

The Role of Local Public Goods for Fiscal Policy in the Spatial Economy

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Motivation

- Widespread use of public policies to reduce spatial disparities by stimulating distressed local economies and labour markets
 - e.g., US, UK, France, Germany, among others
- Essence of spatial policies:
 - **Efficiency:** Employment gains in less productive places might simply be the employment losses in more productive places (Glaeser & Gottlieb, 2008; Kline & Moretti, 2014)
 - **Equity:** Especially households in high non-employment areas may benefit from public policies, as the local labour supply adjusts more elastically, and fewer people migrate to these places, putting less pressure on local congestion and prices (Austin et al., 2018; Bartik, 2020)
- **Question:** Can spatial policies increase employment and equity w/o reducing overall output and welfare?

This Paper

We provide new evidence on the local and general equilibrium effects of fiscal policies under spatial mobility and extensive labour supply

Empirical Strategy

- **Quasi-experiment:** Exploit fiscal budget shocks (via the fiscal redistribution scheme) induced by erroneous accounting and forecasting of local population counts (Helm & Stuhler, 2020; Serrato & Wingender, 2016)
- **Identifying assumption:** The size of fiscal budget shock was unexpected and, arguably, exogenous to local economic conditions

Novel Theoretical Framework

- Quantify the importance of public policies by using spatial model with sorting of heterogeneous workers across local labour markets and sectors
- Incorporate extensive labour supply decisions that are shifted by local fiscal policy via multiplier effects from public-goods provision

Main Findings

Findings

- Fiscal budget shocks impact local labour market
 - **Main empirical fact:** (Negative) fiscal shock to local fiscal budgets (via Census shock) decreases workers' labour supply by approx 0.8 percentage points relative to control regions
- Local fiscal policy (via public goods provision) impacts on ...
 - ... labour supply decisions of heterogeneous workers
 - ... the spatial sorting of economic activity, as fiscal spending shocks trigger migration into regions with higher public good provision

Implication

- Due of regional differences in public spending & non-employment, spatial policies may increase employment and equity while limiting efficiency costs
 - ⇒ Marginal welfare effects are higher in regions with low initial public spending AND high non-employment

Empirical Evidence

Fiscal transfers in Germany and the 2011 Census Shock

- **Federal gov. & States:** Substantial fiscal redistribution scheme
Transfers
- **Goal:** Redistribute tax revenues to ensure "equal" living conditions
- **Complicated set of rules:**
 - Larger local population is associated with larger net transfers
 - Official population counts are carried out very irregularly, such that they are approximated via extrapolations ("Bevölkerungsfortschreibung") in the meantime
 - After a nation-wide Census, population counts and in turn fiscal transfers are "corrected" immediately 2011 Census Shock
 - Induces unexpected, but permanent spatial variation in fiscal capacities that is exogenous to economic and fiscal conditions
- **Volume:** More than 10% of German GDP, each year

Reduced-form Effects

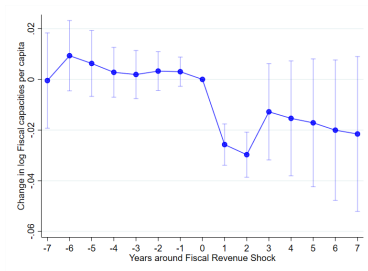
- **Main Concern:** Census Shock correlated with local economic trends that simultaneously predict local public finance and employment dynamics
- **Binary Treatment:** $D_{i,t} = 1$ for locations with a large negative Census shock (one SD below the mean)
- **Treatment Effects Strategy:** Let $\Delta Y_{i,t}^s(d) = Y_{i,t}^s(d) - Y_{i,t-1}$ denote the potential change in (log) outcome from time $t - 1$ to time $t + s$ (Serrato and Wingender, 2016)
- **Causal Effect:** of a change in treatment in t on outcome s periods thereafter for treated counties (ATET) is

$$\beta^s = \mathbb{E} [\Delta Y_{i,t}^s(1) - \Delta Y_{i,t}^s(0) | D_{i,t} = 1, D_{i,t} = 0]$$

