allow consistency across countries and sectors. Unit of analysis is the legal unit (firm). Entrants and exiters are excluded from the analysis.*

***Source:** own calculations based on CompNet data, firms with at least 20 employees. Countries include HR, CH, CZ, DK, FI, FR, DE, HU, IT, LV, LT, NL, MT, PO, PT, RO, SK, SI, SV, ES, SE, UK.*

4. Methodology

Our goal is to test some of the predictions of the theory. We start by looking at the correlation between the aggregate job reallocation rate and the level of development of a country as captured by GDP per capita. Our conjecture is that the level of reallocation is inversely related to the level of development of the country as measured by its GDP per capital under the assumption that the catch-up process offers countries that are further from the technology frontier ample opportunity for growth through reallocation.

For our cross country analysis we want to control for systematic differences in industry composition and firm characteristics that are unrelated to growth opportunities derived from the level of development of the country. The literature documents systematic variation in job reallocation rates across industries due to differences in capital requirements, the level of product specialization, firm specific human capital, and pace of technological change, to name a few.[7] We want to abstract from reallocation that is driven by systematic industry differences and instead focus on reallocation that is driven by growth opportunities within industries and that are derived from their level of development as well as the framework conditions that might impact those opportunities. Similarly there are systematic variation in reallocation rates across employer characteristics such as size and age which we also want to abstract from.

[7] See Davis & Haltiwanger, 1999 and Haltiwanger et al., 2014.

Finally we would like to abstract away from job reallocation effects derived from business cycle shocks that might affect countries in different ways.

A. Controlling for industry and size composition across countries:

We estimate the following specification where the job reallocation rate (JRR) is the employment weighted mean from a regression that controls for country specific, industry, size, and year effects as follows:

$$JRR_{cits} = B_{1c}*Country_c + B_{2ci}*Country_c*Sector_i*Size_s + B_{3ct}*Country_c*year_t + e_{cits} \quad (1)$$

Industry controls are at the sector level and include indicators for 1. Manufacturing, 2. Construction, 3. Wholesale and retail trade, 4. Transportation and storage, 5. Accommodation and food service, 6. Information and communication, 7. Real estate, 8. Professional, scientific and technical, and 9. Administrative and support service. We include three firm size classes defined by, 1. Small (20-49 empl.), 2. Medium (50-249 empl.), and 3. large (>249 empl.). We are interested in the vector B1c which gives us the job reallocation rate for each country controlling for industry, year, and size effects. Estimates are the weighted average of the period between 2010 and 2017.

Country	Country Code	(1) JRR	(2) JRR Adjusted	(3) JRR Predicted	(4) JRR Residual	(5) Gdp.Capita	(6) Gdp Growth
croatia	HRV	0,176	0,199	0,198	0,001	12,091	0,107
czechrepublic	CZE	0,165	0,199	0,195	0,005	17,329	0,160
denmark	DNK	0,174	0,193	0,170	0,023	52,771	0,089
finland	FIN	0,174	0,187	0,177	0,010	43,660	0,037
france	FRA	0,150	0,149	0,181	-0,032	36,494	0,058
germany	DEU	0,156	0,168	0,179	-0,011	40,527	0,129
hungary	HUN	0,180	0,198	0,198	0,000	12,206	0,205
italy	ITA	0,165	0,157	0,185	-0,028	30,985	-0,025
latvia	LVA	0,191	0,238	0,197	0,040	12,957	0,354
lithuania	LTU	0,181	0,209	0,197	0,012	13,460	0,410
malta	MLT	0,210	0,206	0,191	0,016	23,123	0,322
netherlands	NLD	0,156	0,159	0,176	-0,017	45,026	0,059
poland	POL	0,182	0,198	0,198	0,000	12,026	0,264
portugal	PRT	0,183	0,161	0,193	-0,032	19,313	0,039
romania	ROU	0,214	0,238	0,200	0,038	8,657	0,320
slovakia	SVK	0,178	0,199	0,196	0,004	15,713	0,176
slovenia	SVN	0,160	0,186	0,192	-0,006	20,861	0,095
spain	ESP	0,158	0,148	0,189	-0,041	25,550	0,060
sweden	SWE	0,165	0,183	0,172	0,011	50,222	0,087
switzerland	CHE	0,161	0,174	0,150	0,025	83,052	0,045
unitedkingdom	GBR	0,166	0,160	0,176	-0,017	44,082	0,097

