The Path to Convergence:
Reallocation, Responsiveness, and Growth

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Motivation

- Business Dynamism is key in modern market economies
  - Allows for the reallocation of resources to more productive activities
  - Significant part of productivity growth

- Schumpeterian endogenous growth models and the path to convergence
  - Entrepreneurship and innovation are key to economic growth
  - Reallocation is the result of businesses responding to their environment
  - Technological diffusion is important for developing economies (convergence) but…
  - Ability to attract and adopt existing technologies (investment vs innovation)
  - Appropriate institutions: Conditions that allow for the reallocation of resources

- Some countries do better than others. Not a lot of cross country harmonized data.

- We use microdata from 19 European economies at different stages of development to explore
  - Reallocation and productivity patterns
  - Firm's responsiveness to shocks
  - Their path to convergence

Questions

- Can we use microdata in a cross country setting to explore the connection between reallocation, business dynamism, and growth:
    - Yes
    - Can we expand the database…
- Is the path to convergence affected by business dynamism and the responsiveness to shocks?
    - Appears so
    - What framework conditions are important?
- Is knowledge diffusion and the ability to take advantage of opportunities important
    - Yes
    - Large variation across countries
    - What framework conditions are important?

Theoretical Background

- Schumpeterian growth models Klette & Kortum, 2004; Lentz & Mortensen, 2008; Acemoglu et al., 2008 ; Akcigit & Kerr, 2018; Acemoglu et al., 2018
  - Innovation and entrepreneurship key to economic growth
  - Creative destruction associated with innovation (reallocation) => Economic Growth
  - In developing economies => ability to adopt existing technologies (knowledge diffusion)

- Predictions Aghion et al., 2014
  - Faster innovation-led growth is associated with higher rates of job creation and destruction (job reallocation)
  - Countries further from the frontier can potentially leapfrog ahead by adopting existing technology ("advantage of backwardness")
    - But less competition in countries further from the frontier might be beneficial (protect monopolist rents)
  - Frictions and institutional failures will lead to lower productivity enhancing reallocation and economic growth
    - Less innovation/adoption
    - Even when there is: Less ability for businesses to take advantage of those innovations
    - (Growth requires appropriate institutions and policies to sustain it)

Empirical evidence: (Re)allocation and Growth

- Cross country studies
  - Hsieh and Klenow (2009, 2012)
  - Haltiwanger, Scarpetta and Schweiger (2010)
  - Arnold, Nicoletti and Scarpetta(2011)
  - Bartelsman, Haltiwanger and Scarpetta (2013)
- Country studies
  - Acemoglu, Akcigit, Alp, Bloom and Kerr (2018)
  - Decker, Haltiwanger, Jarmin, and Miranda (2020)
  - Akcigit and Ates (2021)
  - …. (many country studies outside US)

Growth Theory in Cross Country Setting

- **H1:** Reallocation is inversely related to the level of development of the country as measured by its GDP per capita
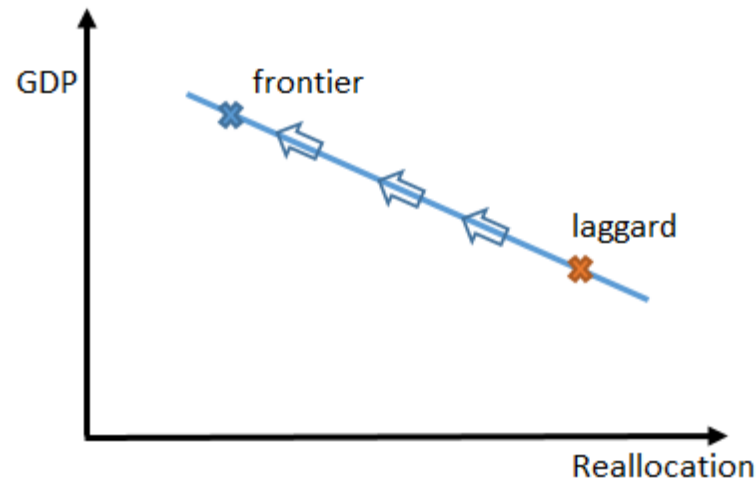 - **H1.b.** Higher reallocation countries experience higher GPD/capita growth

- **H2:** Positive correlation between Reallocation (in excess of predicted value) and GDP growth

Figure 1 Catch-up Process
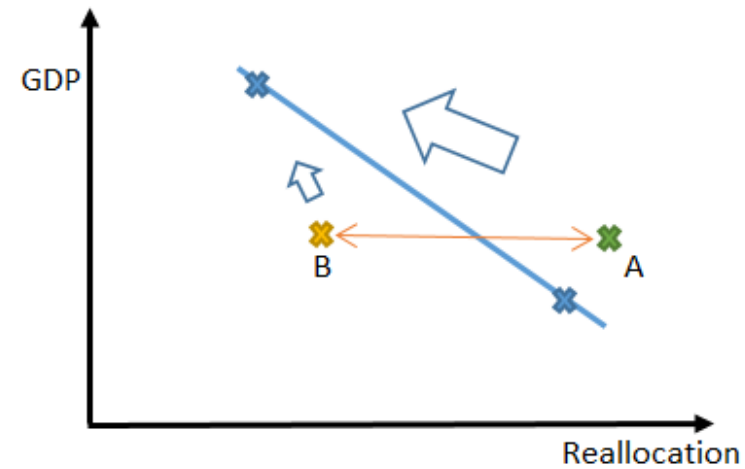
Figure 2 Framework conditions and the catch-up process

Preview of Findings (conditional on compositional differences)

- **H1:** Reallocation is higher in less developed economies => more opportunity for productivity enhancing reallocation
  - **H1.b:** Find positive correlation between reallocation rates and per capita GDP growth: Consistent with productivity enhancing reallocation
- **H2:** Countries that experience reallocation rates in excess of what is predicted by their per capita GDP experience faster growth (on average)
- Analysis of microdata
  - Evidence of differences in knowledge diffusion across economies
  - Strong reallocation dynamics in response to idiosyncratic productivity shocks
    - Reallocation is productivity enhancing
  - Significant variation in reallocation and responsiveness across countries
    - Country specific factors are important
  - What are the factors driving reallocation? Suggest some avenues for further research…

Data

European CompNet data

CompNet data (9th vintage)

- Self-collect the CompNet data set.
- Run harmonized data collection protocols on <u>administrative</u> firm-level data in 21 European countries (distributed micro-data analysis)
- Receive **industry-level** output.
- Rich information on business dynamism, markups, productivity, firm growth
- See Bighelli et al. (2022) for a description of 7th vintage data.

- NOTE: Efforts to expand to Asian countries (China, India, Malaysia, Vietnam, Indonesia)

https://www.comp-net.org/

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

Panel B: Macro – Sector Coverage (balanced sample excluding France)

Macro-sector	Employment unweighted (1)	Employment weighted (2)	Number of firms unweighted (3)	Number of firms weighted (4)
Manufacturing	0.53	1.03	0.56	1.00
Construction	0.57	1.03	0.51	1.00
Wholesale and retail trade	0.78	1.01	0.73	1.00
Transportation and storage	0.49	1.05	0.42	1.00
Accommodation and food service activities	0.76	1.05	0.70	1.04
ICT	0.55	1.01	0.50	1.01
Professional Activities	0.42	1.01	0.40	1.01
Administrative and service	0.49	1.06	0.38	1.00

Notes: Panel A displays country-level statistics using the first and last year of observation for each country. Panel B shows statistics for each sector using the balanced set of countries and sectors from 2009 to 2018 (excluding France, the Wholesale and retail trade and Accommodation and Food Service activities sector for Germany). * Germany does not contain sample number information for confidentiality reasons and hence it is excluded from all the unweighted computations.
Source: own calculations based on CompNet data. Firms with at least 20 employees.

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Facts on Business Dynamism in Europe

Indicators
Job reallocation
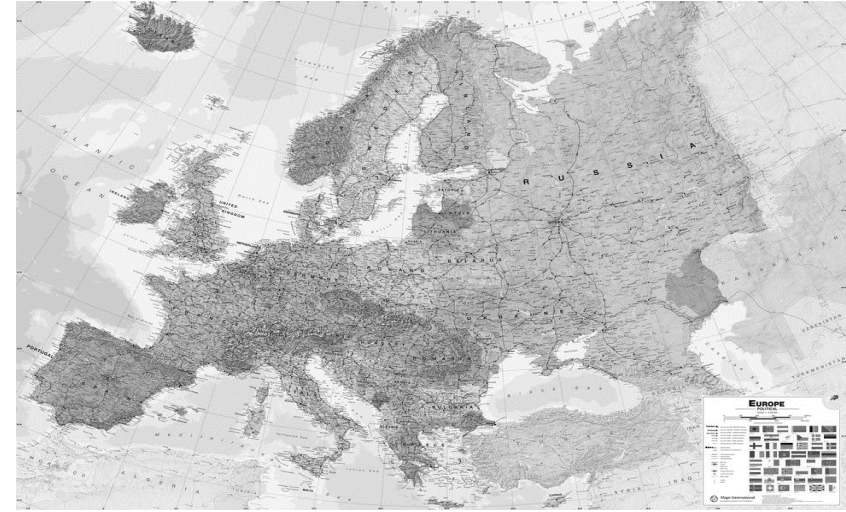
Firm growth: $\quad g_i = (E_i - E_{i-1})/X_i \ , \ X_i = 0.5 \cdot (E_i + E_{i-1})$

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1. Job Reallocation Rate: $\text{JRR}_{at} = \sum_{i \in a} \left(\frac{X_{iat}}{Xat}\right) |g_{iat}| = \text{JCR}_{at} + \text{JDR}_{at}$

---

    a) Job Creation Rate: $\qquad \text{JCR}_{at} = \sum_{i \in a} \left(\frac{X_{iat}}{Xat}\right) g_{iat} \ \text{ iff } g_i >= 0$

    b) Job Destruction Rate: $\qquad \text{JDR}_{at} = \sum_{i \in a} \left(\frac{X_{iat}}{Xat}\right) |g_{iat}| \ \text{ iff } g_i \text{ if } g_i < 0$