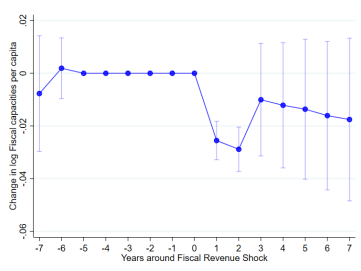
- **Assumption:** Selection on observables
 $\Delta Y_{i,t}^s(d) \perp D_{i,t} | Y_{i,t-1}^{t+1}, Y_{i,t-4}^{t+1}, \mathbb{I}\{District\}_{i,t}, \mathbb{I}\{Year\}_{i,t} \quad \forall s \geq 2$

Census shock on Fiscal capacities per capita

Inverse Probability Weighting (IPW)

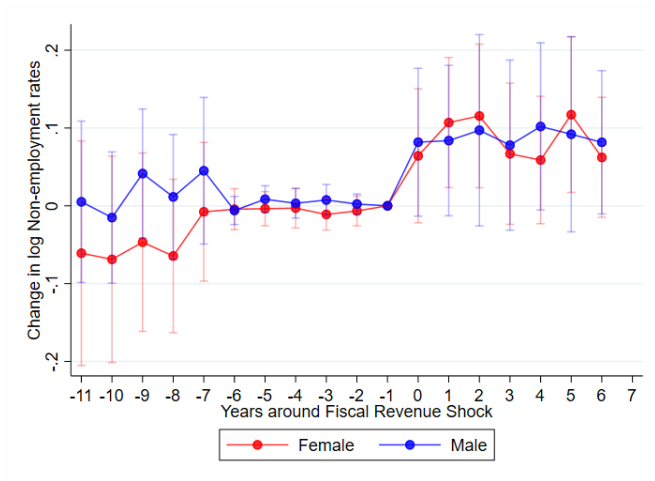


IPW with Regr. adjustment



Dynamic Effects on Non-Employment from IPW

Cumulative effect

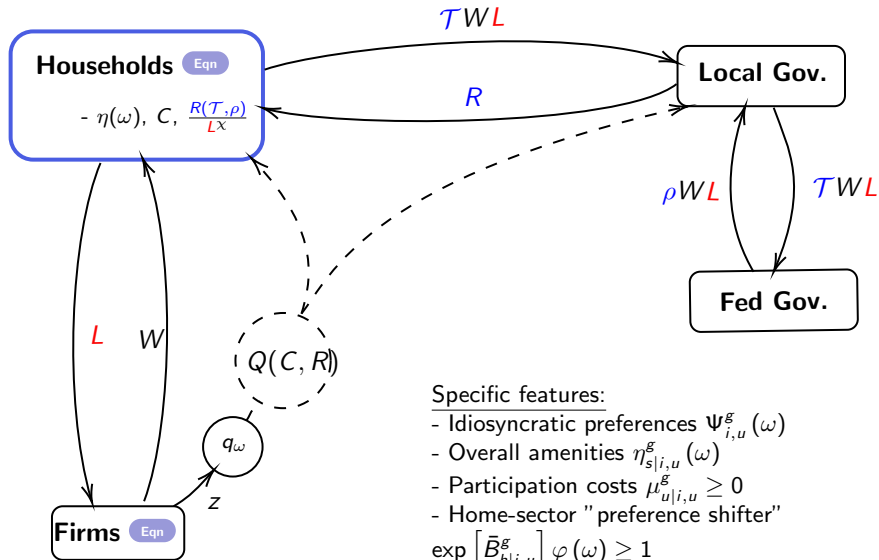


Model

Model Setup

- Provide a comprehensive account on the effects of fiscal policies under spatial mobility and extensive labour supply
- Quantitative spatial general equilibrium model
 - Sorting of heterogeneous workers across local labour markets (Diamond, 2016; Rossi-Hansberg et al., 2019)
 - Local governments supplying local public goods (Fajgelbaum et al., 2019), and a fiscal transfer scheme reallocates resources across jurisdictions (Henkel et al., 2021; Fajgelbaum & Gaubert, 2020)
- We extend the framework by introducing ...
 - ① Extensive labour supply decisions of heterogeneous worker groups that are shifted by local public-goods provision
 - ② Selection into occupational sectors based on comparative advantage or type-specific preferences (Hsieh et al., 2019; Burstein et al., 2020)

Model Outline



Specific features:

- Idiosyncratic preferences $\Psi_{i,u}^g(\omega)$
- Overall amenities $\eta_{s|i,u}^g(\omega)$
- Participation costs $\mu_{u|i,u}^g \geq 0$
- Home-sector "preference shifter"
 $\exp \left[\bar{B}_{h|i,u}^g \right] \varphi(\omega) \geq 1$
- Trade & Input-Output linkages

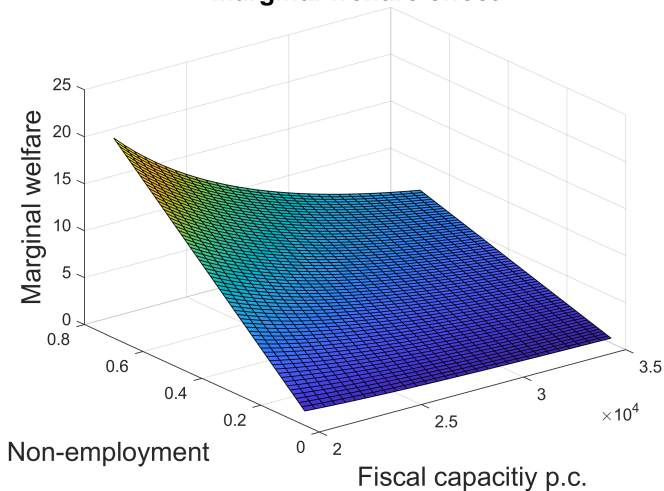
Welfare effect of public spending I

- **Case I** ($\rho_{h,R}^g = 0$): Local welfare elasticity of public expenditure is spatially invariant ($= \alpha$)
- **Case II** ($\rho_{h,R}^g > 0$): Local welfare elasticity of public expenditure is spatially invariant, as it shifts the cut-off level $\tilde{\varphi}_{s|i,u}^g$ for home-market-preference shocks (i.e. local labour supply)
 - (i) Positive fiscal externality via larger local tax revenues and a larger federal portfolio (and in turn local public goods $> \alpha$)
 - (ii) But also larger congestion of local public goods
- **Sufficient statistics:** initial wages, public expenditure, non-employment rates as well as structural parameters $\{\alpha, \epsilon^g, \rho_{h,R}^g, \rho_{h,C}^g\}$

Welfare effect of public spending II

Quantification: $\alpha = 0.2, \epsilon = 5, \rho_C = 0.0625, \rho_R = 0.051$

Marginal welfare effect

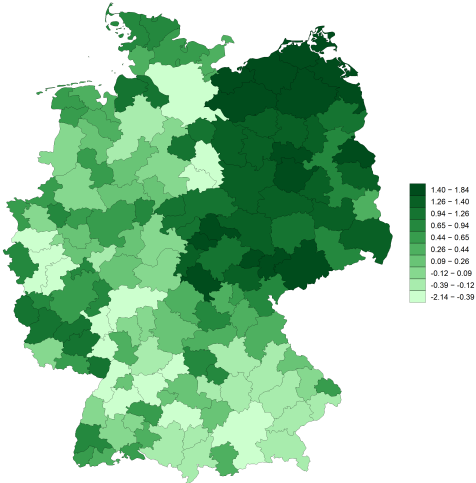


Quantification

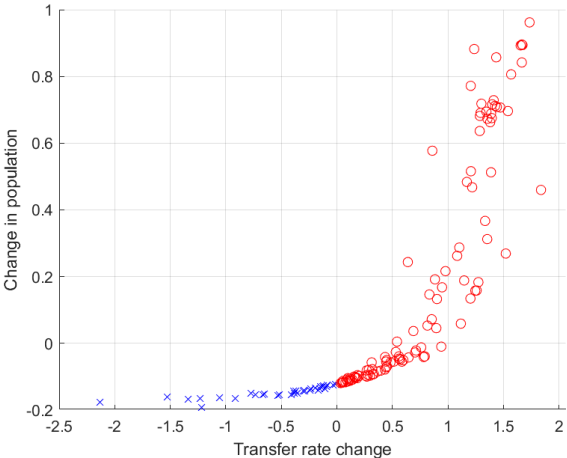
- Estimate/calibrate required model parameters to solve for initial spatial equilibrium in 2008 Parameters
- Use set of equations and parameters to uncover model-consistent prices, costs and initial distribution of amenities/productivity levels
- Counterfactual: Use the structure of the model to quantify importance of public policies for local labour supply decisions and the spatial distribution of economic activity and the aggregate economy

