

Macroeconomic Development, Rural Exodus, and Uneven Industrialization

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Motivation

- Economic development shifts employment away from agriculture and generates a cycle of industrialization and de-industrialization
- This process is **uneven across space**
 - Industrialization typically begins in a few regions within a country
(Northeast in US; Basque Country, Catalonia in Spain; Guangdong, Jiangsu, Shanghai in China)
- The initially **agrarian regions** may follow different paths
 - a) They may catch up and industrialize
 - Agrarian workers move to industry in the same region
US (1880-1940), Indonesia (1971-2010), Costa Rica (1963-2011)
 - b) They may experience a rural exodus and fail to industrialize
 - Agrarian workers help industrialization elsewhere
Spain (1940-2000), China (2000-2015), France (1872-1975)

Or anything in between: India (1987-2011), Brazil (1980-2010)

What we do

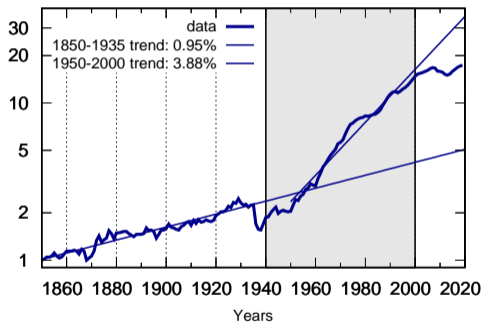
- Our goal:
 - a) Uncover the economic forces shaping these different patterns of development
 - b) Examine their aggregate implications

⇒ **Finding:** internal migrations are key for local *and* aggregate sectoral allocations
- Main object of study: economic development in Spain (1940-2000)
 - Regional-level data for the whole development process
 - Interesting development episode
(fast growth, structural change, internal migration, uneven regional industrialization)
- Model of *structural change* w/ *internal migration* and *internal trade*
 - **Theory:** internal migrations generate uneven industrialization across regions
 - **Quantitative analysis:** drivers of internal migrations and their effects on the macroeconomy

