Tariffs Hit Differently

The Regional Impact of US Tariffs across Europe and the Role of the Single Market

Gabriel Felbermayr[1], **Julian Hinz**[2,3], Sebastian Krantz[3], Hendrik Mahlkow[1,3], Joschka Wanner[4,3]

[1]WU Vienna & WIFO [2]Bielefeld University [3]Kiel Institute for the World Economy
[4]University of Würzburg & CESifo

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Source: Volkswagen



Source: DPA


Source: DPA

External shocks, local damage

- Europe’s economic-security shocks come from outside:
  - Tariffs — the 2025 US tariff schedule
  - Export controls — Chinese restrictions on gallium, germanium, rare earths
  - Chokepoints — Red Sea attacks, shipping rerouted around the Cape
- Each is set at a national border or a sea lane. Each is felt in a place.

How much does the Single Market insure Europe’s regions against shocks from outside?

This paper

- A quantitative trade model at the level of 288 European regions, linked in one production network
- One test shock: the 2025 US tariffs, partner $\times$ product

$\rightarrow$ The same machinery takes export bans and route disruptions

- The same shock hits four Europes, from fragmented to deeply integrated

$\rightarrow$ The difference between them is the insurance

- Workers move between regions at a cost; we calibrate how much they respond to wage gaps

Setup

Four Europes, one shock

- Fragmented — no Single Market, MFN tariffs between European countries
- Integrated, single countries — Single Market, but workers stay in their country
- Integrated EU — today: Single Market and free movement
- Deep integration — internal non-tariff barriers 15% lower

→ Each step changes one margin: trade policy, then mobility, then barrier depth

details

The model: key equations

Trade

$$\pi_{od}^{j,k} = \left(\frac{c_o^j \, t_{od}^{j,k} \, \tau_{od}^{j,k} / A_o^j}{P_d^{j,k}} \right)^{\epsilon^j}$$

Gravity shares by sector j and user k. An external shock moves trade costs t or tariffs τ.

Income

$$I_d = \underbrace{w_d L_d}_{\text{labour}} + \underbrace{\iota_d \textstyle\sum_o r_o S_o}_{\text{structures}} + \underbrace{T_d}_{\text{tariffs}} + \underbrace{D_d}_{\text{deficit}}$$

Wages stay local. Deficit: fixed share of world value added.

Location

$$s'_{oh} = \frac{s_{oh} \, \hat{\tilde{w}}_o^{\,\varepsilon_L}}{\sum_{m \in M_h} s_{mh} \, \hat{\tilde{w}}_m^{\,\varepsilon_L}}$$

Workers of origin h choose a region on real wages $\tilde{w} = w/P^C$. ε_L: how strongly they respond.

Baqaee–Farhi general equilibrium, solved in changes; trade elasticities from Fontagné et al. (2022).

▸ full model

Labour mobility with frictions

- Standard closures: workers move *within* countries, or *EU-wide*. Both frictionless.

$\rightarrow$ Frictionless mobility equalises real wages, so it hides incidence inside the bloc

- Ours: logit location choice with elasticity ε_L ▸ model
  - $\varepsilon_L \to 0$: nobody moves $\quad \varepsilon_L \to \infty$: perfect mobility
- Who lives where: 2021 censuses, 232 countries of birth $\times$ 287 regions ▸ data
- $\varepsilon_L = \mathbf{4.1}$: migration absorbs about 60% of a regional shock in the long run (Arpaia et al. 2016) ▸ fig

REICIO: Europe at regional resolution

- Every European country in the OECD ICIO replaced by its NUTS2 regions

→ 335 units (288 regions, 47 countries) $\times$ 10 sectors

→ Country totals preserved; built from public data only

how

- Checked against customs records by region and partner (France, Spain):
  - regional exports: correlation 0.88

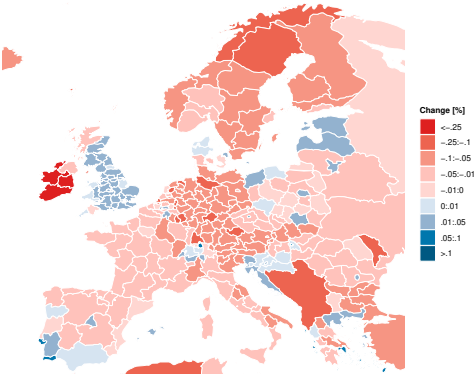
fig

An open, reproducible regional input–output table for Europe.