No entry and exit in our job reallocation rate -> data constraint

Young firms: Firms with age ≤ 5

Job reallocation for all countries

Young firm activity not observed: Finland, Poland, Sweden, Switzerland, Portugal

Fact 1. Basic Facts: Firm Size and Age
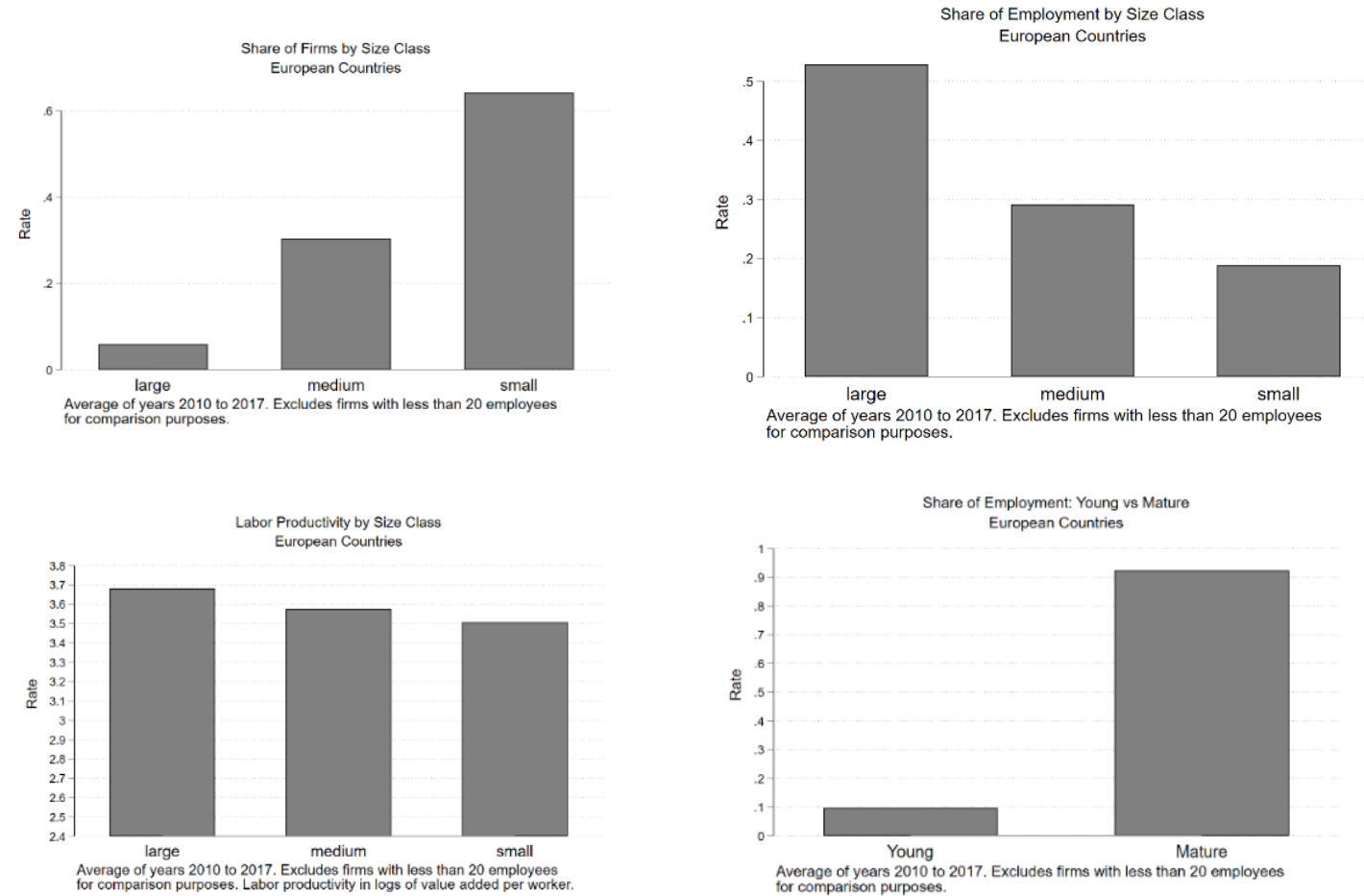
Figure 3 *Panel a) Share of firms by size class. Panel b) Share of employment by size class. Panel c) Labor productivity by size class. Panel d) Share of employment by firm age.*

Fact 2. Job Reallocation by Size
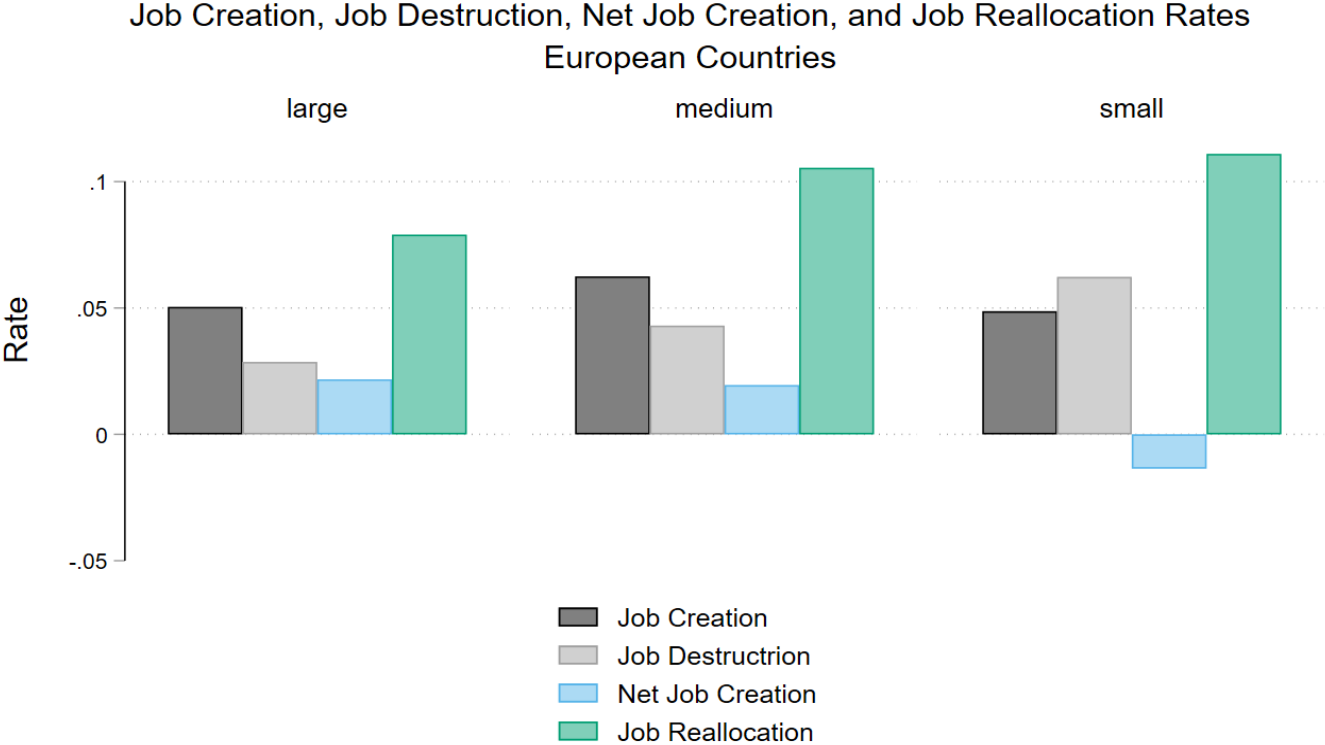
Job Creation, Job Destruction, Net Job Creation, and Job Reallocation Rates
European Countries

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

Empirical Framework: Part I
Job Reallocation and Growth

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Job Reallocation and Growth

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

- Control for composition effects: Country*sector*size
  - inherently some sectors and firm types are more volatile
- Control for economy-wide shocks: Country*year
  - Nine Sector controls:
    - 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.
  - Three firm size classes:
    - 1. Small (20-49 empl.), 2. Medium (50-249 empl.), and 3. large (>249 empl.).
  - Estimates are the weighted average of the period between 2010 and 2017
    - Cross sectional regressions
- Interested in $B_{1c} = Adj\text{-}JRR_c$

Job Reallocation Rates

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.