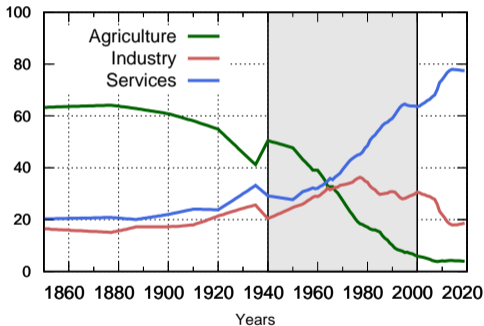
The Spanish development experience

Main facts

(a) Real GDP per capita

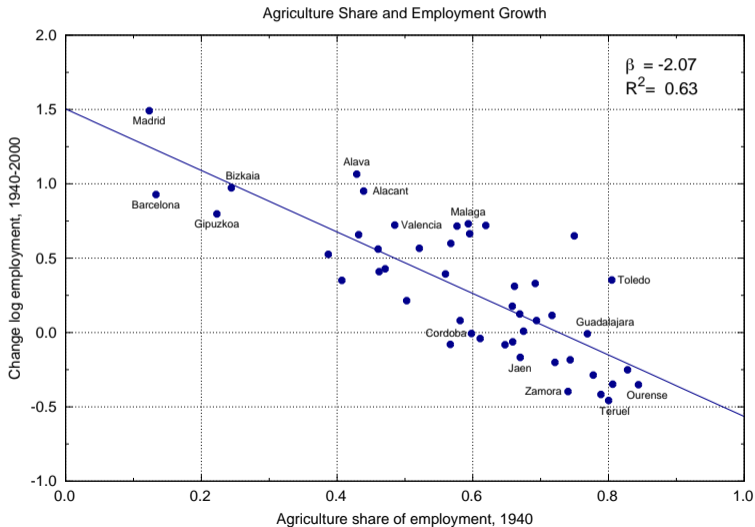


(b) Sectoral employment shares



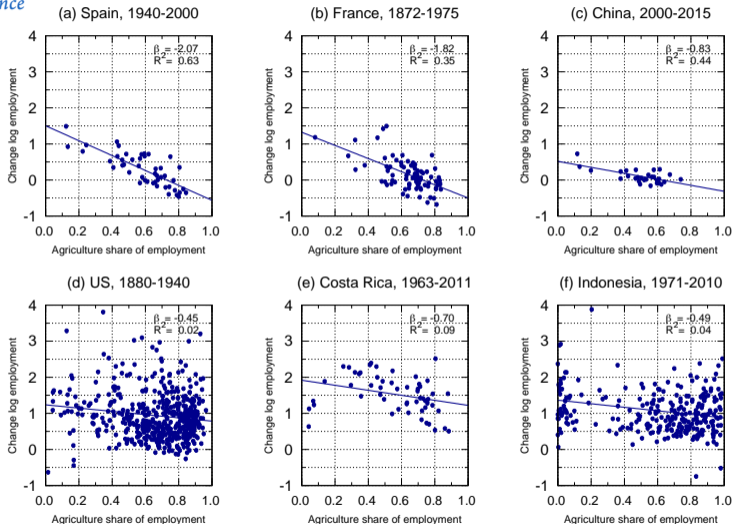
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Rural exodus (map)



Heterogeneity in development experiences

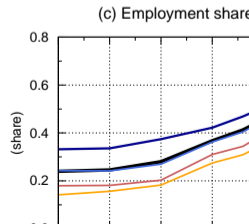
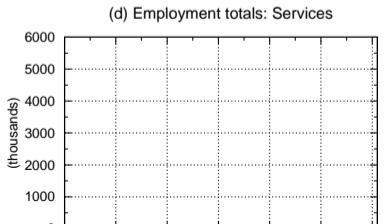
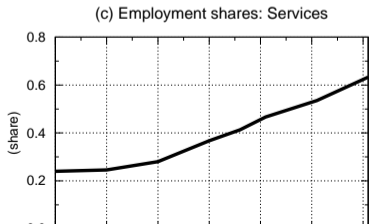
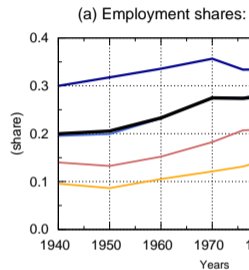
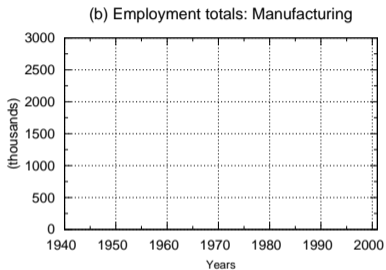
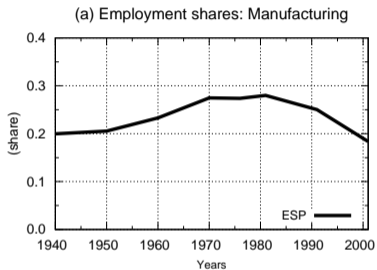
Some international evidence



Source. US from Eckert, Peters (2018), China from Hao et al (2020), Spain from Budí-Ors, Pijoan-Mas (2022), rest of countries from IPUMS International Census Database
 Budí-Ors, Pijoan-Mas

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Uneven regional industrialization



Model I

① Growth and structural change *a la* Duarte, Restuccia (2010)

- Closed economy w/ many regions $r = 1, 2, \dots, R$ and 3 sectors $j = a, m, s$
- Sector-region specific productivity
- Household preferences with non-unitary income and price elasticities

⇒ Usual two forces of structural change

② Migration *a la* Artuç, Chaudhuri, McLaren (2010)

- Workers move to locations with highest value
- Idiosyncratic taste shocks for locations
- Route-specific migration costs

⇒ Smooth upward-sloping labor supply in each region

Model II

③ Trade *a la* Eaton and Kortum (2002)

- Continuum of tradable varieties within each sector
- Variety-specific productivity in each region
- Route-specific iceberg trade costs

⇒ Regional trade driven by comparative advantage

- a) Intra-sectoral trade (share of imported sectoral value added)
- b) Inter-sectoral trade (difference between sectoral expenditure and employment shares)

⇒ Smooth downward-sloping labor demand in each region

• **Equilibrium:** regional wages w_r clearing the labor markets each period

- L supply: affected by migration costs and real wage differences across regions
- L demand: affected by trade costs and wage and productivity differences across regions

Migrations and (uneven) structural change

Outmigration from location r (say a decrease in migration costs $\mu_{r\ell} \forall \ell$) generates

- 1/ A decrease in labor supply L_r
- 2/ A decrease in labor demand L_{rj} that is
 - Asymmetric across sectors

$$\frac{\partial L_{rj}}{\partial L_r} = \left(\frac{\pi_{rrj} P_{rj} C_{rj}}{P_{rj} Y_{rj}} \right) \left(\frac{L_{rj}}{L_r} \right)$$