→ We simulate the model using changes in transfer rates due to massive investments in public childcare provision in Germany between 2008-2021

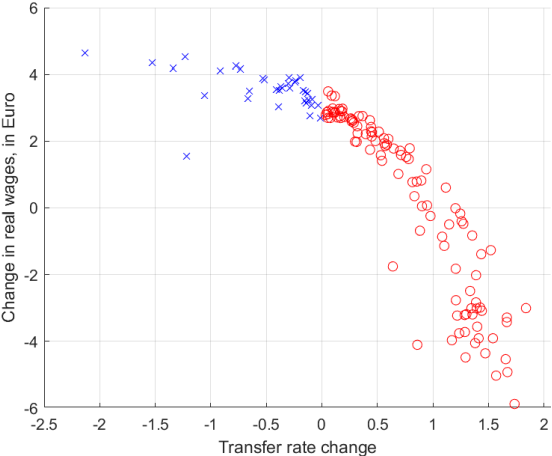
Implied fiscal redistribution from public policy (KiföG)



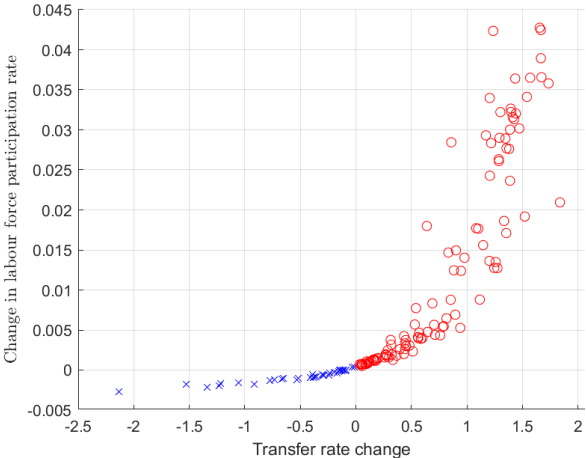
Population



Real Wage



Labour force participation



Aggregate effects

	$\rho_{h,R}^E > 0$		$\rho_{h,R}^E = 0$	
	Overall	Recipient	Overall	Recipient
<u>Panel A: Population and Employment</u>				
Δ Population (Male)	0	17,210	0	17,903
Δ Population (Female)	0	16,073	0	17,310
Δ Labour force (Male)	1,016	15,116	-190	14,428
Δ Labour force (Female)	2,875	14,592	1,139	13,644
Δ Labour force participation rate (Male)	0.004	0.007	-0.001	-0.000
Δ Labour force participation rate (Female)	0.011	0.018	0.004	0.006
<u>Panel B: Wages and prices</u>				
Δ Average wage (Male; in €)	-11.59	-11.17	-11.87	-11.43
Δ Average wage (Female; in €)	-6.78	-5.50	-6.68	-5.44
Δ Real wage (Male; in €)	1.49	0.08	1.64	0.22
Δ Real wage (Female; in €)	1.36	0.25	1.52	0.37
<u>Panel C: Aggregate measures</u>				
Δ Fiscal capacities (per capita; in €)	-8.36	42.90	-9.87	41.51
Δ Rent income (in %)	-0.237	-0.012	-0.246	-0.021
Δ National Portfolio	-0.079	-0.079	-0.096	-0.096
Δ Real GDP (in %)	-0.002	0.098	-0.006	0.094
Δ Welfare (Male; in %)	0.117	0.117	0.118	0.118
Δ Welfare (Female; in %)	0.115	0.115	0.118	0.118

Conclusion

- Exploit **random shocks** to **fiscal redistribution system** to estimate **local employment effects** of fiscal policies
- Combine reduced-form estimates with **novel spatial GE model** to analyse local fiscal expenditures, incorporating public good provision and local multiplier effects under spatial mobility
- **Spatial policies** may increase (i) **employment** and (ii) decrease **gender employment gaps**; hence increasing (iii) **equity** and (iii) **efficiency** given spatially-variant marginal utility from initial differences in public spending & non-employment

→ **NEXT STEPS:** Set-up simple examples to illustrate main mechanisms; Derive optimal tax and transfer rates