Table 2 Job Reallocation Rate and GDP per capita for selected European countries.
Notes: *Residual Job Reallocation, (4), is the difference between predicted Job Reallocation, (3), and Adjusted Job Reallocation (2) where predicted job reallocation results from a regression of GDP per capita on Adjusted Job Reallocation. Job reallocation Adjusted (2) is the result of controlling for country, industry, year, and size fixed effects in equation (1).*
Source: *own calculations based on CompNet data, firms with at least 20 employees.*

Table 2, columns (1) and (2) presents job reallocations rates for each country both before and after adjusting for industry, size, and year fixed effects (JRR, and JRR Adjusted). We compute a measure of Residual Job Reallocation, column 4, as the difference between predicted Job Reallocation, column 3, and Adjusted Job Reallocation where predicted job reallocation results from a regression of Adjusted Job Reallocation on GDP per capita. It is a measure of job reallocation in excess of what might be expected from the level of development of the country. The table also shows GDP per capita and GDP per capita growth over the 2010 to 2017 period. GDP per capita is obtained from the World Bank GDP per capita (Constant 2015 US$), World Bank national accounts data, and OECD National Accounts data files.[8] GDP per Capita is the average over the period.

5. Results

Figure 5 summarizes the relationship between the level of development of a country, as captured by their GDP per capita, and their job reallocation rates after controlling for country specific industry, year, and firm size fixed effects as specified in equation (1). The chart shows a strong negative correlation between job reallocation rates and the level of development of the country of -0.50. This is consistent with the idea that countries at lower levels of development experience more opportunities for potentially productivity enhancing reallocation as workers move from less valuable and productive activities towards more productive ones. Countries with higher levels of job reallocation in the 2010 to 2017 period

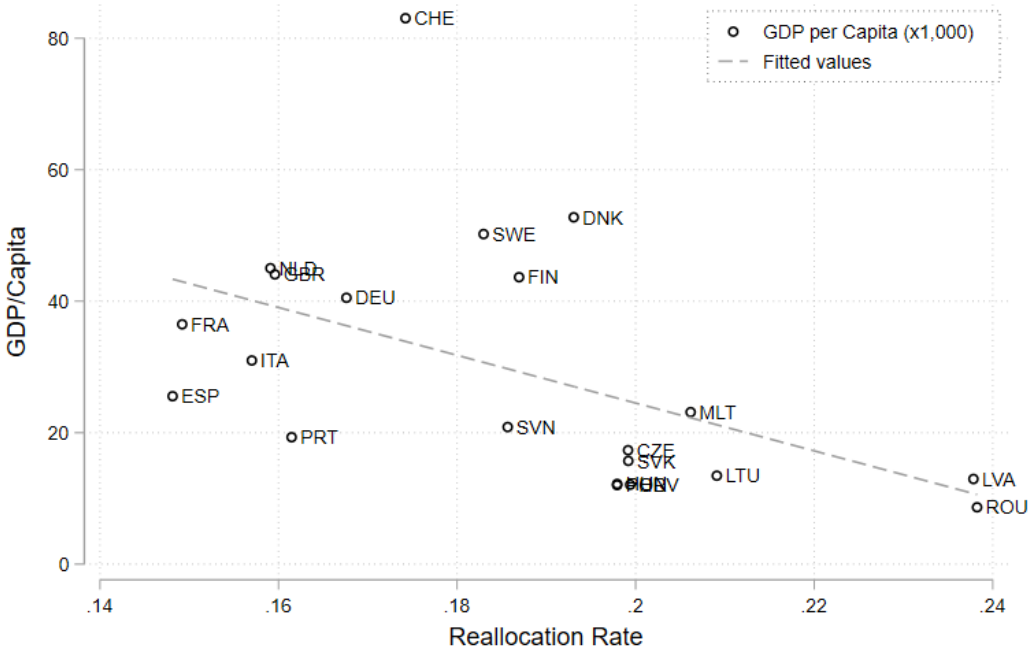

Figure 5 *Job reallocation and GDP per capita.*

Notes: *Small firms less with less than 20 employees are excluded to allow consistency across countries and sectors. Unit of analysis is the legal unit (firm). Entrants and exiters are excluded from the analysis. GDP per capita is from the OECD National accounts data files.*