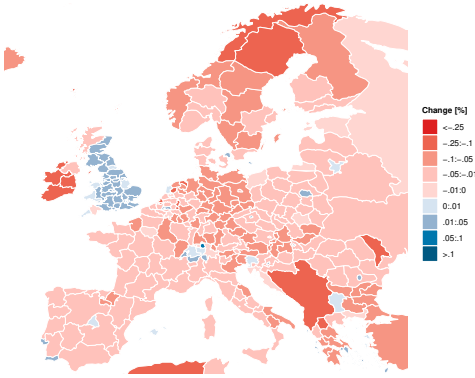
Results

Same shock, two Europes

Fragmented



Integrated EU — today

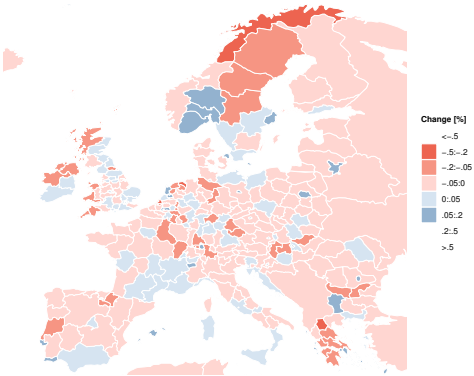


Change in real value added per capita (%), 2025 US tariffs. *Source:* own calculations, REICIO.