Job Reallocation Rate and Adjusted Job Reallocation Rate
By Country
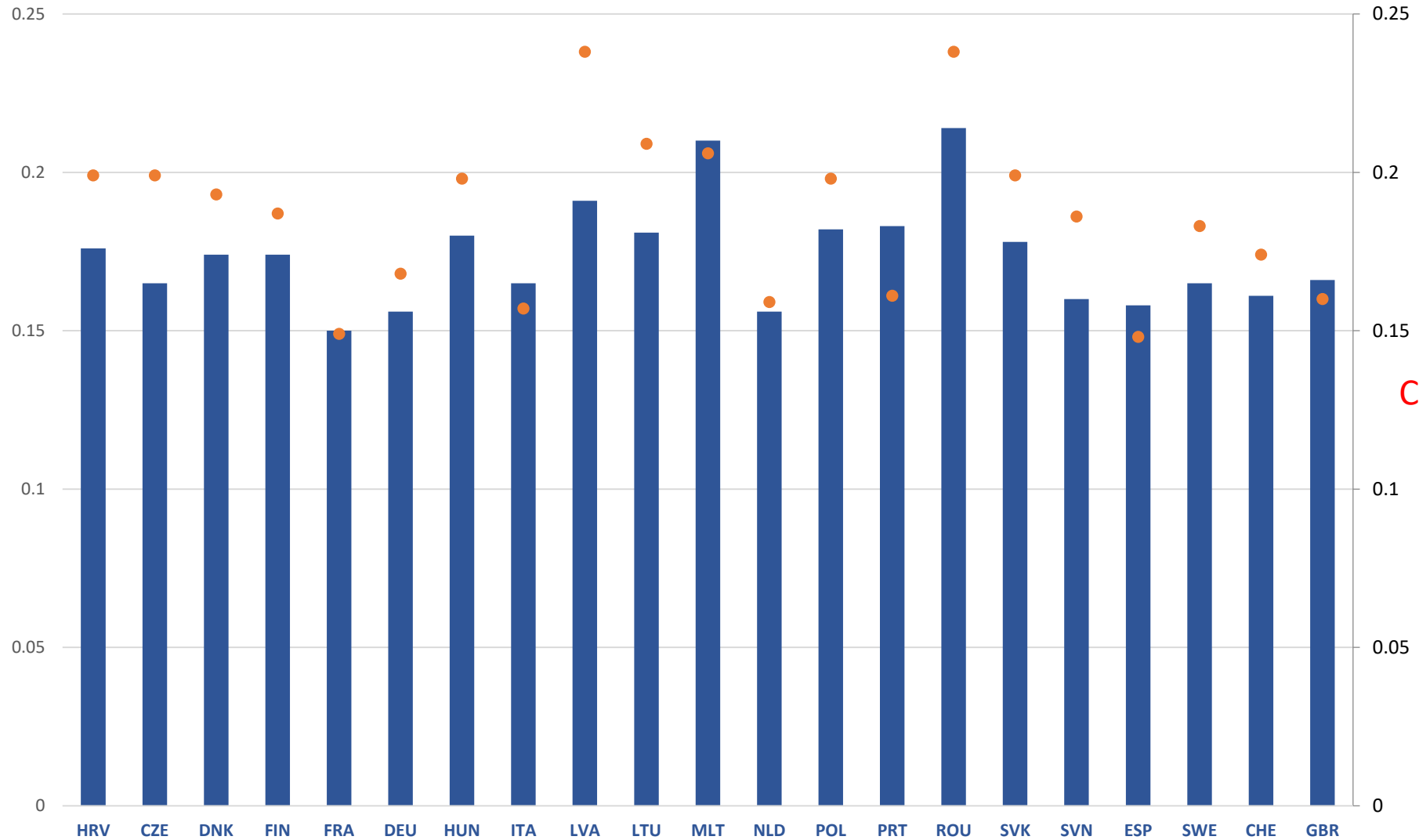
Correlation = 0.78