Additional material

Literature I

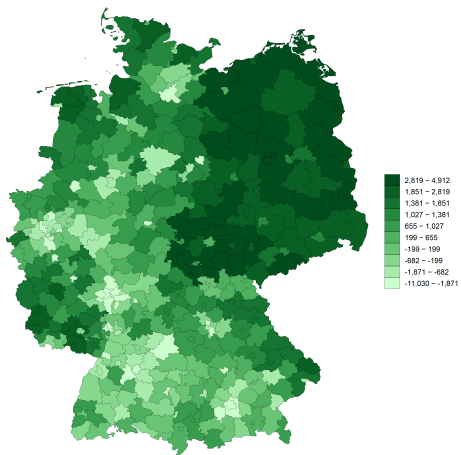
- **Optimal design of public policies under spatial mobility:** [Albouy et al., 2019; Colas and Hutchinson, 2021; Fajgelbaum and Gaubert, 2020; Fu and Gregory, 2019; Gaubert et al., 2021; Rossi-Hansberg et al., 2019; Fajgelbaum et al., 2019; Serrato and Zidar, 2016]
 - We jointly study the misallocation of workers across region-sector pairs and the extensive margin of labour supply → public policy may shift labour supply across both dimensions
 - We highlight an additional agglomeration force via fiscal budgets of local and federal governments & congestion costs on a region's amenities or public goods
 - Additional sources of inefficiency with distinct qualitative and quantitative implications for the design of spatial policies.
- **Evaluation of place-based policies:** [Kline and Moretti, 2013, 2014; Criscuolo et al., 2019]
 - We focus on the GE effects and optimality of public policies in the spatial economy

Literature II

- **Quantitative spatial general equilibrium models w/ unemployment:** [Adao et al., 2022; Carrere et al., 2020; Kim and Vogel, 2021; Bilal, 2020; Caliendo et al., 2019]
 - We focus on the impact of local fiscal expenditure on local labour supply and worker sorting and thus add a public finance component
- **Geographic cross-sectional fiscal spending multipliers”:** [Chodorow-Reich, 2019; Nakamura and Steinsson, 2014]
 - We combine quasi-random variation in local fiscal budgets induced by Census shocks [Helm and Stuhler, 2021; Serrato and Wingender, 2016] with rich administrative labour market data to estimate heterogeneous effects across different worker group
 - We argue that female workers' labour supply may react more elastically to local public good provision

- **Empirical literature documenting rel. btw. local public goods & labour force participation, especially among female workers:** [see Blau and Currie, 2006; and Olivetti and Petrongolo, 2017 for an overview; Crespo and Mira, 2014; Le Barbanchon et al., 2021; Dettling, 2017]
 - We bridge a gap between empirical literature and general equilibrium models, that allow precise predictions about counterfactual outcomes and welfare in the spatial economy

Fiscal transfers



Census shock and Fiscal Transfers

- Definition of Census shock (May, 2011):

$$\Delta \ln \text{Census}_{i,2011} \equiv (\ln L_{i,\text{Census}} - \ln L_{i,2010}) * 100$$

- Event study of Census shock on changes in fiscal transfers:

$$\Delta \text{Transferpc}_{i,t} = c_t + c_{j,t} + \sum_{s=T+k} \beta_s \Delta \ln \text{Census}_{i,2011} \times 1[t = s] + u_{i,t}$$

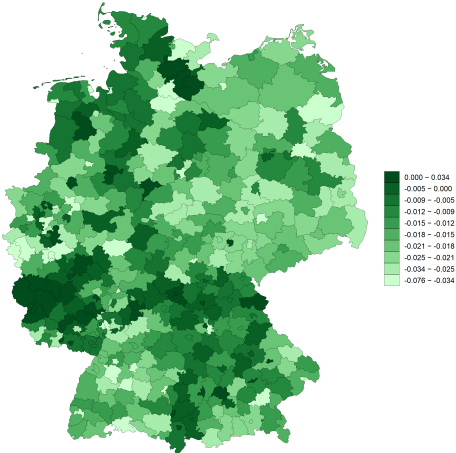
- No statistically significant impact in pre-periods