Source: *own calculations based on CompNet data, firms with at least 20 employees. Countries include HR, CH, CZ, DK, FI, FR, DE, HU, IT, LV, LT, NL, MT, PO, PT, RO, SK, SI, SV, ES, SE, UK.*

[8] License : (CC BY-4.0). Update from 25.07.2023.

include Romania, Latvia, Lithuania, and Malta. These countries are also amongst the ones with smaller GDP per capita. Countries with the highest levels of GDP per capita are located in the middle of the job reallocation distribution including Sweden, Denmark, Finland, and Switzerland. Countries with relatively low levels of job reallocation include Spain, France, and Italy. If anything it would appear that for Western European economies the inverse relation between GDP per capita and the job reallocation rate doesn't quite hold. It is reversed with a correlation of 0.53. Countries in Western Europe with lower GDP per capital exhibit relatively low reallocation rates. Actual reallocation rates are of course affected by country specific framework conditions. Our results suggest these potentially have a large impact in Western Europe.

Models of firm dynamics and empirical evidence suggest job reallocation is tied to productivity growth. We explore the connection between job reallocation and improvements in productivity as captured by GDP per capita growth in Figure 6. We find a strong and positive correlation between job reallocation rates and growth in GDP per capita of .81. As expected the countries that experience the highest growth in GDP per capita are those countries with the highest job reallocation rates. Latvia, Rumania, Lithuania, and Malta, stand out. By contrast, countries with the lowest GDP per capita growth are also the ones experiencing the lowest job reallocation rates. We do not make claims of causation but these results suggest some countries experience very dynamic business environments, with relative large amounts of job creation and job destruction. These countries are able to reap the benefits of improvements in allocative efficiency as reallocation moves resources towards more

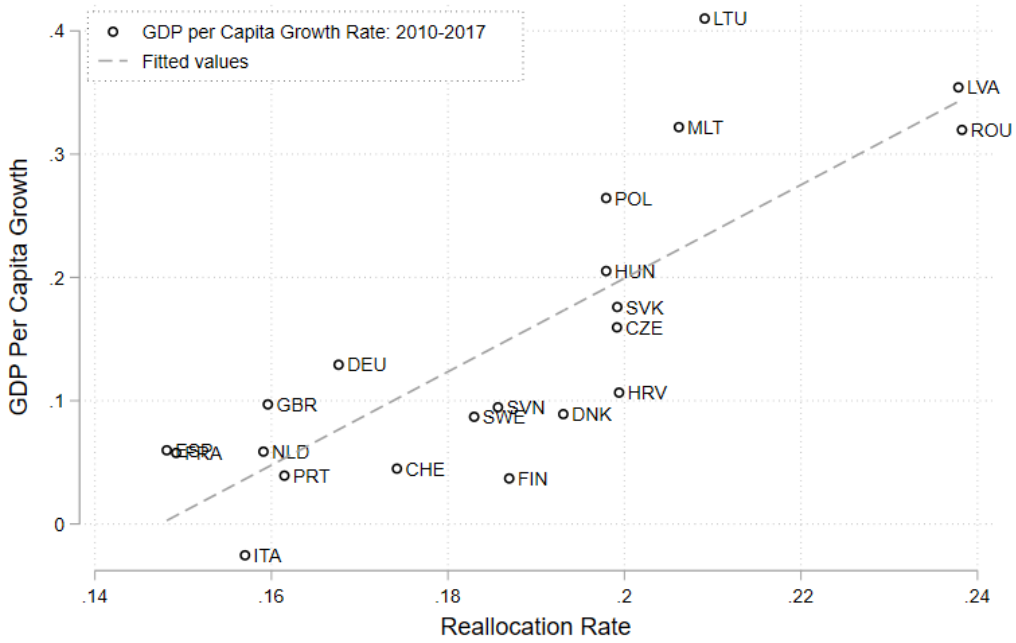

Figure 6 *Job reallocation and GDP growth.*

Notes: *Small firms less with less than 20 employees are excluded to allow consistency across countries and sectors. Unit of analysis is the legal unit (firm). Entrants and exiters are excluded from the analysis. GDP per capita growth is computed as the growth rate between 2010 and 2017.*