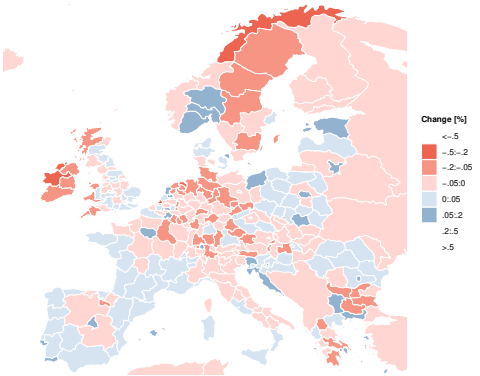
all four

Same shock, two Europes: where workers go

Fragmented — moves within countries

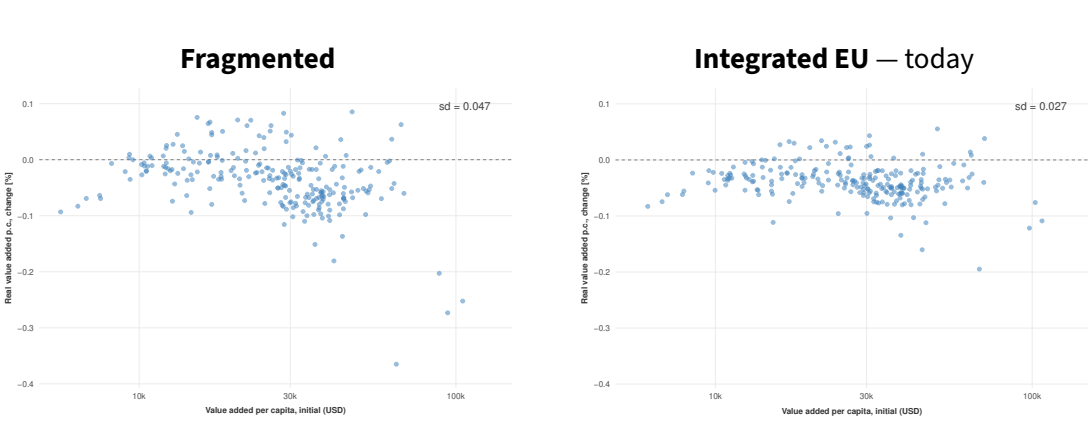


Integrated EU — moves across the EU



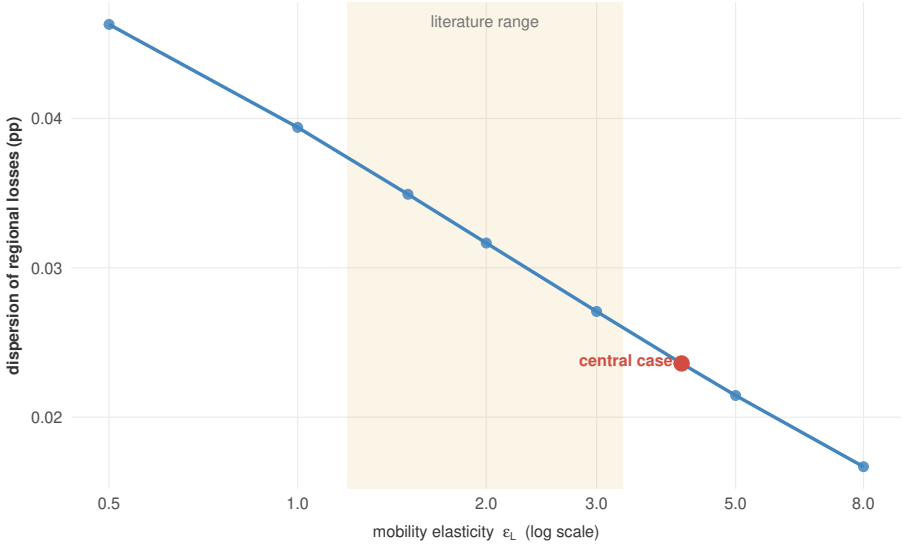
Change in regional labour supply (%), 2025 US tariffs. *Source:* own calculations, REICIO.

Integration narrows the spread of losses



Regional loss against initial income, EU27 regions. *Source:* own calculations, REICIO.

all four



Cross-regional dispersion of regional losses against the mobility elasticity ε_L. Shaded: range of structural estimates in the literature. *Source:* own calculations, REICIO.

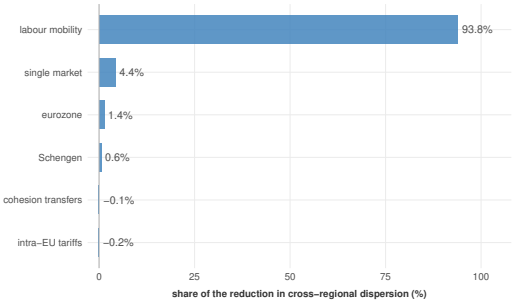
Mobility and the spread of losses

- From high to low mobility frictions ($\varepsilon_L = 1 \rightarrow 5$), dispersion halves: $0.039 \rightarrow 0.021$
- 46% of the reallocation crosses a national border ▸ fig
- We can say who moves: the exposed, and the already dispersed ▸ fig

Free movement is part of Europe's shock absorber.

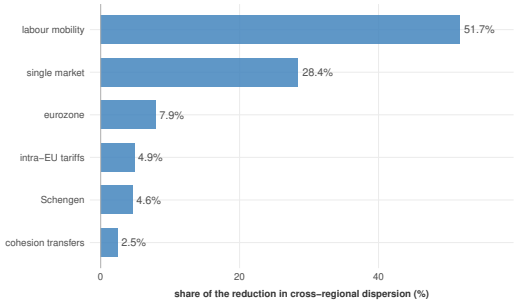
Which part of integration does the insuring?

Value added — where production lands



Dispersion 0.063 → 0.024

Real income — what residents keep



Dispersion 0.128 → 0.105

Shapley decomposition of the fall in dispersion from fragmented to fully integrated; six margins, all 64 combinations.

Source: own calculations, REICIO.

Policy

What this means for Europe’s economic security

- Measure exposure by region, not by country. Same shock: Wolfsburg, Frankfurt, Cork.
- The Single Market is insurance. It spreads the loss more than it shrinks it.
- Two instruments, two jobs.
  - free movement evens out where the loss lands
  - the goods market protects what residents can buy
- Fixed transfers do not insure. Cohesion funds are set seven years ahead

→ They raise income levels, but leave the spread of losses almost unchanged

more

Conclusions

- Country averages hide the incidence of external shocks
- Integration works on the spread, not the mean — risk-sharing rather than efficiency
- How much insurance Europe gets depends on how mobile labour really is
- Next: the same regional lens on export controls and chokepoint shocks

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Backup

Model: preferences and production

- N regions (o, d), J sectors (j, k); each region makes its own variety of each good (Armington), as in Baqaee–Farhi (2024)
- Consumers: nested CES

