MIT 14.582 PhD International Economics II — Lectures 21-22: Economic Geography and Urban Economics (Policy) —

Dave Donaldson

Spring 2025

Plan for Today's Lecture

1. A Brief Overview of Place-Based Policies
2. Optimal Policy in the Presence of Externalities
    1. A Refresher on Pigouvian Taxation
    2. A Toy Economic Geography Model
3. Quantitative Exploration: Fajgelbaum and Gaubert (2020)

What Are Place-Based Policies?

- **Place-based policies =** policies that target specific places, where places could be neighborhood, city, or region
- **Examples:**
  - Appalachian Regional Commission
  - Tennessee Valley Authority
  - European Regional Development Fund
  - Special Economic Zones in China
- Place-based policies can take various forms:
  - Infrastructure investment (e.g. Tennessee Valley Authority)
  - Tax subsidies (e.g. new Amazon headquarter)
  - Special rules and regulations (e.g. S.E.Z.)

What is The Rationale for Place-Based Policies?

- **Redistribution rationale** (because of spatial inequality):
  - Large variation in income per capita across across cities and regions within the same country (Flint, MI vs. Greenwich, CT)
  - Subsidies to disadvantaged areas in the hope of helping the disadvantaged residents of those areas
- Popular among policy-makers, but skepticism among economists:
  - If the goal is to help the poor, why not just target poor directly via a more progressive tax system?
  - Those who benefit from place-based policies might not be the poorest:
    - Suppose workers perfectly mobile + housing supply completely inelastic
    - $\Rightarrow$ redistribution towards land owners in targeted areas, not workers
  - Hinges on how attached to a place we think people (the net payers/recipients of a presumptive redistributional policy) are

What is The Rationale for Place-Based Policies? (cted)

- **Efficiency rationale** (i.e. because of market failures)
- Kline and Moretti (ARE, 2014) offer the following list:
  1. *Public goods.* Public amenities (e.g. public safety) and productive public goods (e.g. roads) likely to be underprovided by private sector.
  2. *Agglomeration economies.* Spatial proximity among firms and workers may generate productivity spillovers. Similarly, proximity among consumers may affect the supply (or quality) of local amenities.
  3. *Labor market imperfections.* Labor market search frictions may lead the unemployment rate in a community to be inefficiently high.
  4. *Missing insurance/credit constraints.* Residents cannot insure themselves against local shocks, which may prevent them from smoothing consumption.
  5. *Pre-existing distortions.* Many government interventions that are ostensibly person based (e.g. income taxation, the minimum wage) generate spatially biased distortions.

Optimal Place-Based Policy in the Presence of Externalities

- In this lecture, we will focus on agglomeration economies:
  - Consistent with concentration of economic activity in dense areas
  - Consistent with positive correlation between productivity and density
  - Have seen studies with evidence for $\alpha_1, \alpha_2, \beta_1, \beta_2 \neq 0$ in recent lectures
- Existence of productivity (or amenity) spillovers $\Rightarrow$ Laissez-faire equilibrium unlikely to be efficient
- **Questions:**
  - Which areas should be subsidized/taxed relative to others?
  - How do optimal subsidies vary with agglomeration economies?
- **Background reading:**
  - Glaeser and Gottlieb (Brookings 2008), Kline and Moretti (ARE, 2014)
  - Recent survey: Fajgelbaum and Gaubert (2025 Hbk chapter)

A Refresher on Pigouvian Taxation

- Consider an Arrow-Debreu economy with:
  - continuum of identical consumers $i \in [0, 1]$
  - continuum of identical firms $j \in [0, 1]$
- **Preferences:**

$$U(x_i, \bar{x})$$

  where:
  - $x_i = (x_{i,1}, ..., x_{i,N})$ is vector of consumption of agent i
  - $\bar{x} = (\int x_{i,1} di, ..., \int x_{i,N} di)$ is the vector of aggregate consumption
- **Technology:**

$$F(x_j, \bar{x}) \leq 0$$

- The N "goods" here may correspond to goods consumed or labor supplied at different locations $\Rightarrow$ local amenity (β) and productivity (α) spillovers are nested.

Planner's Problem

- First-best allocation solves

$$\max_x \{U(x, \bar{x}) | F(x, \bar{x}) \leq 0\}$$

- At first-best allocation, for any pair of goods n and m, marginal rate of substitution must be equal to marginal rate of transformation:

$$\frac{U_{x_n} + U_{\bar{x}_n}}{U_{x_m} + U_{\bar{x}_m}} = \frac{F_{x_n} + F_{\bar{x}_n}}{F_{x_m} + F_{\bar{x}_m}}$$