Source: *own calculations based on CompNet data, firms with at least 20 employees. Countries include HR, CH, CZ, DK, FI, FR, DE, HU, IT, LV, LT, NL, MT, PO, PT, RO, SK, SI, SV, ES, SE, UK.*

productive activities. Other countries experience relatively low job reallocation rates and low GDP per capita growth. As argued this is likely tied to how close they are from the technology frontier so we find countries with the higher GDP per capital levels amongst them (see Figure 5).

More developed economies broadly share lower job reallocation rates and GDP per capita growth. However, amongst this group Italy, Spain, and France stand out as particularly low reallocation countries. Given their relatively low GDP per capita levels the implication is these countries should do better and currently fail to achieve their full growth potential. Amongst Eastern European economies, countries that appear to do well given their reallocation rate and position in the GDP per capita distribution include Lithuania, Poland, and Malta. These countries appear to be poster childs along the convergence path.

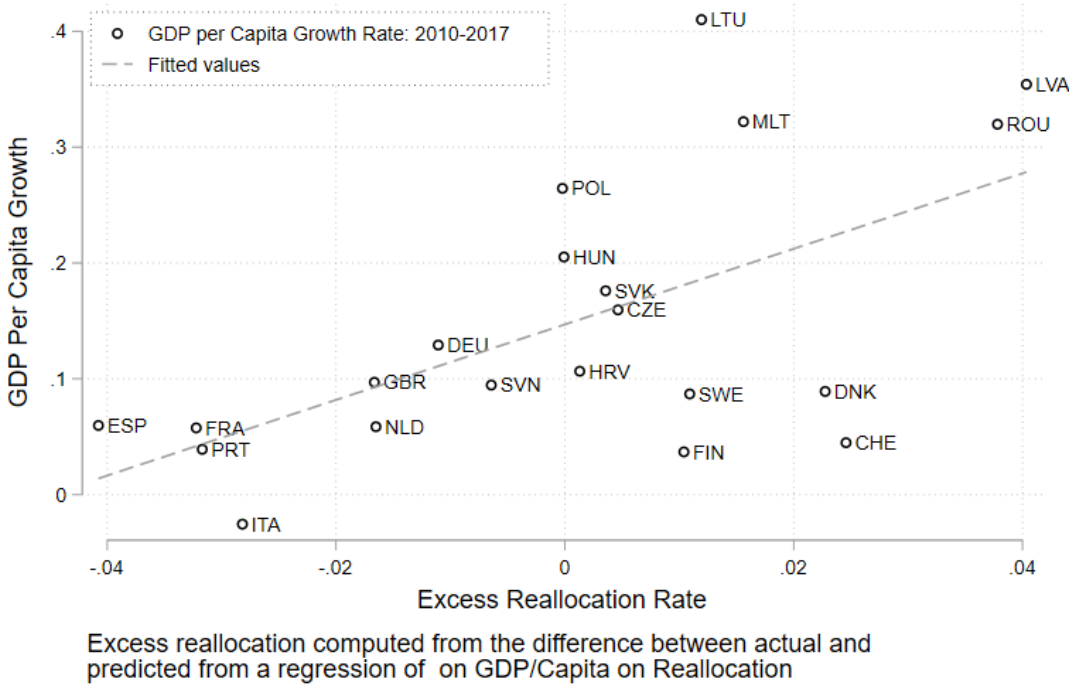

Figure 7 Job reallocation in excess of predicted, and GDP growth.