- Smaller than the fall in labor supply

- 3/ In equilibrium: an increase in w_r
 - a) Partly offsets decline in labor supply L_r
 - b) Decreases labour demand L_{rj} due to $\downarrow \pi_{r\ell j}$ (more so in more tradable sectors)
 - c) Changes in $P_{rj} C_{rj} / P_r Y_r$ due to income effects: changes in labor demand

\Rightarrow Uneven structural change induced by migration

Calibration

- We want the model to account for the Spanish development episode
 - Match data every ten years in the period 1940-2000
 - Productivity, employment, and gross migration flows*
- Large parameter space for $R = 47$ (provinces within mainland Spain)
 - Common across time and space:
 - preferences and elasticities
 - Time changing:
 - Productivity: sector-region specific
 - Trade costs: sector-route specific
 - Migration costs: route specific
- Challenge: identify trade costs w/o trade data
 - Correlation between sectoral employment and expenditure shares
 - Gervais and Jensen (2019)

Drivers of the heterogeneity in development patterns

- *What were the drivers of the rural exodus and uneven industrialization?*
 - 1) Decline in migration costs
 - 2) Early divergence in productivities across regions
 - Both together: account for difference between the US (1880-1940) and Spain
 - One by one: Spain similar to India (1987-2011) or Brazil (1980-2010)
- Why?
 - Both forces \uparrow migration from laggard to leading regions
 - \uparrow migration \Rightarrow Prevents industrialization in laggard areas
 - \rightarrow *Smaller demand for local manufactures in laggard areas (PE)*
 - \rightarrow *Limits wage growth in industrial provinces, allowing them to serve all country (GE)*

(Strength of both mechanisms depends on level of trade frictions)

Role of rural exodus

Without any population movement since 1940:

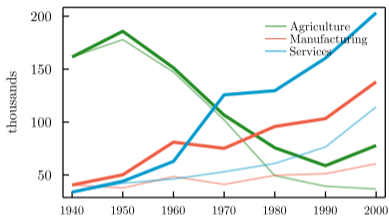
- ① Initially agrarian provinces would have also industrialized
 - Changes over time in productivity and trade costs were conducive of industrialization
- ② Spain in 2000 would have been a poorer and more agrarian country
(GDP growth: 38 pp less; ∇ Agr: 3.4 pp less; \triangle Ser: 8.8 pp less)
- ③ No de-industrialization at country level
 - Leading provinces cannot lever up industrial comparative advantage
 - Lower increase in industrial productivity at the aggregate (misallocation)
 - *Slower industrialization* (\triangle Man: 5.4 pp less)