→ across sectors, $\sigma = 0.9$: sectors are mild complements

→ across origin regions within a sector, θ^j

- Producers: nested CES

→ value added vs. intermediates, 0.5; across input sectors, 0.2

→ value added = labour and immobile structures, Cobb–Douglas

→ intermediates from every origin region

- Low elasticities in the input nests: cost shocks travel far along the value chain

Model: trade, market clearing, income

$$\pi_{od}^{j,k} = \left(\frac{c_o^j \, \phi_{od}^{j,k} / A_o^j}{P_d^{j,k}}\right)^{\epsilon^j}, \qquad \phi_{od}^{j,k} = t_{od}^{j,k} \, \tau_{od}^{j,k} \qquad \text{trade shares, by user } k$$

$$Y_o^j = \sum_d \frac{\pi_{od}^{j,C}}{\tau_{od}^{j,C}} \alpha_d^j I_d + \sum_{k,d} \frac{\pi_{od}^{j,k}}{\tau_{od}^{j,k}} \beta_d^{M,k} \gamma_d^{j,k} Y_d^k \qquad \text{goods market}$$

$$w_o L_o = \sum_j \beta_o^{F,j} \gamma_o^{L,j} Y_o^j \qquad \text{labour market}$$

$$I_d = w_d L_d + \iota_d \textstyle\sum_o r_o S_o + T_d + D_d \qquad \text{income}$$

Solved in changes (Dekle et al. 2007): only baseline shares from REICIO, elasticities (Fontagné et al. 2022) and the shock are needed. Tariff revenue is spent where it is collected; the trade deficit D_d is a fixed share of world value added.

Labour mobility (I): where workers choose to live

- Worker types h = country of birth, fixed total $\bar{L}_h$
- Value of region o for type h, with a type-I extreme-value taste shock ϵ_{oh}:

$$V_{oh} = \log A_{oh} + \log \tilde{w}_o + \tfrac{1}{\varepsilon_L}\,\epsilon_{oh}, \qquad \tilde{w}_o = \frac{w_o}{P_o^C}$$

- Logit location shares and regional labour supply:

$$s_{oh} = \frac{A_{oh}^{\varepsilon_L}\,\tilde{w}_o^{\varepsilon_L}}{\sum_{m\in M_h} A_{mh}^{\varepsilon_L}\,\tilde{w}_m^{\varepsilon_L}}, \qquad L_o = \sum_h s_{oh}\,\bar{L}_h$$

- Total labour of each type is fixed; where it works is not

Labour mobility (II): a gravity structure

- Bilateral attractiveness in gravity form:

$$\log A_{oh} = \underbrace{\alpha_o^L}_{\text{amenity}} + \underbrace{\alpha_h^L}_{\text{origin}} - \underbrace{\tau_{oh}^L}_{\text{friction}} \quad \Longrightarrow \quad s_{oh} = \frac{\left(e^{\alpha_o^L}\tilde{w}_o\right)^{\varepsilon_L} e^{-\varepsilon_L \tau_{oh}^L}}{\Phi_h}$$

- τ_{oh}^L: distance, national borders, language, migrant networks
- $\Phi_h = \sum_{m \in M_h} (e^{\alpha_m^L}\tilde{w}_m)^{\varepsilon_L} e^{-\varepsilon_L \tau_{mh}^L}$ plays the role of multilateral resistance: a region's pull depends on all alternatives
- We do not estimate τ^L or α^L: their levels are in the observed census shares s_{oh}

Labour mobility (III): counterfactuals in changes

$$s'_{oh} = \frac{s_{oh}\hat{A}_{oh}^{\varepsilon_L}\widehat{\tilde{w}}_o^{\varepsilon_L}}{\sum_{m\in M_h} s_{mh}\hat{A}_{mh}^{\varepsilon_L}\widehat{\tilde{w}}_m^{\varepsilon_L}}, \qquad \hat{L}_o = \frac{\sum_h s'_{oh}\bar{L}_h}{\sum_h s_{oh}\bar{L}_h}, \qquad \hat{A}_{oh} = e^{\Delta\alpha_o^L - \Delta\tau_{oh}^L}$$