Notes: *Small firms less with less than 20 employees are excluded to allow consistency across countries and sectors. Unit of analysis is the legal unit (firm). Entrants and exiters are excluded from the analysis. GDP per capita growth is computed as the growth rate between 2010 and 2017. Job reallocation in excess of predicted is computed as the residual of a regression of job reallocation and GPD per capita.*

Source: *own calculations based on CompNet data, firms with at least 20 employees. Countries include HR, CH, CZ, DK, FI, FR, DE, HU, IT, LV, LT, NL, MT, PO, PT, RO, SK, SI, SV, ES, SE, UK.*

Theory suggests framework conditions and institutions are likely to matter for reallocation and growth. Frictions from product or labor market regulation, market power, frictions in knowledge transfer, or financial markets to name a few, can slow down and limit productivity enhancing reallocation (e.g. Aghion et al., 2009; Bassanini et al., 2010; Haltiwanger et al., 2014; De Loecker et al., 2021; Biondi et al., 2023). The implication is that a country with institutions that impede productivity enhancing reallocation should experience below average reallocation given their level of development. In turn this should have an impact on their

ability to catch-up to the frontier as captured by their GDP per capita growth. We explore this prediction next. We first compute a measure of the residual or excess reallocation for each country as the difference between their adjusted job reallocation rate (controlling for country specific industry, size, and year effects) and their reallocation as predicted from a regression of job reallocation on GDP per capital. Countries with above/below average reallocation relative to their GDP per capita predicted level will have positive/negative residual reallocation.

We explore the simple correlation between residual reallocation and growth in GDP per capita in Figure 7. We find a strong and positive correlation, 0.6, between the reallocation rate in excess of GDP predicted levels, and growth in GDP per capita. Countries with the highest levels of excess job reallocation during the 2010 to 2017 period include Romania, Latvia, Lithuania, and Malta. These countries also experience the highest growth in GDP per capita. By contrast, countries that experience low job reallocation relative to what might be expected from their level of development tend to exhibit low growth in GDP per capita. Notable examples include Spain, Italy, France, and Portugal. Some countries are exceptions to this rule. Specifically, Germany, and Great Britain, also exhibit relatively low reallocation rates but manage to generate positive growth during this period.[9] Finland, and Switzerland exhibit relatively high reallocation but experience little growth during this time. These countries have the highest GDP per capita in Western Europe and might already be closer to their technology frontier.

A. Understanding business Responsiveness and productivity:

The question arises as to whether countries with relatively low reallocation simply have fewer opportunities for productivity enhancing reallocation or alternatively whether their businesses display more muted responses to productivity shocks due to framework conditions. To address this question we follow closely the work of Decker et al., 2020. These authors estimate firm level policy functions describing the employment response to the productivity realizations of firms. We bring this framework to the CompNet data and estimate a similar set of regressions directly on the micro level data using our distributed infrastructure.

This class of policy specifications is derived from canonical models of firm dynamics with adjustment costs (H. Hopenhayn & Rogerson, 1993). A firm's labor demand is derived from first order conditions and captures the employment growth response to TPF shocks conditional on state conditions (initial firm size). We estimate the following empirical specification:

$$g_{i,+1} = \beta_0 + \beta_1 tfpr_{it} + \beta_2 l_{it} + \beta_3 \mathrm{X} + \varepsilon_{it}$$

Where $g_{i,+1}$ is the employment growth of firm i between t and $t+1$, $tfpr_{it}$ is the productivity shock of firm i at time t and l_{it} is initial firm size. X includes industry times year fixed effects to abstract from common industry year specific shocks and focus on idiosyncratic shocks. We estimate separate regressions for each country. Regressions are employment weighted to capture economic aggregates.

[9] Note however that their excess reallocation rates are significantly higher than those of Spain, France, Italy, or Portugal.

From the policy function it is easy to see that aggregate reallocation will be a function of the responsiveness coefficient, β_1, as well as the dispersion of the productivity shocks, $tfpr_{it}$. The higher the dispersion of shocks the higher the opportunities for productivity enhancing reallocation. The higher the responsiveness, the higher the reallocation of employment to more productive activities. Put differently, firms that experience positive productivity realizations will expand, while those that experience negative realizations will decline. This reallocation is what leads to allocative efficiency gains in a standard Olley & Pakes, (1996) productivity decomposition.