Correlation

Event Study - Yearly

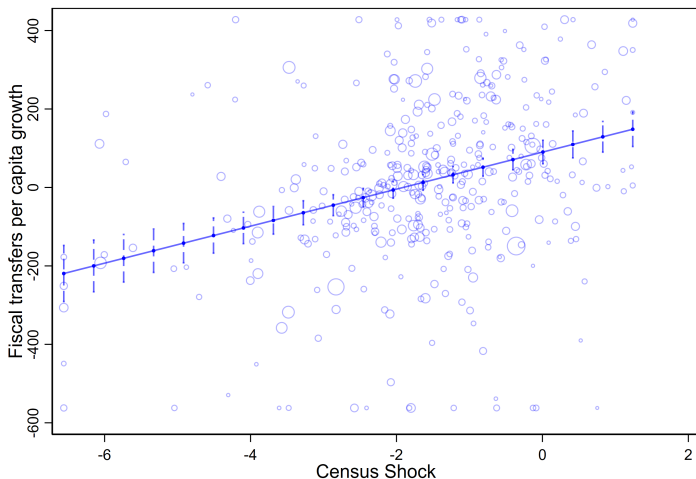
Event Study - Cumulative

Census Shock



Fiscal transfers and Census shock

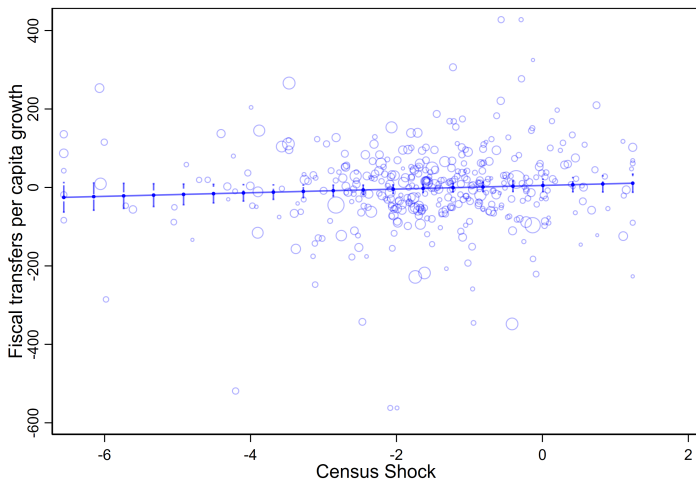
Fiscal transfer shock period



Source: Beta = 57.15; t-stat = 5.02; R-squared = 0.0610.

Fiscal transfers and Census shock II

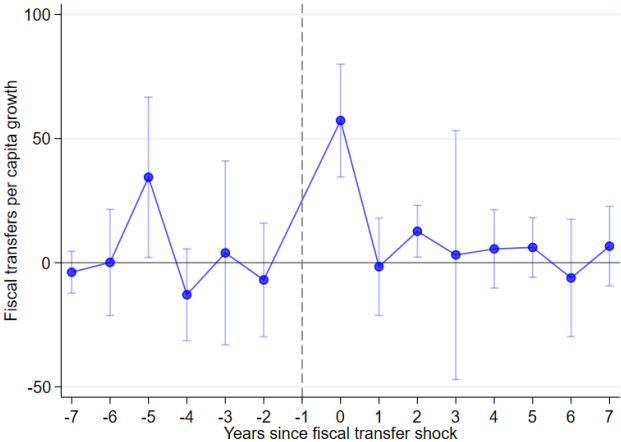
Fiscal transfer shock period



Source: Beta = 7.43; t-stat = 1.42; R-squared = 0.0062.

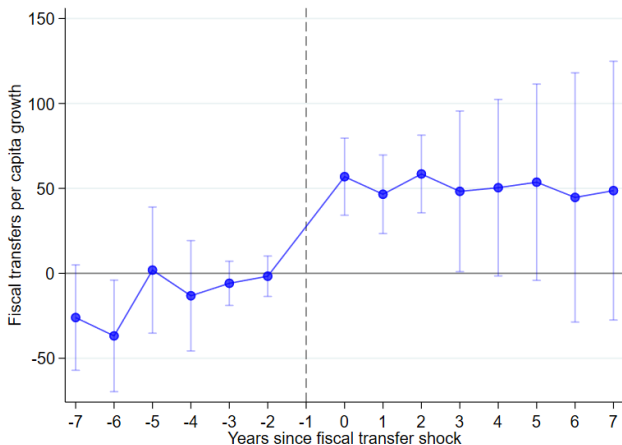
Fiscal transfer growth and Census shock

Yearly effect



Cumulative fiscal transfer growth and Census shock

Cumulative effect



Preferences

- Cobb-Douglas utility from the consumption of final goods produced by different sectors and local public goods

$$V_{s|i,u}^g(\omega) = \eta_{s|i,u}^g(\omega) \left(\frac{R_{s|i,u}}{L_i^\chi} \right)^\alpha \left(\frac{I_{s|i,u}^g}{P_i} \right)^{1-\alpha} \Psi_{i,u}^g(\omega),$$