- Trade shock: $\hat{A}_{oh} = 1$, so workers respond only to real wages
- Links with no workers in the census stay at zero: adjustment on existing links only
- Limits: $\varepsilon_L \to 0$ nobody moves; $\varepsilon_L \to \infty$ real wages equalise within M_h
- Wages clear the labour market: $w'_o L'_o = \sum_j \beta_o^{F,j\prime}\gamma_o^{L,j\prime}Y_o^{j\prime}$

Labour mobility (IV): EU integration and timing

- EU labour-market integration lowers cross-border frictions:

$$\Delta\tau^{L}_{oh} = \begin{cases} -\delta^{L}_{EU} & o \text{ and } h \text{ in different EU countries} \\ 0 & \text{otherwise} \end{cases}$$

- Borders still matter after integration: frictions fall, they do not vanish
- Static long-run allocation. Read it as the end point of slow adjustment: each period a share χ_L of workers may move,

$$s_{oh,t+1} = (1 - \chi_L)\, s_{oh,t} + \chi_L\, s^{*}_{oh,t}$$

Labour mobility (V): calibrating ε_L

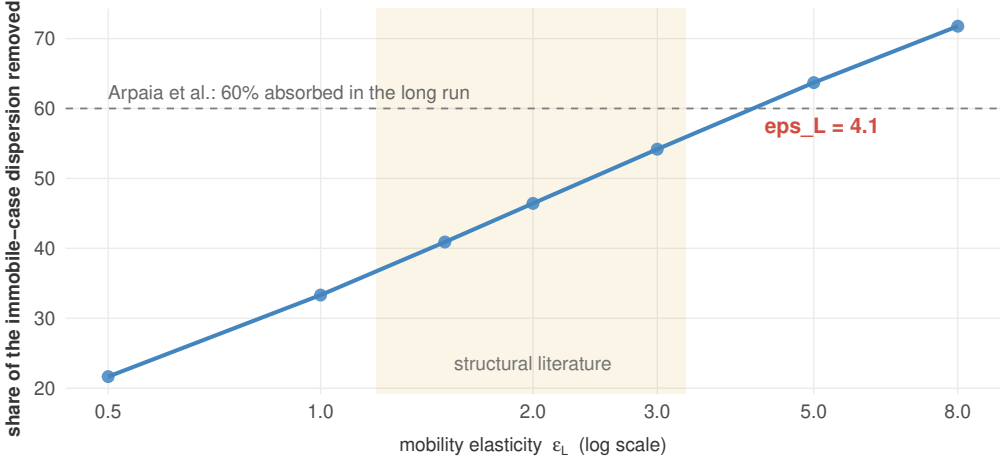
- Target: migration absorbs over 60% of an asymmetric labour-demand shock after a decade (Arpaia et al. 2016)
- Model counterpart: share of the immobile-case dispersion that mobility removes,

$$\text{absorption}(\varepsilon_L) = 1 - \frac{\text{sd}(\varepsilon_L)}{\text{sd}(\text{immobile})} \quad \Longrightarrow \quad \varepsilon_L = 4.1$$

- Structural estimates are lower: 1.2–3.3 (Tombe–Zhu, Bryan–Morten, Monte et al., Redding)
- Cross-border share as a check: 46% of moves in the model; about 20% of all moves in the data

Calibrating mobility to how much of a shock it actually absorbs

Absorption is the fraction of cross−regional dispersion that labour reallocation eliminates



Target from Arpaia, Kiss, Palvolgyi & Turrini (2016): migration absorbs over 60% of an asymmetric labour−demand shock after a decade. Our closure is the long−run object.

Labour mobility (VI): who lives where

- EU and EFTA: Eurostat census 2021 `cens_21cob_r3`, NUTS3 residence $\times$ country of birth, summed to NUTS2
- UK: ONS `TS012`, NRS `UV204`, NISRA `MS-A18`
- 232 countries of birth $\times$ 287 regions, 522m people; matches Eurostat regional totals at 0.9998
- Home bias differs: 98% of Spanish- and French-born live in their country; Romanian-born 85%, Luxembourg-born 80%

Solving the model

1. Given the shock $(\hat{t}, \hat{\tau})$: update unit costs and price indices
2. Update trade shares, output and cost shares
3. Update consumer prices, income and tariff revenue
4. Update worker locations $\hat{L}$ from the mobility block, then wages $\hat{w}$ and rents $\hat{r}$
5. Repeat until convergence

Check: $\varepsilon_L \to 0$ reproduces the immobile case inside the full model to 8×10^{-7}.