To proceed we need a measure of the productivity shock. We compute TFPR as the residual from a standard Cobb-Douglas production function in logs as in Baily et al., 1992 and Decker et al., 2020 as follows:

$$lnTFPR_{it} = lnQ_{it}^{R} - \alpha_K lnK_{it} - \alpha_L lnL_{it} - \alpha_M lnM_{it} - \alpha_E lnE_{it}$$

where Q_{it}^{R} is gross-output (i.e. real revenues) of firm *i* at time *t*, with input variables capital (i.e. fixed assets), labor (i.e. number of employees), materials, and energy (i.e. intermediate inputs). Nominal values are deflated using deflators available in EU-Klems that are specific for each variable (output, capital, intermediates), country, sector (2-digit), and year of observation. We derive the output elasticity of each input as the country-2-digit-sector-year median cost-share defined as input expenditure over total costs. Note cost shares equal factor elasticities under the assumptions of cost minimization and full adjustment of factors. These are strong assumptions which need not hold for all firms at all time but we assume are true on average over time. Since we do not observe (firm specific) prices of output TFPR reflects both technical efficiency as well as demand/product appeal shocks. In this regard our TFPR it should be interpreted as a composite shock.[10] We estimate TFPR from data covering the period between 2012 and 2017 given limitations of the data. TFPR is deviated from industry-year averages to focus on idiosyncratic shocks.

Before examining the results from estimating the policy functions it is helpful to examine the properties of the productivity distributions across the European countries in our data. Figure 8 shows the standard deviation of TFPR shock realizations for countries in Western vs Eastern Europe, panel A, and the correlation between dispersion and GDP per capita growth, panel B. Several things are worth pointing out. First, the dispersion of productivity shocks is higher in Eastern European countries consistent with the idea that these countries are further from the productivity frontier and there are potentially significant productivity gains from the efficient reallocation of resources towards more productive and innovative firms. However, these differences are very small. Idiosyncratic shocks other than distance to the technology frontier seem to dominate the dispersion in these series.[11] Second, we do not find a strong correlation between the dispersion in TFP shocks and the level of GDP per capita suggesting that once you account for differences in production inputs across countries firms in the East and the West experience similar productivity realizations (results not shown). However, we do find some correlation between the dispersion in shocks and GDP per capita growth (panel B). Importantly for our purposes, results indicate the dispersion in productivity shock realizations does have some bearing on the reallocation rates of countries.

[10] This is what we want since firms actually respond to both demand and efficiency shocks.

[11] Second, there is quite a bit of variation in the dispersion across countries with both East and West European countries moving in a band that ranges between 0.1 to 0.2 log points.