- Overall idiosyncratic preference component:

$$\eta_{s|i,u}^g(\omega) = \begin{cases} \bar{A}_i^g \exp \left[\bar{B}_{h|i,u}^g \right] \varphi(\omega) & \text{if } s = h \\ \bar{A}_i^g \exp \left[-\mu_{u|i,u}^g \right] & \text{if } s = u \in M. \end{cases} \quad (1)$$

- Fréchet distributed (shape parameter $\theta^g > 1$; scale parameter 1) idiosyncratic preferences $\Psi_{i,u}^g(\omega)$ for living and working in region-sector pair $\{i, u\}$

Market and non-market compensation

- Wage income $w_{s|i,u}^g$ is taxed at local rate \mathcal{T}_i :

$$I_{s|i,u}^g = (1 - \mathcal{T}_i) w_{s|i,u}^g.$$

- Workers in the home market receive non-employment compensation and profit less from public good expenditure:

$$w_{s|i,u}^g = \begin{cases} (w_{u|i,u}^g)^{1-\rho_{h,C}^g} \\ w_{u|i,u}^g \end{cases} \quad \text{and} \quad R_{s|i,u} = \begin{cases} (R_{u|i,u})^{1-\rho_{h,R}^g} & \text{if } s = h \\ R_{u|i,u} & \text{if } s = u \in M, \end{cases}$$

with $\{\rho_{h,C}^g, \rho_{h,R}^g\} \in [0, 1]$

- Indirect utility is a function of the real wage, local public goods and the preference parameter $\eta_{i,s}^g(\omega)$:

$$V_{i,s}^g(\omega) = \eta_{i,s}^g(\omega) \left(\left[\frac{R_i}{L_i^X} \right]^{1-\rho_{h,R}^g} \right)^\alpha \left(\frac{[I_{i,s}^g]^{1-\rho_{h,C}^g}}{P_i} \right)^{1-\alpha}$$

Worker sorting and extensive labour supply I

- Timing:
 - (1) Workers first decide on place to live and work (incorporating expected wages and home market preferences)
 - (2) Afterwards, workers decide whether to supply labour (given random preference shock φ)
- Workers join labour force if attainable utility is higher
 \Rightarrow Unique region-sector-specific cut-off $\tilde{\varphi}_{i,s}^g$

$$\tilde{\varphi}_{s|i,u}^g = \left(\frac{1}{\mathcal{B}_{s|i,u}^g} \right) \left([w_{u|i,u}^g]^{\rho_{h,C}^g} \right)^{1-\alpha} \left([R_{s|i,u}]^{\rho_{h,R}^g} \right)^\alpha$$

with $\mathcal{B}_{i,s}^g \equiv \exp \left[\bar{B}_{i,h}^g + \mu_{i,s}^g \right] > 1$

- Idiosyncratic preferences φ are drawn from group-specific Pareto distribution:

$$G^g(\varphi) = 1 - \varphi^{-\epsilon^g}$$

Worker sorting and extensive labour supply II

- Number of workers in region i and sector s that end up joining the labour force

$$L_{i,s,m}^g = \left[1 - \left(\left(\frac{1}{B_{i,s}^g} \right) \left([l_{i,s}^g]^{\rho_{h,C}^g} \right)^{1-\alpha} \left(\left[\frac{R_i}{L_i^X} \right]^{\rho_{h,R}^g} \right)^\alpha \right)^{-\epsilon^g} \right] L_{i,s}^g$$

- In the first stage, workers choose regions and sectors to work in (incorporating future labour supply decision)
- Expected utility of worker (ω) in region-sector pair $\{i, s\}$ depends on market and non-market outcomes, prices, employment probabilities, structural parameters as well fundamental variables (Amenities, preferences)