The four baselines

- Fragmented: no Single Market, MFN tariffs between European countries, workers move within countries
- Integrated, single countries: Single Market and common external tariff, workers move within countries
- Integrated EU: as today, workers move across the EU
- Deep integration: internal non-tariff barriers 15% lower on cross-border EU pairs
- Non-tariff wedges from Felbermayr et al. (2022), goods / services:
  - Single Market 0.381 / 0.492 eurozone 0.072 / 0.158 Schengen 0.087 / 0.075

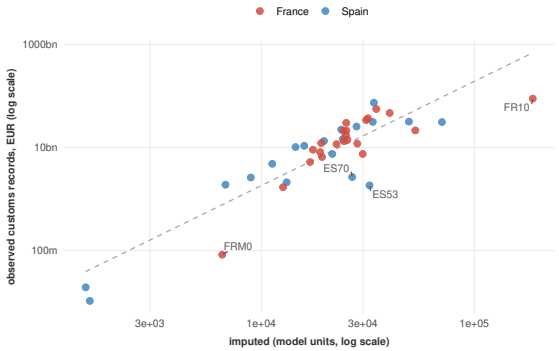
REICIO construction

1. Collapse national ICIO blocks to 10 sectors; split intermediate and final trade
2. Regionalise with regional accounts and location quotients
3. Add spatial structure from JRC freight and interregional matrices
4. Balance block by block (IPF) to row and column totals
5. Put the EU block back into ICIO; allocate extra-EU flows by regional shares and population-weighted distance

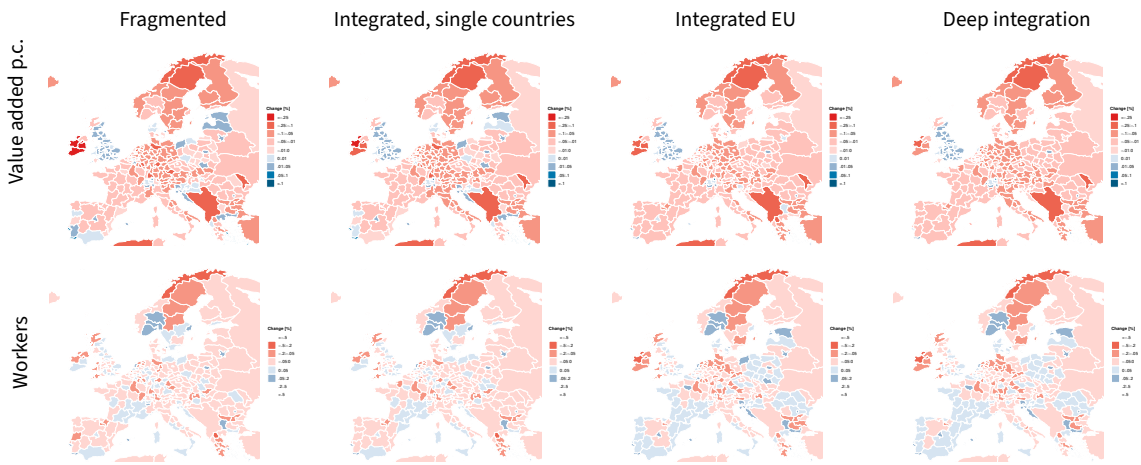
Limits: no cross-border commuting; regional export mix follows the national split; one benchmark year for spatial patterns.

Validating the regional trade split

- France and Spain publish customs records by region and partner country (2019)
- Regional total exports: correlation 0.88
- Region × partner: 0.74
- About a third of the partner mix is misallocated
- French border regions trade 2.1 times more with Spain than imputed