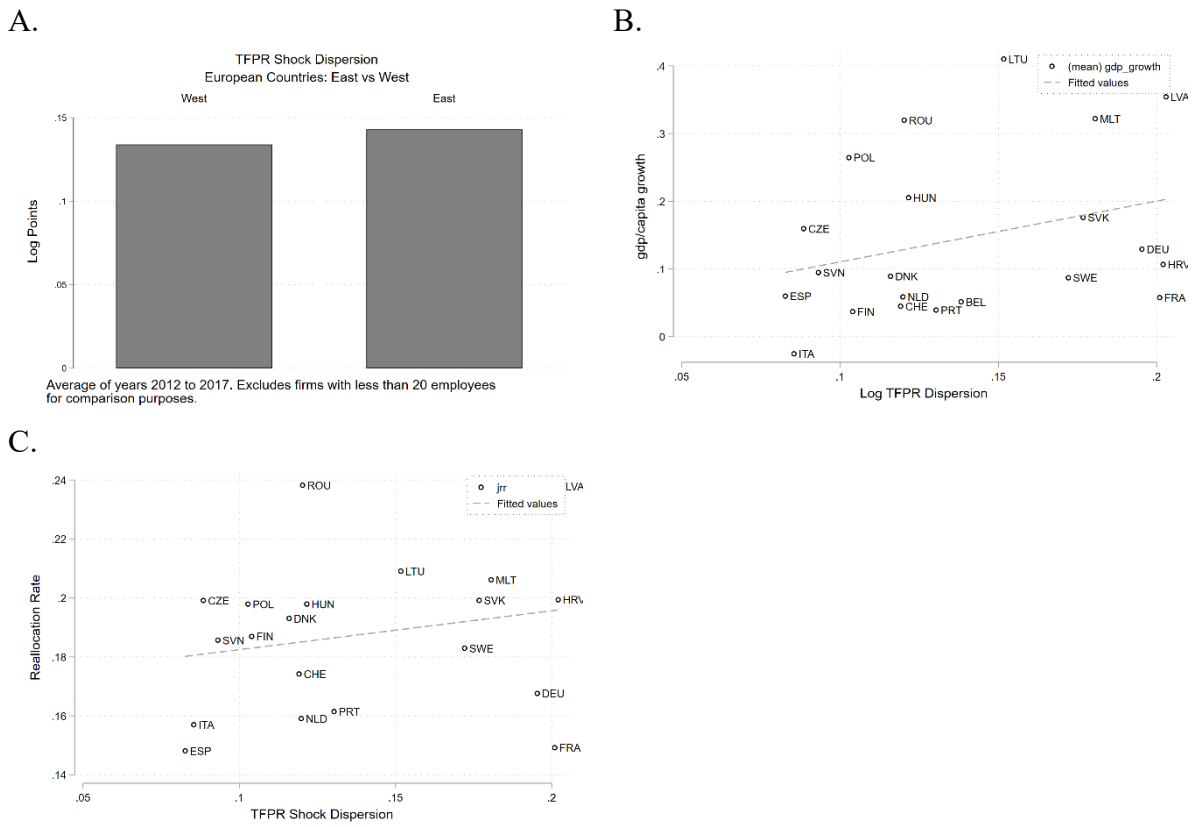

Figure 8 TFPR Dispersion and Relationship with GDP/Capita

Notes: *Small firms less with less than 20 employees are excluded to allow consistency across countries and sectors. Unit of analysis is the legal unit (firm). Entrants and exiters are excluded from the analysis. Charts show standard deviation of TFPR in logs for the period 2012 to 2017. Measures of TFPR are deviated from industry-year means to allow for meaningful comparison. Results for the UK are not included.*

Source: *own calculations based on CompNet data, firms with at least 20 employees. Countries include HR, CH, CZ, DK, FI, FR, DE, HU, IT, LV, LT, NL, MT, PO, PT, RO, SK, SI, SV, ES, SE.*

Figure 9 shows the marginal response for firms one standard deviation from industry-year means across the European countries in our sample.[12] Panel A displays West European countries. Panel B displays East European countries. Countries with unusually low responsiveness to productivity shocks include Italy, Netherlands, and Sweden –all relatively low growth economies. Romania, Chech Republic, and Slovakia display high responsiveness to productivity shocks. In general businesses in all East European countries with the exception of Latvia experience high responsiveness to their changing environment. The causes behind the differences in responsiveness across economies can differ and is the subject of ongoing research. Leading explanations include framework conditions such as frictions in product, labor markets, and financial markets, firm market power, as well as technological development including the introduction of automation or outsourcing technologies. What remains clear is that economies that create the conditions that allow their businesses to take full advantage of available opportunities for productivity enhancing reallocation can expect to experience higher growth.

[12] Responsiveness regressions do not include the UK. These data was not available at the time of producing this report.

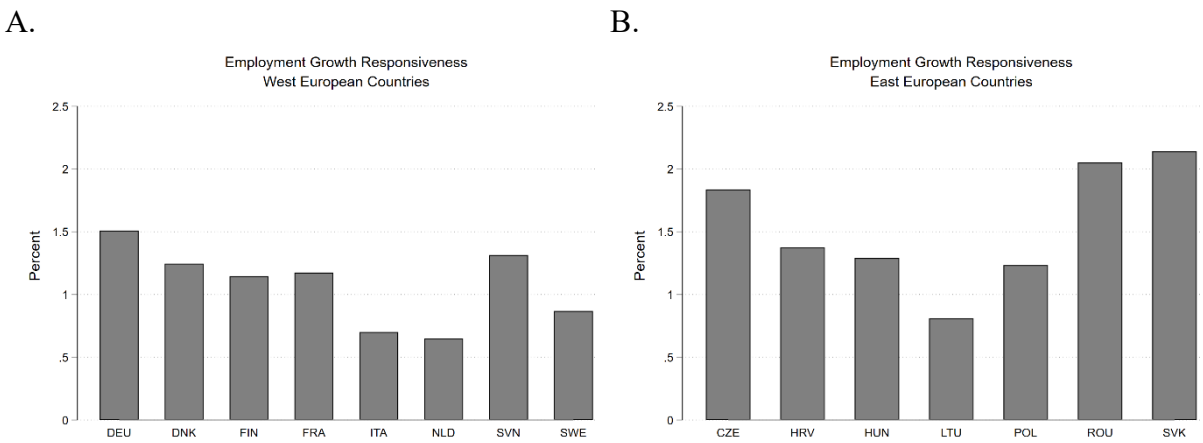

Figure 9 Growth Responsiveness: Marginal Effects.