Role of rural exodus

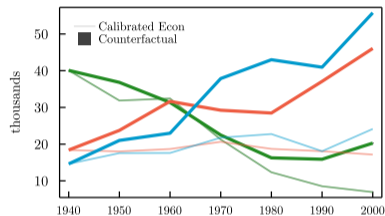
Lagging provinces

Laggard Provinces

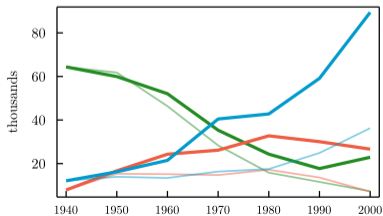
(a) Jaén: Emp. Levels



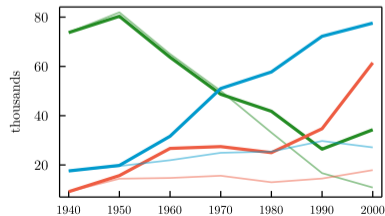
(b) Palencia: Emp. Levels



(c) Teruel: Emp. Levels



(d) Zamora: Emp. Levels



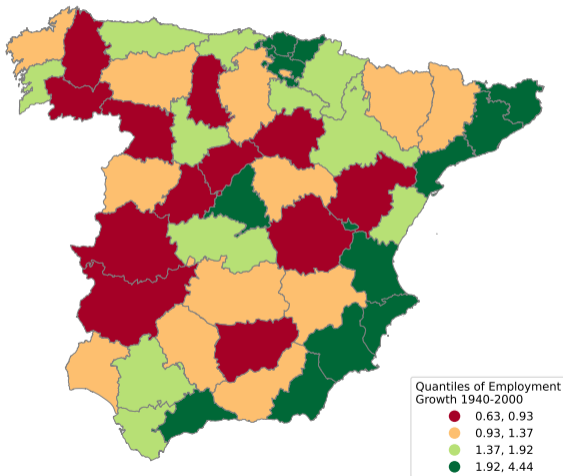
Concluding remarks

- Macroeconomic development shifts demand away from agriculture
- In Spain
 - Industrialization was concentrated in a few regions
 - More agrarian (and poorer) regions failed to industrialize
 - Farmers in those regions migrated and helped industrialization elsewhere
- We find
 - 1) Large role of productivity divergence and decline in migration costs for **rural exodus**
 - 2) The rural exodus is key for *industrial failure in laggard regions*
 - 3) The rural exodus accelerated *aggregate growth and structural change*
- Further work: understand differences in development patterns across countries
 - Factors affecting migration costs and technology diffusion seem first-order

The Spanish development experience

2. Rural exodus

Employment in 2000 relative to 1940



Consumption and Migration

Static problem w/ two sequential choices:

- 1) Location: individual i in location ℓ chooses r offering highest value

$$V_{\ell r}^i = \mathcal{V}(w_r, P_{ra}, P_{rm}, P_{rs}) - mc_{\ell r} + \kappa \epsilon_r^i$$

→ This delivers *bilateral migration flows* and *labor supply*

$$\underbrace{\rho_{\ell r} = \frac{\exp\left\{\frac{1}{\kappa}(\mathcal{V}(w_r, P_{ra}, P_{rm}, P_{rs}) - mc_{\ell r})\right\}}{\sum_k^R \exp\left\{\frac{1}{\kappa}(\mathcal{V}(w_k, P_{ka}, P_{km}, P_{ks}) - mc_{\ell k})\right\}}}_{\text{Share of people living in } \ell \text{ that move to } r}, \quad \underbrace{L_r = (1+n) \sum_{\ell}^R \rho_{\ell r} L_{\ell}^0}_{\text{Labor Supply in } r}$$

- 2) Consumption: agents maximize CRRA utility over non-homothetic c basket

$$\max u(c_r) \quad \text{s.t.} \quad P_{ra}c_{ra} + P_{rm}c_{rm} + P_{rs}c_{rs} = w_r$$

$$c_r = \left[\omega_a^{1/\nu} (c_{ra} + \bar{c}_a)^{\frac{\nu-1}{\nu}} + \omega_m^{1/\nu} (c_{rm} + \bar{c}_m)^{\frac{\nu-1}{\nu}} + \omega_s^{1/\nu} (c_{rs} + \bar{c}_s)^{\frac{\nu-1}{\nu}} \right]^{\frac{\nu}{\nu-1}}$$

→ *Indirect utility* of living in location r : $\mathcal{V}(w_r, P_{ra}, P_{rm}, P_{rs})$

→ Sectoral *expenditure shares* in location r

Production and Trade

Eaton and Kortum (2002)

- In each sector j and region r , production function for variety $x \in [0, 1]$

$$y_{rj}(x) = A_{rj}(x)L_{rj}(x)$$

- Regional trade of varieties subject to iceberg transport costs $\tau_{r\ell j} \geq 1$
- Firm optimization: $p_{r\ell j}(x) = \frac{w_r}{A_{rj}(x)} \tau_{r\ell j}$

- Local assembly of varieties into non-tradable sector j composite goods

- Consumers in location ℓ buy variety x of sector j from cheapest supplier:

$$p_{\ell j}(x) = \min_{r \in \{1, \dots, R\}} p_{r\ell j}(x)$$

- If productivity $A_{rj}(x)$ drawn from a Fréchet dbon $F_{rj}(A) = \exp\{-T_{rj}A^{-\theta_j}\}$

$$\Rightarrow P_{rj} = \gamma_j \underbrace{\left[\sum_{\ell}^R (w_{\ell} \tau_{\ell r j})^{-\theta_j} T_{\ell j} \right]^{-1/\theta_j}}_{\text{Price of region } r \text{ sector } j \text{ composite good}},$$

Price of region r sector j composite good

$$\pi_{r\ell j} = \underbrace{\frac{(w_r \tau_{r\ell j})^{-\theta_j} T_{rj}}{\sum_k^R (w_k \tau_{k\ell j})^{-\theta_j} T_{kj}}}_{\text{Share of } \ell \text{'s sector } j \text{ expenditure spent in } r \text{ varieties}}$$

Share of ℓ 's sector j expenditure spent in r varieties