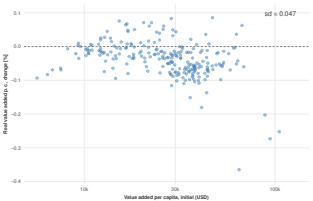


All four Europes: value added and workers

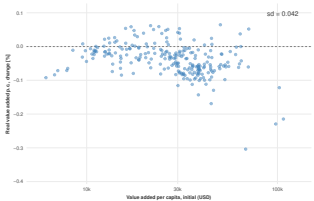


All four Europes: loss against initial income

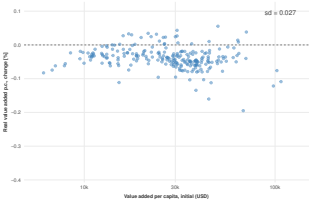
Fragmented



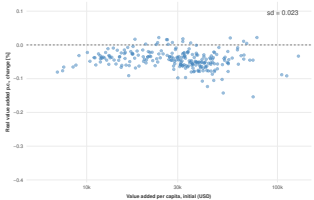
Integrated, single countries

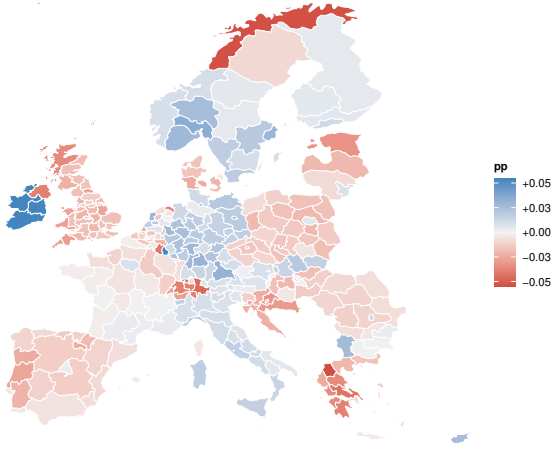


Integrated EU

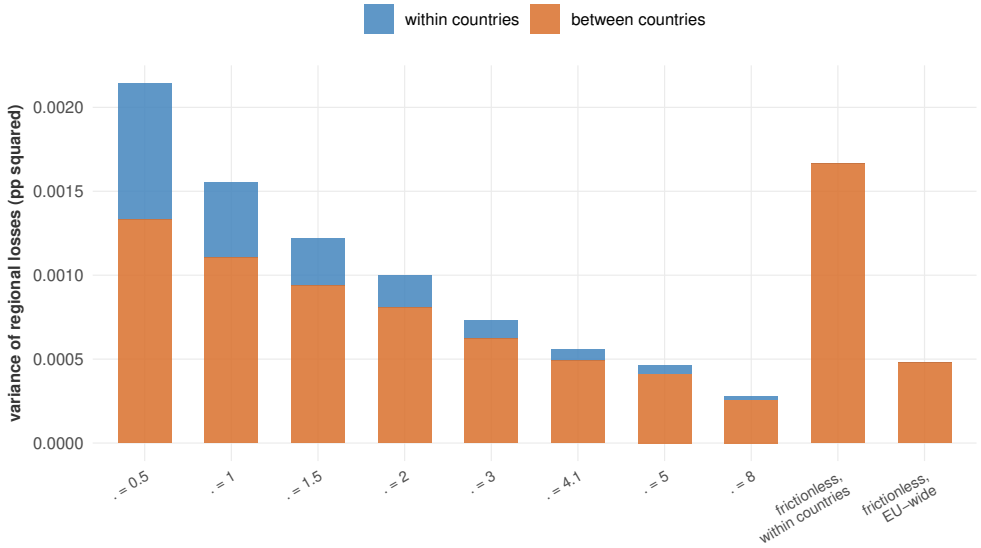


Deep integration

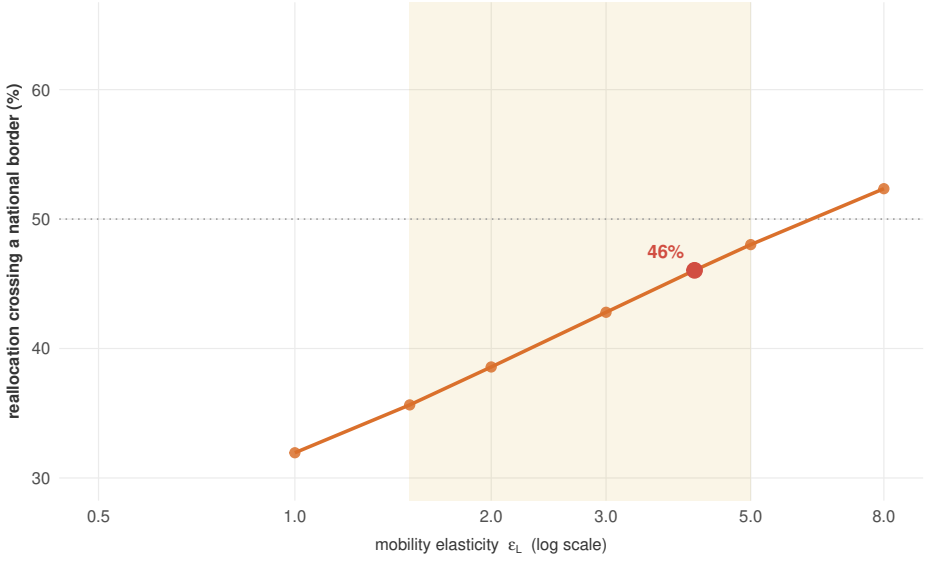




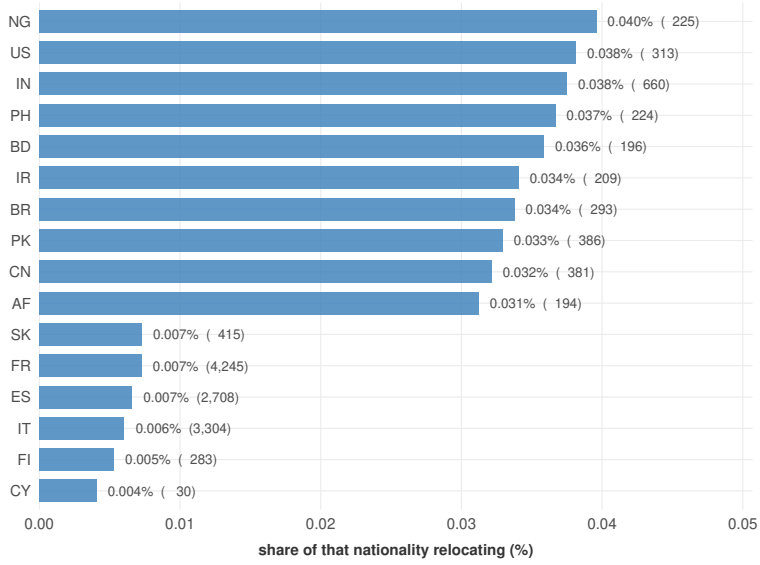
Real value added per capita, frictional EU-wide mobility minus mobility within countries only.



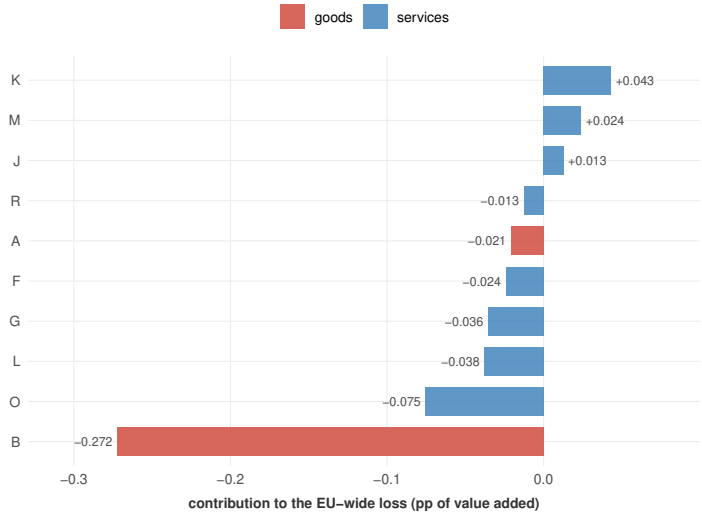
Variance of regional losses within and between countries, by mobility elasticity.



Share of worker reallocation that crosses a national border, by mobility elasticity.



Who moves: reallocation by country of birth.



Contribution of each sector to the EU-wide loss. Goods −2.35%, services −0.29%; manufacturing is 0.47 of the 0.73 pp total.

Cohesion transfers

- A fixed nominal flow, set seven years ahead

→ It cannot respond to a shock, so it cannot insure against one

- It still changes the arithmetic: a higher income level makes the same loss a smaller share

→ Polish regions' proportional income loss is a quarter smaller with transfers

→ EU-wide, the average loss moves by 2%; transfers explain 2.5% of the fall in income dispersion