Notes: *Small firms less with less than 20 employees are excluded to allow consistency across countries and sectors. Unit of analysis is the legal unit (firm). Entrants and exiters are excluded from the analysis. Responsiveness regressions cover the period between 2012 and 2017. Marginal effects are estimated from the interaction of the responsiveness coefficients from the regressions in equation 2 (not shown) and the 1 standard deviation in productivity (not shown). Results for the UK are not included.*

Source: *own calculations based on CompNet data, firms with at least 20 employees. Countries include HR, CH, CZ, DK, FI, FR, DE, HU, IT, LV, LT, NL, MT, PO, PT, RO, SK, SI, SV, ES, SE.*

6. Concluding Remarks

This paper seeks to empirically examine several predictions derived from Schumpeterian growth models that propose a connection between job reallocation and economic growth. Taking these to a cross-country setting, we investigate the patterns of GDP growth per capita drawing correlations with job reallocation and explore implications for path convergence. Specifically, we test two hypotheses.

Firstly, reallocation is inversely related to the level of development of the country as measured by its GDP per capita. The intuition is that economies that are distant from the technological frontier have greater potential to enhance their performance by reallocating resources toward higher value activities. In contrast, in more advanced economies it is harder to achieve significant growth through reallocation.

Secondly, there is a positive correlation between reallocation in excess of what is predicted by the economies' level of development and their GDP growth. The intuition behind this hypothesis lies in the belief that supporting institutions and framework conditions can expedite the process of reallocation and consequently foster accelerated economic growth.

To empirically test these predictions, we leverage the comprehensive CompNet V9 dataset, which offers measures of business dynamism for numerous European countries, in conjunction with data on GDP per capita. The utilization of CompNet data proves particularly valuable in this context, as it stems from member institutions that execute harmonized code on confidential microdata, ensuring data consistency and reliability.

Consistent with theoretical expectations, our findings reveal that reallocation is more pronounced in less developed economies consistent with the notion that these countries have greater potential for productivity enhancing reallocation. Furthermore, our analysis indicates a positive relationship between reallocation and per capita GDP growth, suggesting that reallocation tends to boost productivity and foster economic growth. Specifically, countries experiencing higher levels of reallocation tend to enjoy correspondingly higher rates of per capita GDP growth.

Additionally, our investigation highlights that countries surpassing the predicted reallocation rates based on their per capita GDP experience even faster economic growth. These results underscore the significance of reallocation as a driving force for economic advancement, especially in economies that exhibit rates of reallocation exceeding what one would expect given their level of development.

The observed correlation between reallocation and growth is strong after controlling for industry, size, and year effects across countries. While we remain cautious not to claim causality, our study delves deeper into this relationship by conducting additional analyses to explore how businesses respond to productivity shocks. Our findings indicate businesses in Eastern European countries in general display higher responsiveness than those in the West. These economies in general experience higher GPD per capita growth as well. The reasons behind differences in responsiveness across countries is the subject of study and are fruitful ground for future research.

These results raise important implications for the path to convergence. Our research suggests that without institutions and framework conditions that actively promote reallocation and business dynamism, the path toward convergence may encounter significant sluggishness and potential stalls. To proactively bolster the prospects of progress, policymakers must consider implementing strategies that actively encourage and facilitate the dynamic reallocation of resources within their economies.

By recognizing the link between reallocation and economic growth and by understanding the significance of responsive business practices, policymakers can better formulate targeted policies to optimize resource allocation and promote a dynamic business environment. In doing so, they can create an environment conducive to sustained economic growth, propelling their countries toward convergence and prosperity in the global marketplace.

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