Growth Theory in Cross Country Setting

- **H1:** Reallocation is inversely related to the level of development of the country as measured by its GDP per capita
  - **H1.b.** Higher reallocation countries experience higher GPD/capita growth
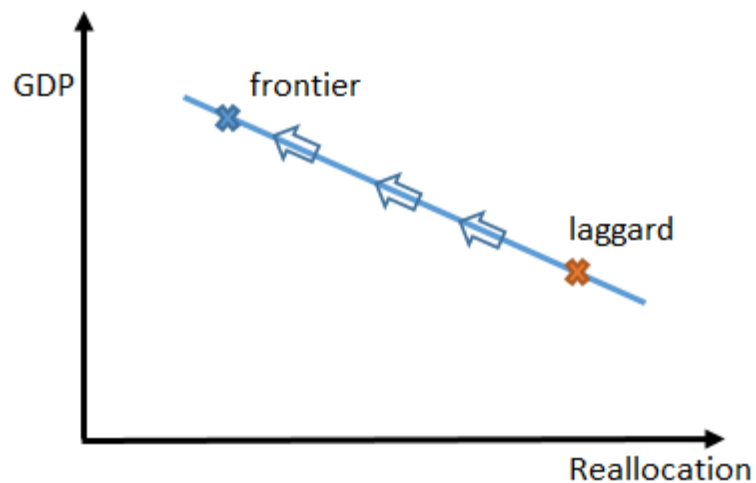
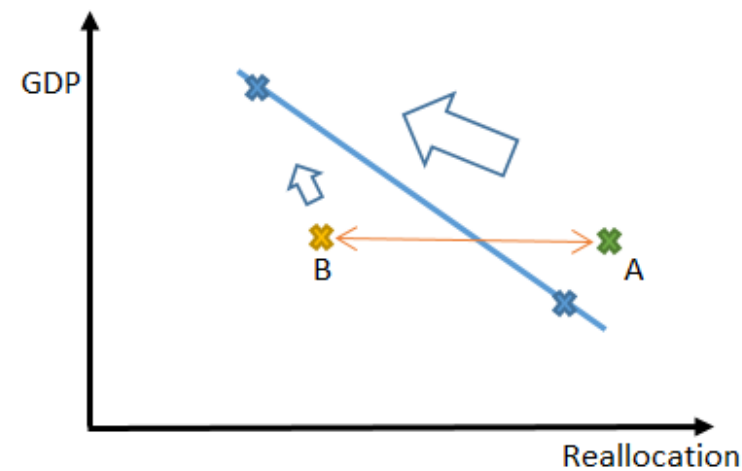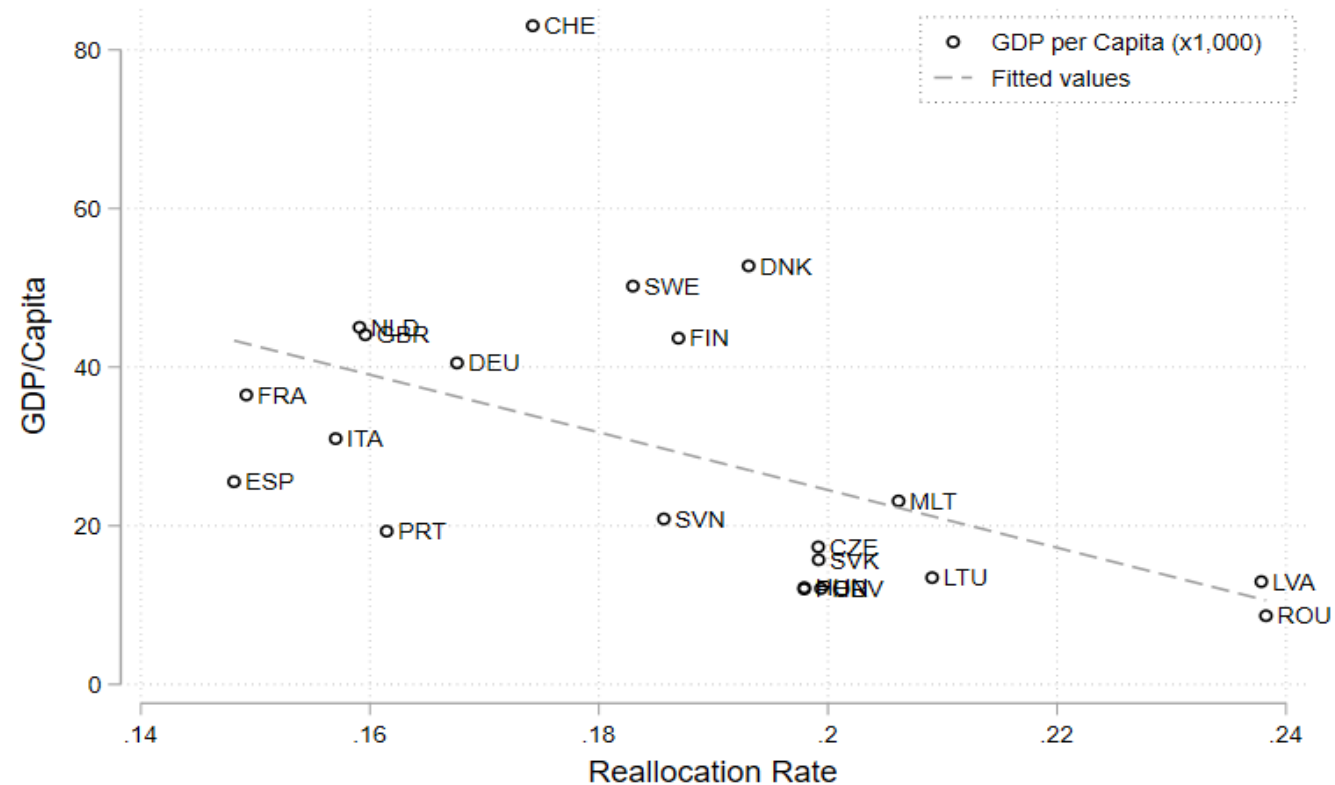- **H2:** Positive correlation between Reallocation (in excess of predicted value) and GDP growth
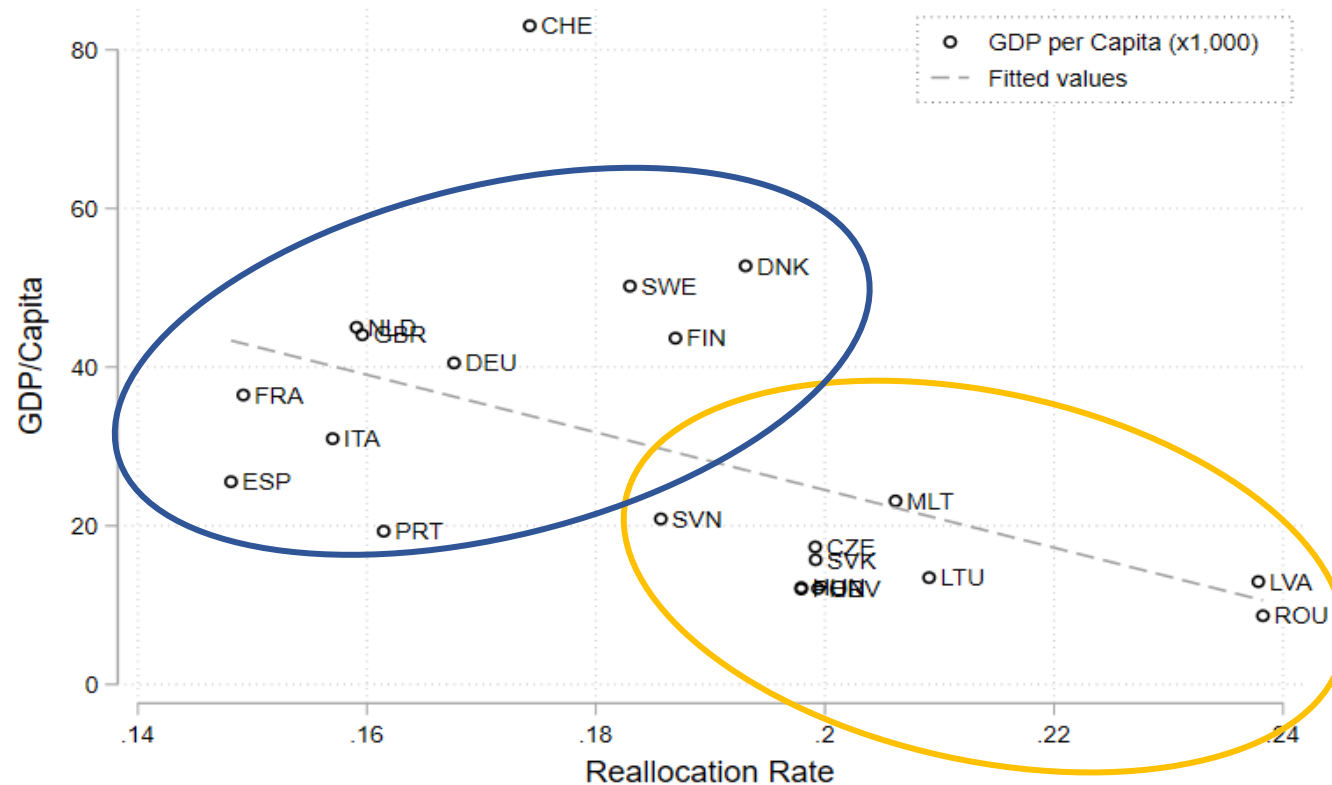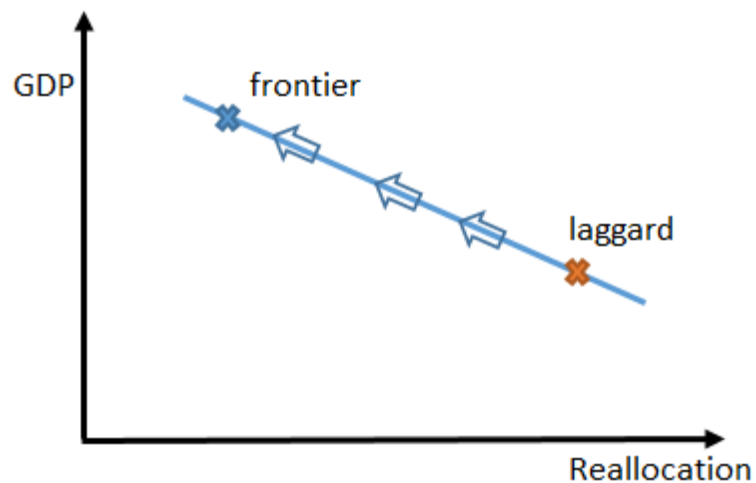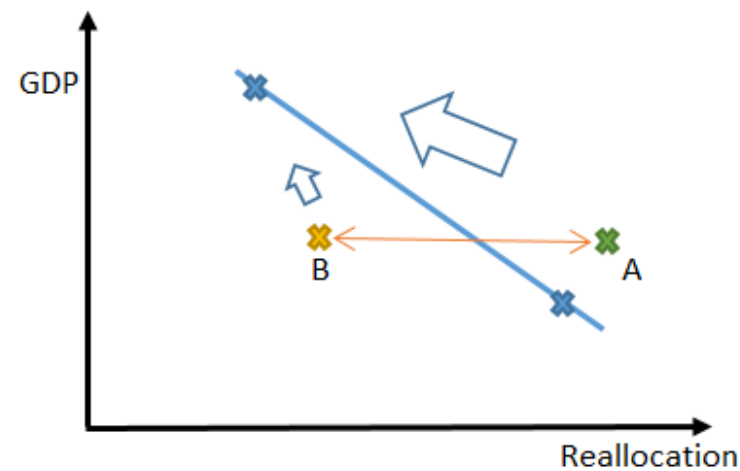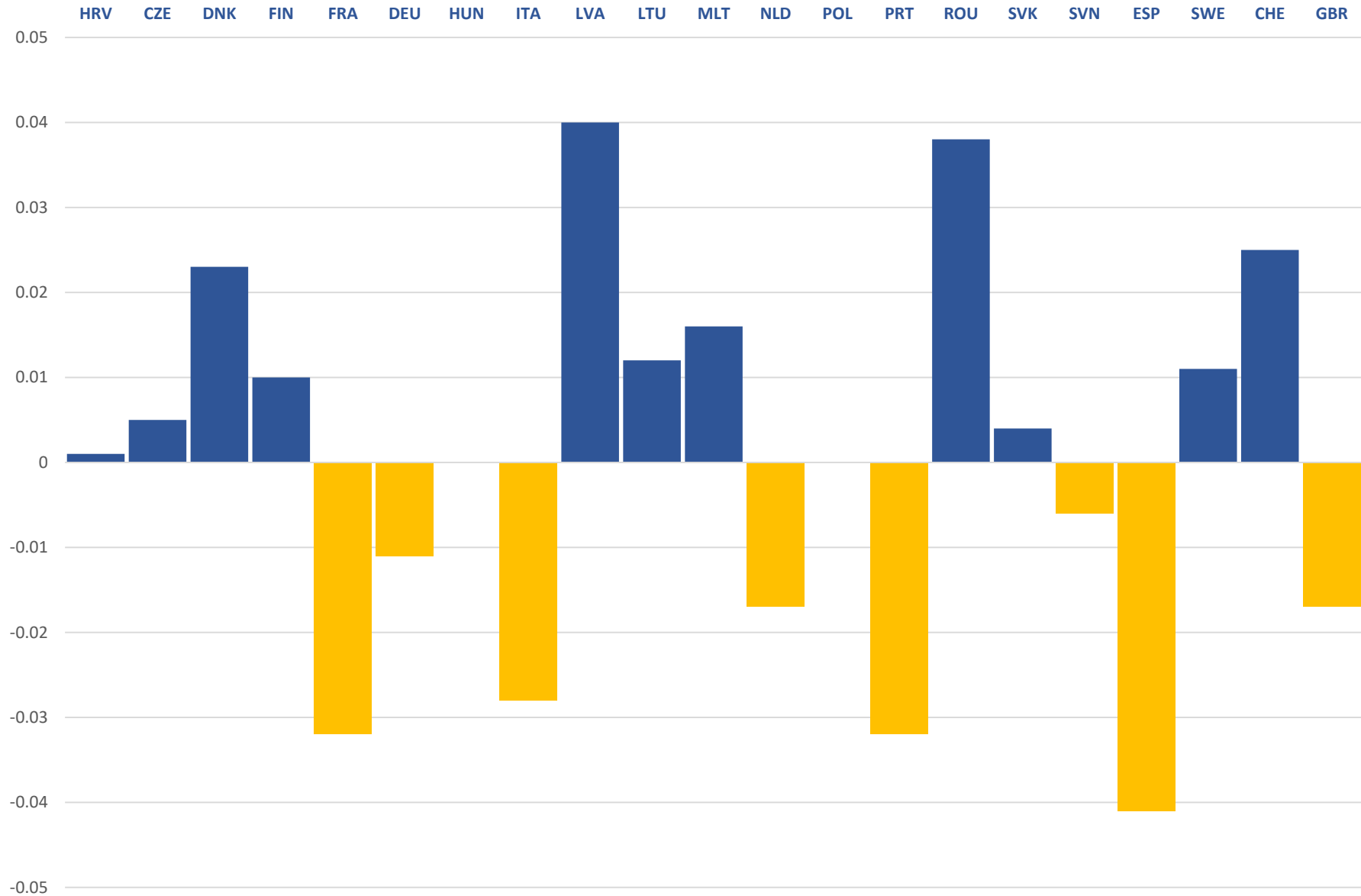

Figure 1 Catch-up Process

Figure 2 Framework conditions and the catch-up process

Job Reallocation and GDP/Capita

Figure 5 *Job reallocation and GDP per capita.*

Job Reallocation and GDP/Capita

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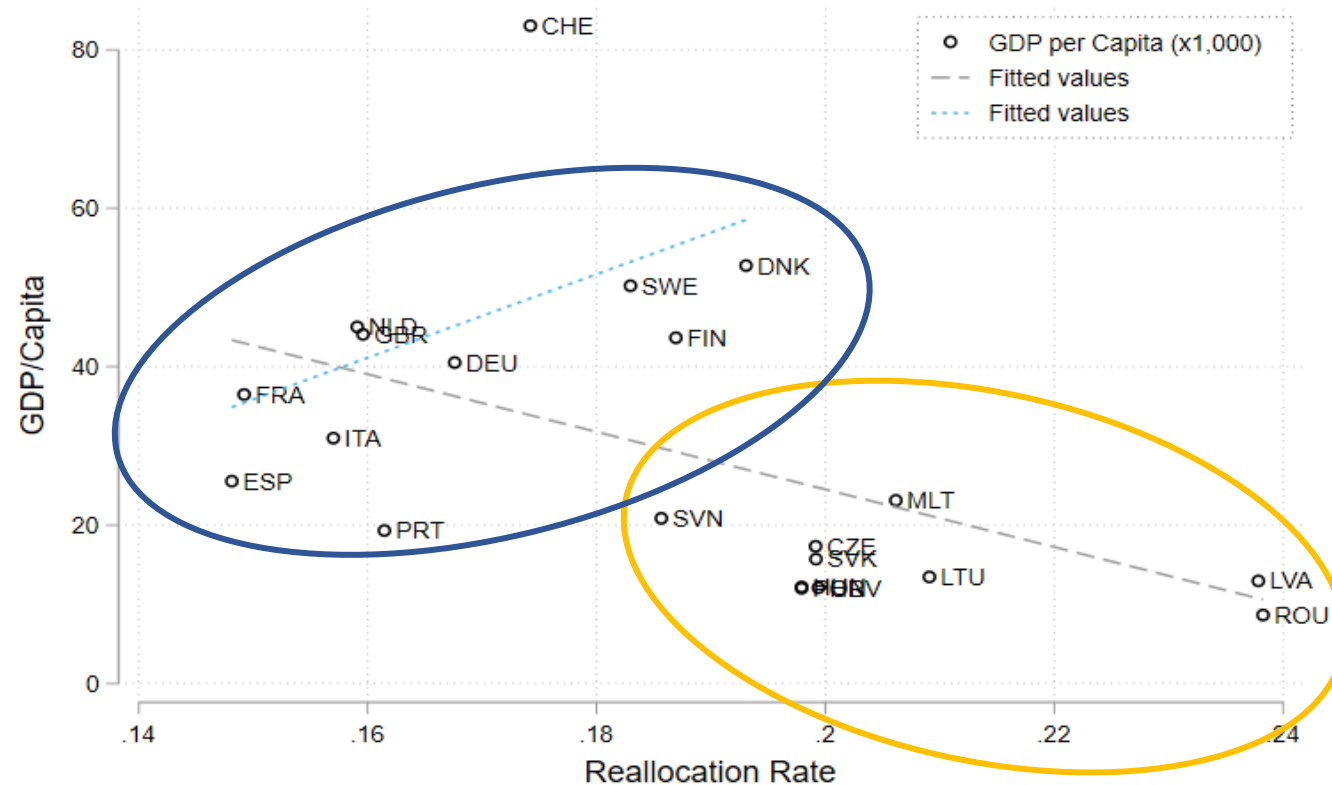
Job Reallocation and GDP/Capita