Worker sorting and extensive labour supply III

- Preferences for regions/sectors are drawn from Fréchet distribution
- Average utility of workers of type g is

$$v^g = \Gamma\left(\frac{\theta^g - 1}{\theta^g}\right) \left(\sum_{s \in M} \sum_{i \in J} [\bar{V}_{i,s}^g]^{\theta^g} \right)^{\frac{1}{\theta^g}}$$

- Number of workers of type g choosing region i and market sector s :

$$L_{i,s}^g = \frac{(\bar{V}_{i,s}^g)^{\theta^g}}{\sum_{s \in M} \sum_{i \in J} (\bar{V}_{i,s}^g)^{\theta^g}} L^g,$$

Intermediate goods producers

- Firms in each region-occupation pair are able to produce many varieties of intermediate goods at differing productivities
- Productive inputs are the human capital of all groups, land and structures as well as materials
- The different labour types are imperfectly substitutable inputs to the production function

Final goods producers

- Intermediate goods are combined into a local CES bundle (final good)
- Local final goods goods are used as materials for the production of intermediate varieties as well as for final consumption and public good provision
- Final goods producers purchase varieties of intermediate goods from the location in which the acquisition cost is the least
- The share of expenditures in pair $\{i, s\}$ that accrues to occupation- s -goods from region j is

$$\pi_{ij,s} = \frac{(\lambda_{j,s} \tau_{ij,s})^{-\nu_s}}{\sum_{n \in J} (\lambda_{n,s} \tau_{in,s})^{-\nu_s}}$$

Production II

Market clearing

Back

Market clearing

- Immobile rentiers own land and structures and rent them at local rates
- Rentiers receive a constant share of the global portfolio of rent incomes
⇒ Allow for observable trade imbalances
- Local governments use local taxes and fiscal transfers to purchase final goods as input for local public good provision at local prices
- Market clearing on goods market as well as input factor clearing (labour, land and structures and materials) needed for identification of preference and demand shifters

Final goods producers

Parameters

Parameter	Description	Approach	Source
Production			
$\zeta^g = \{0.018, 0.032\}$	Productivity spillovers	Set	Ahlfeldt et al. (2020)
$\sigma^g = 2.5$	Elast. of substitution btw males and females	Set	Olivetti and Petrongolo (2014)
$\sigma = 5$	Elast. of substitution of varieties	Set	Head and Mayer (2014)
$\nu_s = 10$	Trade elasticity	Set	Head and Mayer (2014)
$\tau_{ij,s} = \{1, \dots, 1.03\}$	Trade cost	Est.	Trade flows from Schubert et al. (2014)
$1 - \kappa_i = \{0.05, \dots, 0.93\}$	Labour share in production	Cal.	Wage income/ Value added
$\delta_{i,s} = \{0.30, \dots, 0.65\}$	Share of value added	Cal.	Value added / Gross output
$\delta_{i,sv} = \{0, \dots, 0.32\}$	Share of material inputs	Cal.	Input-Output Tables
$\beta_s = \beta_s^R = \{0.001, \dots, 0.42\}$	Expenditure share	Fit.	Equation (42)
Preferences			
$\chi = \{0; 1\}$	Rivalry in public goods cons.	Set	Fajgelbaum et al. (2019); Henkel et al. (2021)
$\alpha = 0.2$	Cobb-Douglas preferences weight on public good	Set	Fajgelbaum et al. (2019); Henkel et al. (2021)
$\theta^g = 1.73$	Fréchet shape parameter	Set	Fajgelbaum et al. (2019)
$\epsilon^g = 5$	Pareto shape parameter	Cal.	Mean $(w_{u j,u}^g)^{(1-\rho_{h,c}^g)} = 0.6 \times \text{Mean}(w_{u j,u}^g)$
Extensive Labour Supply			
$1 - \rho_{h,c}^g = 0.938$	Non-employment comp./Wage income	Cal.	Chetty et al. (2011)
$1 - \rho_{h,R}^g = \{0.956; 0.943\}$	Non-employed public goods cons./Employed public goods cons.	Est.	Section B.2.2
Government			
$\tau_i = \{0.15, \dots, 0.33\}$	Regional tax rate	Cal.	Tax revenues
$\rho_i = \{-0.11, \dots, -0.27\}$	Transfer rate	Cal.	Transfer payments
$t_i = \{0, \dots, 0.09\}$	Share of national portfolio	Est.	Fiscal budget shares

Quantification