Figure 5b *Job reallocation and GDP per capita.*

What about Job reallocation and growth?

Job Reallocation and GDP/Capita Growth
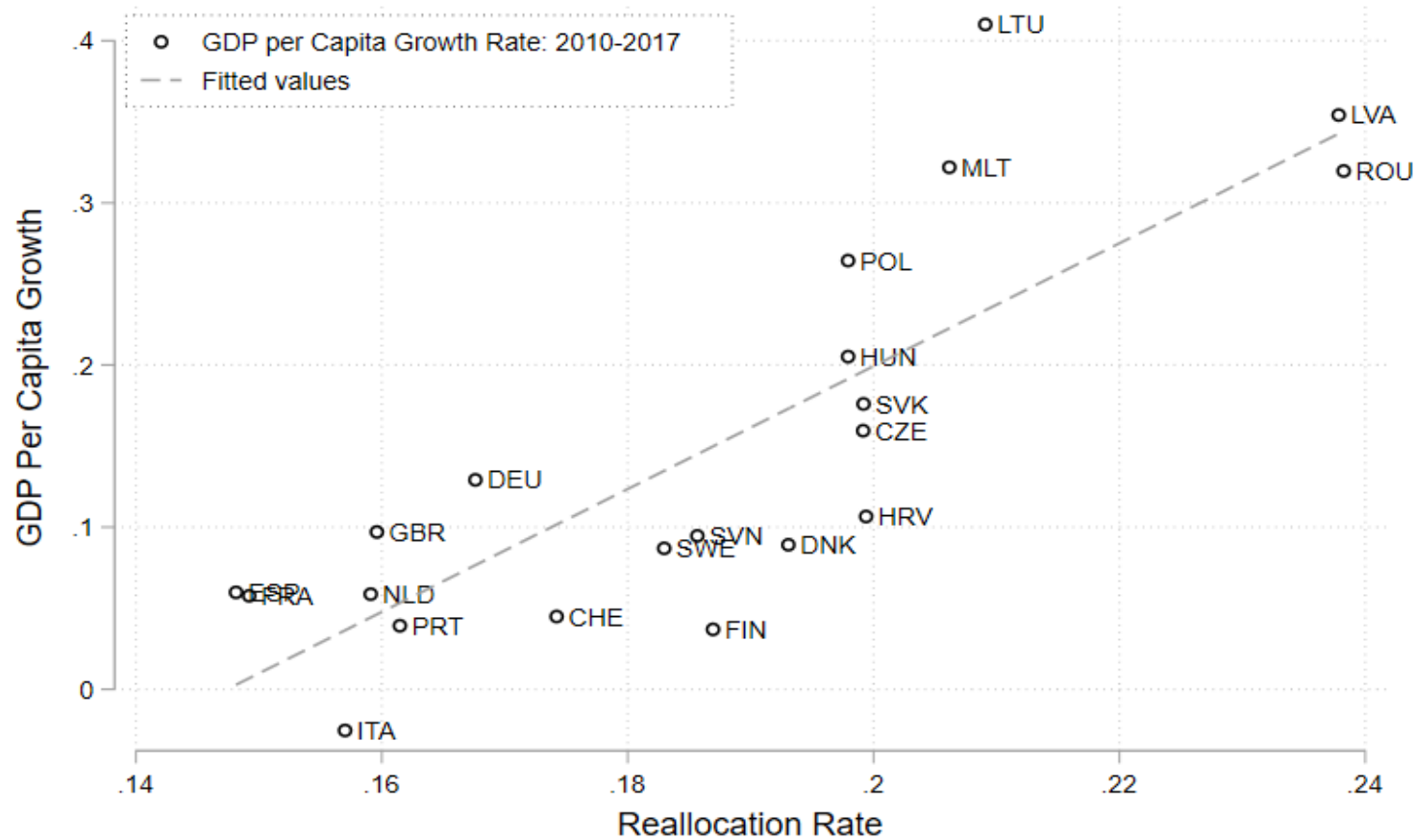
Figure 6 *Job reallocation and GDP per capita Growth.*

Job Reallocation and GDP/Capita Growth
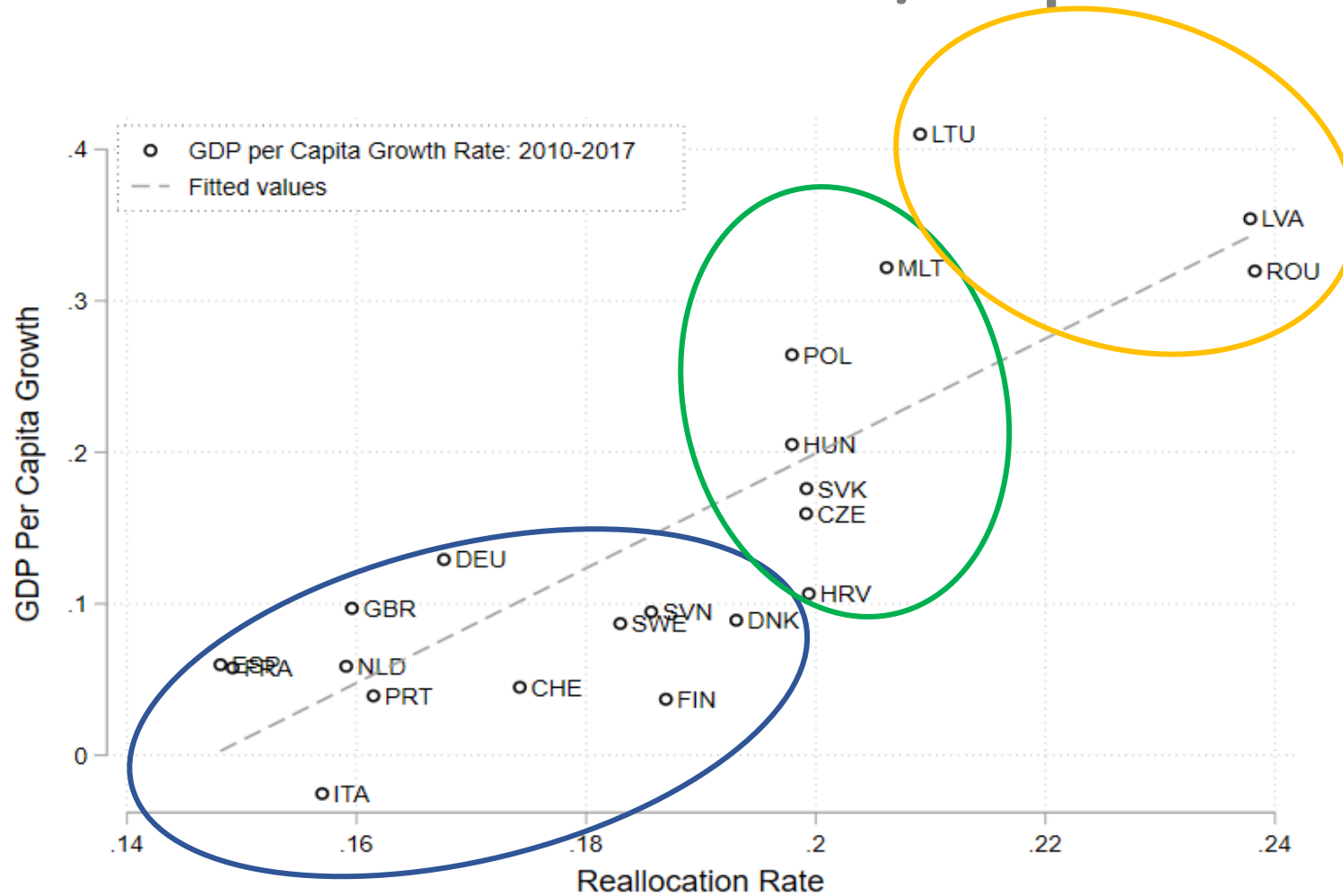
Correlation = 0.81

Mean Income = 41.0
Mean Income = 15.4
Mean Income = 11.7

The catch-up process

Figure 6 *Job reallocation and GDP per capita Growth.*

Growth Theory in Cross Country Setting

- **H1:** Reallocation is inversely related to the level of development of the country as measured by its GDP per capita
  - **H1.b.** Higher reallocation countries experience higher GPD/capita growth

- **H2:** Positive correlation between Reallocation (in excess of predicted value) and GDP growth

Figure 1 Catch-up Process

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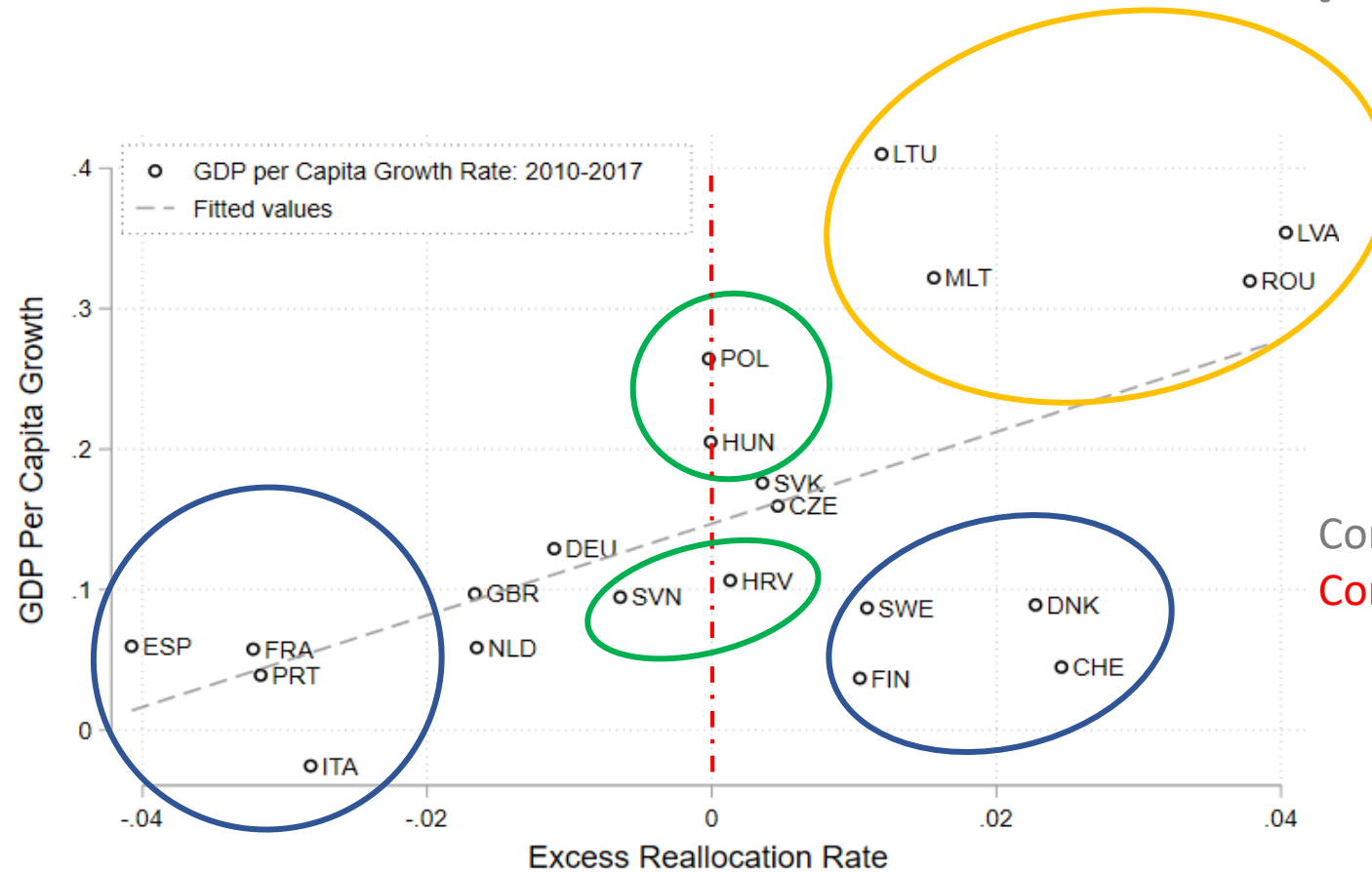
Excess Job Reallocation: By Country

Excess Job Reallocation and GDP/Capita Growth

Figure 7 *Excess Job reallocation and GDP per capita Growth.*

Excess Job Reallocation and GDP/Capita Growth

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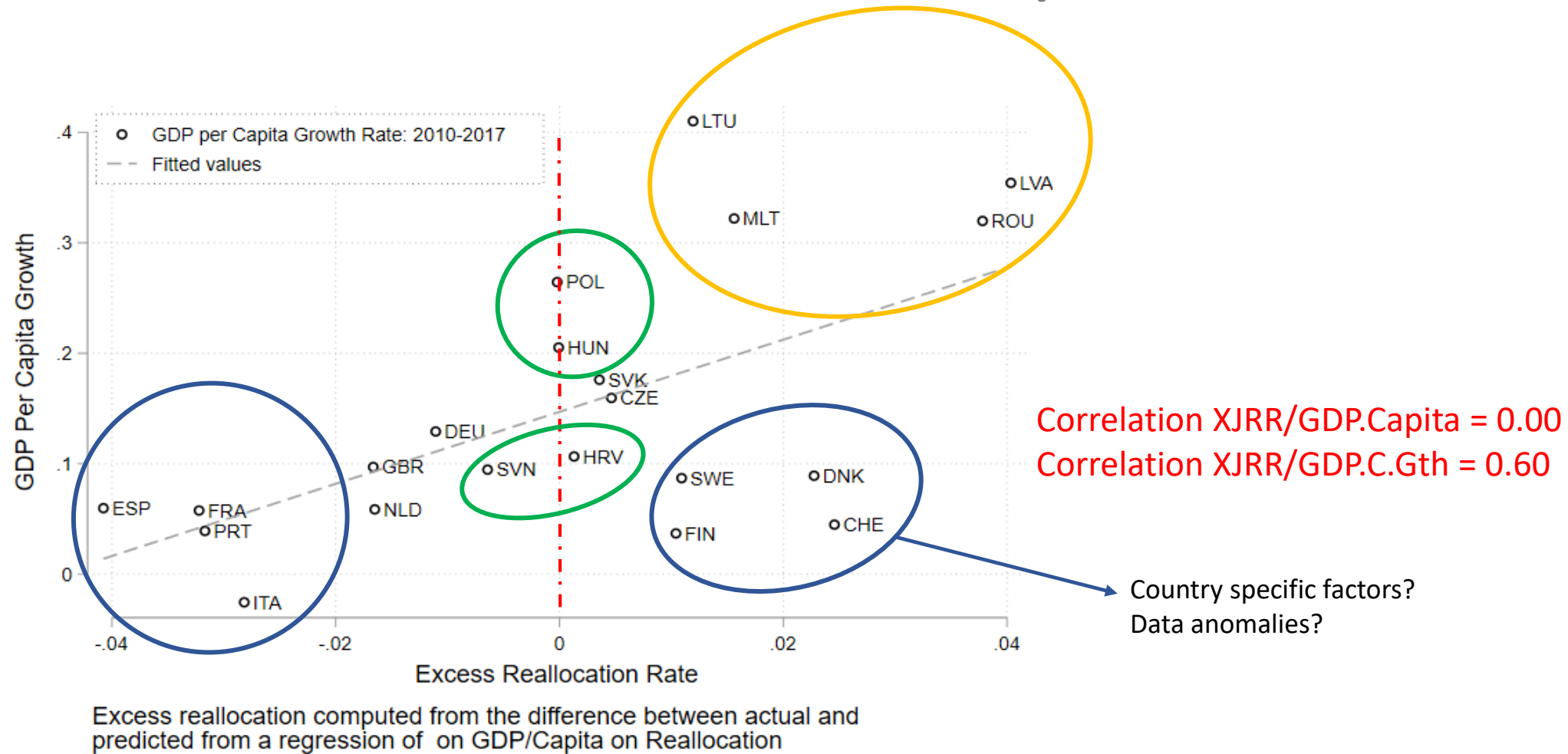
Excess Job Reallocation and GDP/Capita Growth

Figure 7 *Excess Job reallocation and GDP per capita Growth.*

Empirical Framework: Part II
Understanding the link between reallocation and growth

Empirical framework

Canonical models of firm dynamics with adjustment costs (Hopenhayn and Rogerson (1993))

- Reallocation is the result of businesses response to changing environment. Businesses facing positive productivity/profitability conditions enter/expand. If weak conditions then exit/contract => allocative efficiency
- Growth differentials:
  - **Shock Hypothesis:** the dispersion of idiosyncratic productivity or profitability realizations (shock innovations) is different across countries **=> some countries are better innovators/adopters.**
  - **Responsiveness Hypothesis:** adjustment costs differ across countries **=> some countries are better at taking advantage of those innovations.** Weakened productivity selection and possibly large impacts on aggregate productivity.

Empirical Strategy (AER 2020)

From canonical models estimate:

- $g_{it} = f_t(a_{it}, l_{it-1})$

　　　　g_{it}　　: firm-level growth
　　　　a_{it}　　: realization of firm-level productivity
　　　　l_{it-1}　: initial employment.

- Can attribute empirical changes in dispersion/skewness of g_{it} to:
  - 1. Differences in the distribution of a_{it} (persistence or dispersion)
  - 2. Differences in the marginal responsiveness of g_{it} to a_{it}. The estimated **β**.
  - We are going to estimate both, a_{it} and **β**.

Firms' Responsiveness

○ $g_{i,t+1} = \beta_0 + \boldsymbol{\beta_1 tfpr_{it}} + \beta_2 l_{it} + \beta_3 X_{it} + \varepsilon_{it}$

$i = $ firm

$g_{i,t+1} = \dfrac{E_{i,t+1} - E_{i,t}}{0.5(E_{i,t+1} + E_{i,t})}$, $E_{i,t} = $ employment

$TFPR = $ log TFPP or first differences (more data demanding)

$\beta_y = $ responsiveness to the TFPR shock

X_{et} includes ind*year

Measures of Productivity

1) TFPR (from CompNet)
   - Standard Cobb-Douglas

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

   - factor output elasticity = industry cost-shares (strong assumptions f.o.c)
     - Need not hold for all firms at all time but assume true on average over time
   - Since we do not observe (firm specific) prices of output => TFPR = P*TFPQ reflects technical efficiency as well as demand/product appeal shocks (interpret as a composite shock)
   - Deviated from industry-year averages to focus on idiosyncratic shocks

Confounds technical efficiency and product demand shocks. That is OK! Businesses respond to TFPR
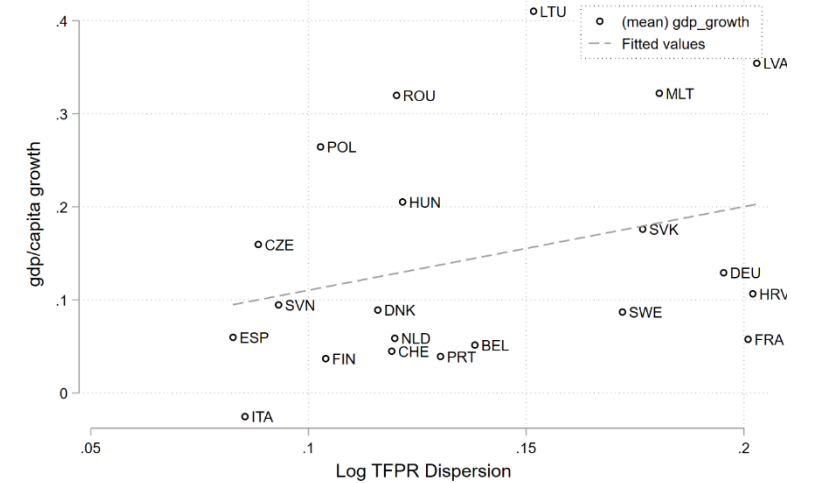
Shock Dispersion

A. Large shock dispersion: higher in East
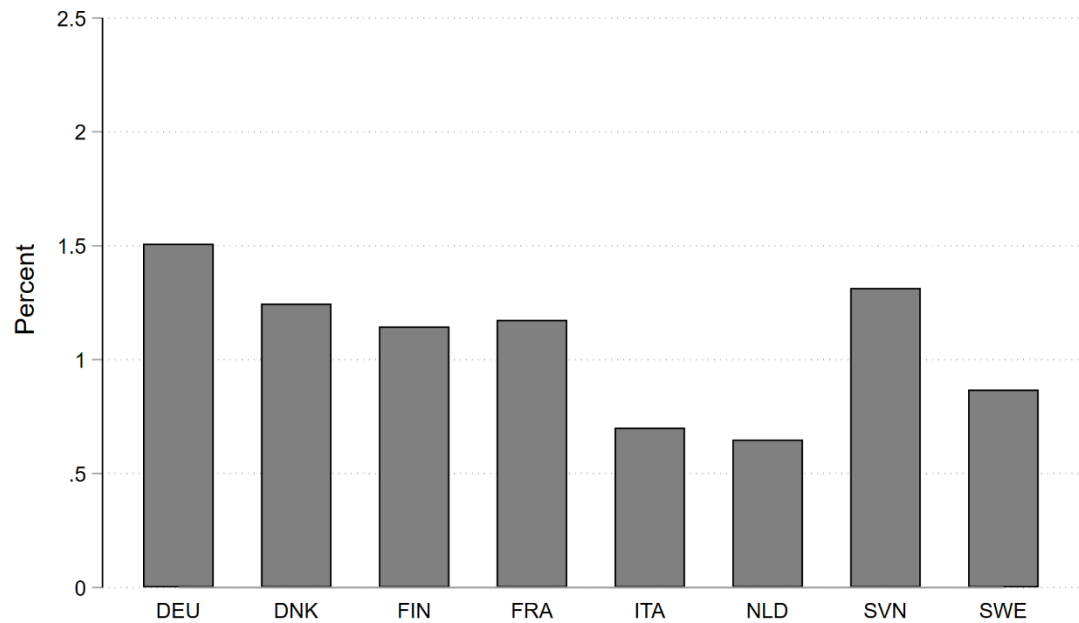But country specific factors matter a lot
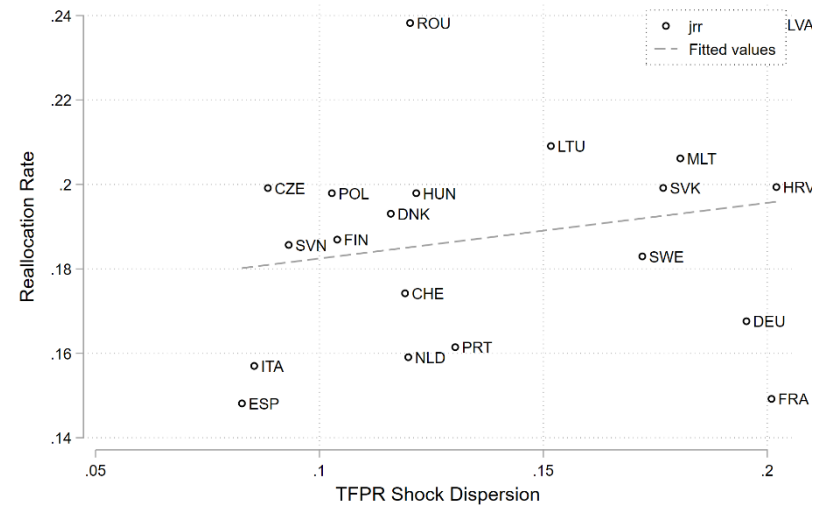
B. Businesses respond to their environment:
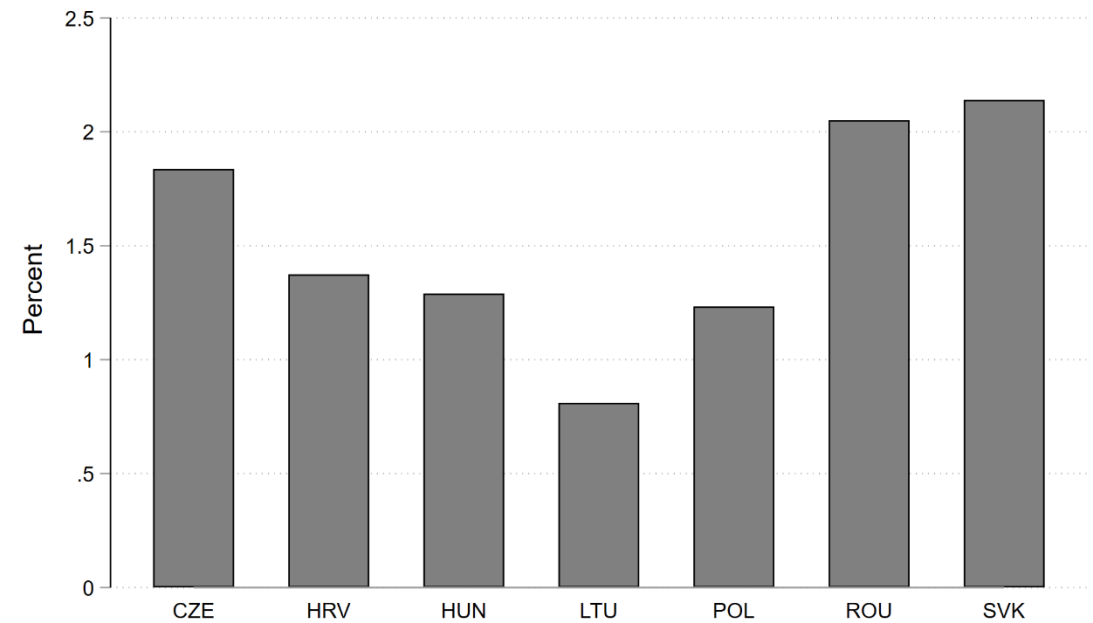Higher dispersion, higher reallocation

C. Shock dispersion correlated with growth

Responsiveness: Marginal effects (subset of countries)

Employment Growth Responsiveness
West European Countries

Employment Growth Responsiveness
East European Countries

Do economies take advantage of growth opportunities? Yes, but some countries more than other! Country specific factors matter!!

Taking Stock

- We set out to explore path convergence within a Schumpeterian endogenous growth model framework using micro data for Europe

- Main findings
  - Reallocation is higher in less developed economies ➔ consistent with knowledge diffusion and path convergence
  - Find positive correlation between reallocation rates and per capita GDP growth ➔ Consistent with productivity enhancing reallocation
  - Countries that experience reallocation rates in excess of what is predicted by their per capita GDP experience faster growth (on average) => framework conditions matter
  - Productivity shock dispersion higher in less developed economies consistent with endogenous growth theory but
    - Shock dispersion seems much more tied to country specific conditions: Framework conditions?
    - ➔ Country specific conditions seem to matter <u>a lot</u> for knowledge diffusion/ability to innovate
  - Large country variation in businesses' ability to take advantage of growth opportunities
    - Pass through tied to country specific conditions
    - <u>If local conditions are not supportive then knowledge diffusion does not matter as much!</u>

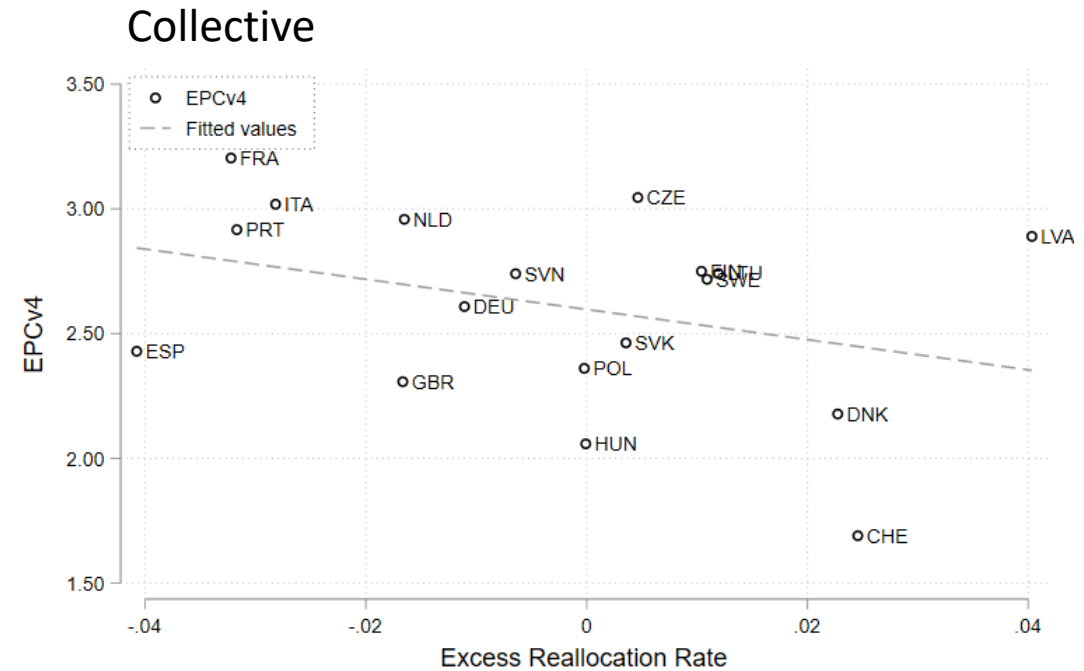# Aside: Framework Conditions & reallocation

Example: Employment protection legislation

Excess Reallocation and Framework Conditions

Employment Protection Legislation (OECD)
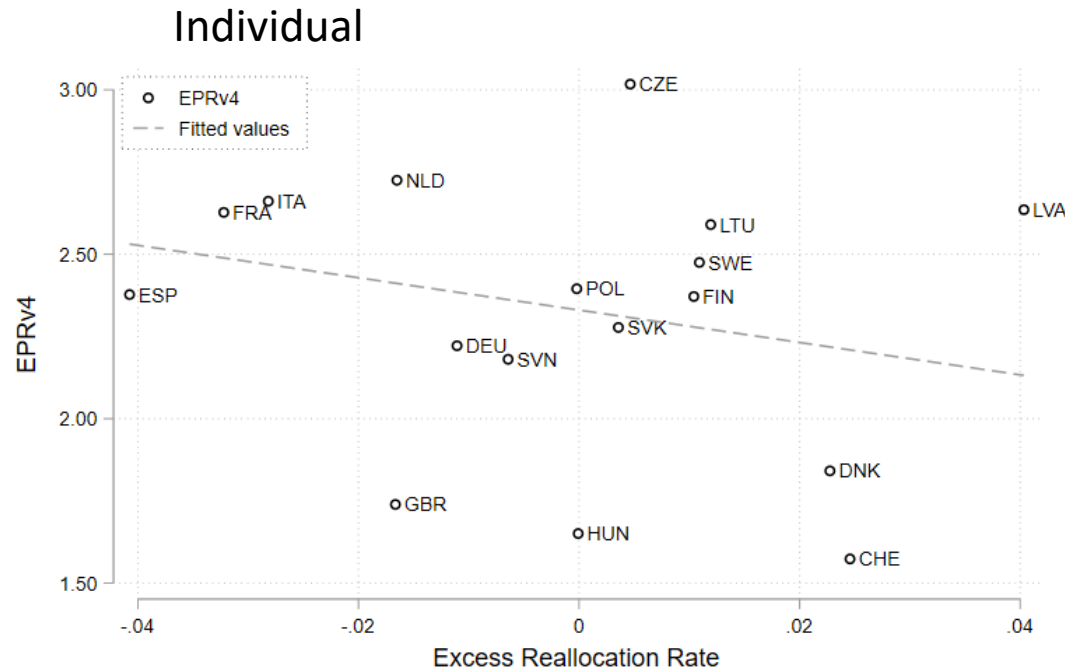
Individual

Excess reallocation computed from the difference between actual and predicted from a regression of on GDP/Capita on Reallocation
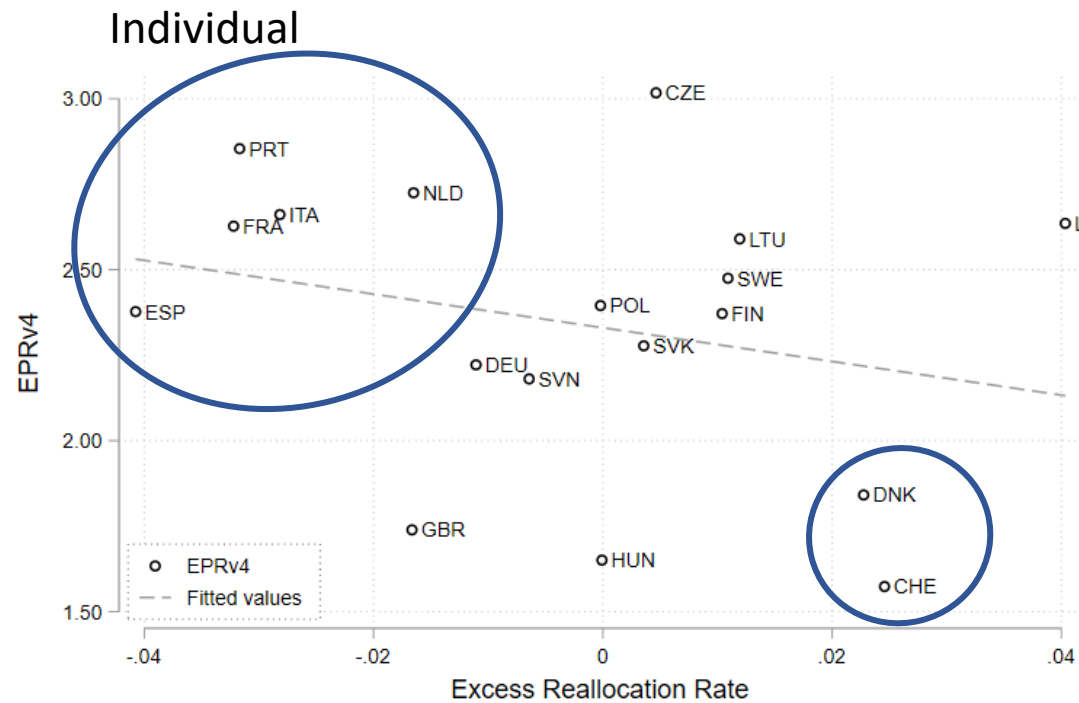
Collective

Excess reallocation computed from the difference between actual and predicted from a regression of on GDP/Capita on Reallocation

Excess Reallocation and Framework Conditions
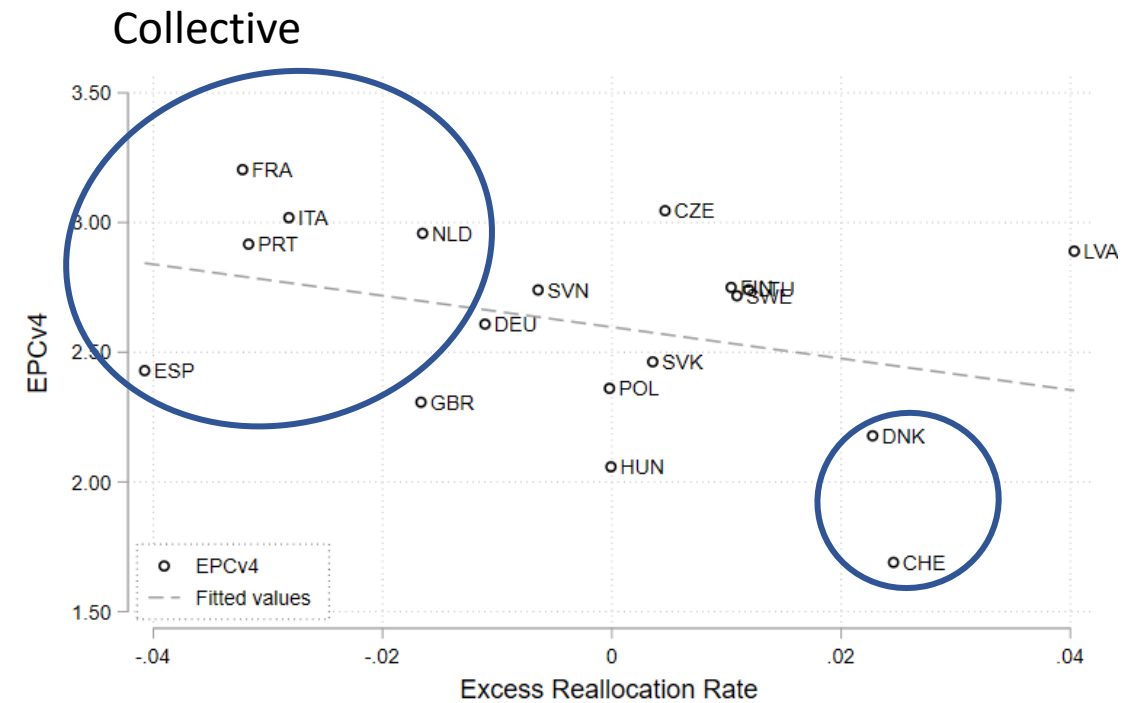
Employment Protection Legislation

Excess reallocation computed from the difference between actual and predicted from a regression of on GDP/Capita on Reallocation

Excess reallocation computed from the difference between actual and predicted from a regression of on GDP/Capita on Reallocation

Next Steps

- Formal analysis of distance to technology frontier (does distance matter)
  - TFP_i/TFP_f or $GDP.C_i/GDP.C_{us}$
  - R&D Intensity: R&D/Sales
  - Global Innovation Index (WIPO)
- Broader analysis of framework conditions: quantifying their effect
  - Protectionism: Business friendliness (WBG B-READY)
  - Competition: Product market regulation (OECD)
  - Access to finance/Credit constraints (IMF/WBG)
    - IMF Financial Development Index
    - WBG Global Financial Development
  - Strength of Democratic institutions (EIU Democracy Index)
  - Other?
- Understanding knowledge diffusion and convergence path: Implications from decline?
- Can we extend data infrastructure effort to other regions of the world? Do results hold?
  - Asia?
  - Latin America?
  - Africa?
- Other business data?
- Robustness checks…

Thank You

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