Decentralized Equilibrium with Taxes

- Consider a decentralized equilibrium with linear commodity taxation + lump-sum transfers
  - Consumers face prices q and receive T_i
  - Firms face prices p
- Utility maximization problem:

$$\max_{x_i}\{U(x_i, \bar{x}) | q \cdot x_i = T_i\}$$

- Profit maximization problem:

$$\max_{x_j}\{p \cdot x_j | F(x_j, \bar{x}) \leq 0\}$$

Optimal Pigouvian Taxes

- First-order conditions of consumers and firms:

$$\frac{U_{x_n}}{U_{x_m}} = \frac{q_n}{q_m}$$
$$\frac{F_{x_n}}{F_{x_m}} = \frac{p_n}{p_m}$$

- To implement first-best, optimal taxes must hence achieve:

$$\frac{q_n/p_n}{q_m/p_m} = \frac{(1+\frac{F_{\bar{x}_n}}{F_{x_n}})}{(1+\frac{F_{\bar{x}_m}}{F_{x_m}})}\frac{(1+\frac{U_{\bar{x}_m}}{U_{x_m}})}{(1+\frac{U_{\bar{x}_n}}{U_{x_n}})}$$

- Note: only relative taxes matter $\Rightarrow$ we can set one tax to zero wlog

Toy Economic Geography Model

- Consider economy with two locations $n = 1, 2$
  - Goods produced by two locations = perfect substitutes + freely traded
  - Agents can split one unit of time between two locations
  - Uniform lump-sum transfer T
  - Will set taxes/subsidies on households (not firms) wlog

- **Agent i's Problem:**

$$\max_{\{c_{i,n}, \ell_{i,n}\}} \sum_n u_n(c_{i,n}) \ell_{i,n}$$

subject to:

$$\sum_n (1 + t_n) c_{i,n} \ell_{i,n} = \sum_n w_n (1 + s_n) \ell_{i,n} + T$$

$$\sum_n \ell_{i,n} = 1$$

Toy Economic Geography Model (Continued)

- **Firm j's problem:**

$$\max_{\{\ell_{j,n}\}} \sum_n A_n(\bar{\ell}_n)\ell_{j,n} - \sum_n w_n \ell_{j,n}$$

- **Market clearing:**

$$\sum_n \bar{c}_n \bar{\ell}_n = \sum_n A_n(\bar{\ell}_n)\ell_n$$
$$\sum_n \bar{\ell}_n = 1$$

- Local productivity spillover if $\gamma_n^P \equiv A_n'(\bar{\ell}_n)\bar{\ell}_n / A_n(\bar{\ell}_n) \neq 0$

Decentralized Equilibrium vs. Planner

- In decentralized equilibrium, $\{\bar{c}_n, \bar{\ell}_n\}$ solves:

$$\max_{\{c_n, \ell_n\}} \sum_n u_n(c_n)\ell_n$$

subject to:

$$\sum_n (1+t_n)c_n\ell_n = \sum_n A_n(\bar{\ell}_n)(1+s_n)\ell_n - [\sum_n s_n A_n(\bar{\ell}_n)\bar{\ell}_n - \sum_n t_n \bar{c}_n \bar{\ell}_n]$$

$$\sum_n \ell_n = 1$$

- In planner's solution, $\{\bar{c}_n, \bar{\ell}_n\}$ solves:

$$\max_{\{c_n, \ell_n\}} \sum_n u_n(c_n)\ell_n$$

subject to:

$$\sum_n A_n(\bar{\ell}_n)\ell_n = \sum_n c_n \ell_n \quad \text{and} \quad \sum_n \ell_n = 1$$

Decentralized Equilibrium vs. Planner

- **FOCs for (interior) decentralized equilibrium with taxes:**

$$u_1'(\bar{c}_1)/u_2'(\bar{c}_2) = (1+t_1)/(1+t_2)$$

$$u_1(\bar{c}_1) - u_2(\bar{c}_2) = u_1'(\bar{c}_1)/(1+t_1)$$
$$\times[(1+t_1)\bar{c}_1 - (1+t_2)\bar{c}_2 - A_1(\bar{\ell}_1)(1+s_1) + A_2(\bar{\ell}_2)(1+s_2)]$$

$$\sum \bar{c}_n \bar{\ell}_n = \sum A_n(\bar{\ell}_n)\bar{\ell}_n$$

$$\sum \bar{\ell}_n = 1$$

- **FOCs for (interior) planner's solution:**

$$u_1'(\bar{c}_1) = u_2'(\bar{c}_2)$$

$$u_1(\bar{c}_1) - u_2(\bar{c}_2) = u_1'(\bar{c}_1) \times [\bar{c}_1 - \bar{c}_2 - A_1(\bar{\ell}_1)(1+\gamma_1^P) + A_2(\bar{\ell}_2)(1+\gamma_2^P)]$$

$$\sum \bar{c}_n \bar{\ell}_n = \sum A_n(\bar{\ell}_n)\bar{\ell}_n$$

$$\sum \bar{\ell}_n = 1$$

Optimal Place-Based Policy

- To implement planner's solution we must have:

$$t_n = 0$$
$$s_n = \gamma_n^P$$

- Consistent with general Pigouvian tax formula. Here:

$$U(c_1, c_2, -\ell_1, -\ell_2, -\bar{\ell}_1, -\bar{\ell}_2) = \begin{cases} u_1(\frac{c_1}{\ell_1})\ell_1 + u_2(\frac{c_2}{\ell_2})\ell_2 & \text{if } \ell_1 + \ell_2 \leq 1 \\ -\infty & \text{if } \ell_1 + \ell_2 > 1 \end{cases}$$
$$F(c_1, c_2, -\ell_1, -\ell_2, -\bar{\ell}_1, -\bar{\ell}_2) = c_1 + c_2 - A_1(\bar{\ell}_1)\ell_1 - A_2(\bar{\ell}_2)\ell_2$$

where c_n is total consumption at a location (so c_n/ℓ_n is consumption flow if agent spends ℓ_n units of time in location n)

Place-Based Policy vs. Industrial Policy

- Recall model with EES in Bartelme, Costinot, Donaldson, and Rodriguez-Clare (2018)
- Consider a toy version of BCDR:
  - Two sectors indexed by n, each with EES
  - Consumer derives utility from consumption in each
- In decentralized equilibrium with taxes, $\{\bar{\ell}_n\}$ solves:

$$\max_{\ell_1, \ell_2} \; u(A_1(\bar{\ell}_1)\ell_1, A_2(\bar{\ell}_2)\ell_2)$$

subject to

$$\sum (1 + t_n) A_n(\bar{\ell}_n)\ell_n = 1 + \sum t_n A_n(\bar{\ell}_n)\bar{\ell}_n$$

Place-Based Policy vs. Industrial Policy

- **FOC for (interior) decentralized equilibrium with taxes:**

$$\frac{u_{c_1}(A_1(\bar{\ell}_1)\bar{\ell}_1, A_2(\bar{\ell}_2)\bar{\ell}_2)}{u_{c_2}(A_1(\bar{\ell}_1)\bar{\ell}_1, A_2(\bar{\ell}_2)\bar{\ell}_2)} = \frac{1+t_1}{1+t_2}$$

$$\sum \bar{\ell}_n = 1$$

- **FOC for (interior) planner's solution:**

$$\frac{u_{c_1}(A_1(\bar{\ell}_1)\bar{\ell}_1, A_2(\bar{\ell}_2)\bar{\ell}_2)}{u_{c_2}(A_1(\bar{\ell}_1)\bar{\ell}_1, A_2(\bar{\ell}_2)\bar{\ell}_2)} = \frac{1+\gamma_1^P}{1+\gamma_2^P}$$

$$\sum \bar{\ell}_n = 1$$

- So optimal "industrial" policy given by Pigouvian formula:

$$t_n = \gamma_n^P$$

- But note how, here, if $\gamma_1^P = \gamma_2^P$ then $t_1 = t_2$, but in that case any level of $t_1 = t_2$ would yield the same allocation (even $t_1 = t_2 = 0$)
  - So it's the heterogeneity in γ_n^P, rather than the level, that matters

Fajgelbaum and Gaubert (2020): Overview

1. **Economic geography model with spillovers**
   - Nest standard quantitative models (e.g. Allen Arkolakis 2014, Redding 2016)
   - Allows transfers across regions and workers
2. **Characterization of efficient spatial transfers and policies**
   - One skill group + constant elasticities $\Rightarrow$ uniform tax/subsidy over space
   - Multiple skill groups $\Rightarrow$ heterogeneous tax/subsidies over space
     - Decentralized sorting may be too strong under positive cross-spillovers
3. **Quantification on U.S. data across MSA's**
   - One skill group: spatial allocation is close to efficient
   - High and low skill: spatial efficiency calls for
     - stronger redistribution to low wage cities (particularly for high skill)
     - lower wage inequality in larger cities and weaker spatial sorting by skill

Preferences

- $j \in 1, ..., N$ city sites, $\theta \in \Theta$ worker types
  - free mobility
  - L_j^θ: population of type-θ workers in city j
- Utility of a type-θ worker in city j:

$$u_j^\theta = U\left(c_j^\theta, h_j^\theta\right) a_j^\theta\left(L_j^1, .., L_j^\Theta\right)$$

  - $U\left(c_j^\theta, h_j^\theta\right)$: traded and non-traded ("housing") consumption
  - $a_j^\theta\left(L_j^1, .., L_j^\Theta\right)$: local amenities of city j
    - endogenous to local population distribution

Technology

- **Labor services:**

$$N_j \equiv N\left(z_j^1 L_j^1, .., z_j^\Theta L_j^\Theta\right)$$

  - Imperfect substitution across groups of workers $1, ..., \Theta$
  - $z_j^\theta = z_j^\theta\left(L_j^1, .., L_j^\Theta\right)$: productivity may depend on local economic activity
- **Production:**
  - Tradables in j: $Y_j = Y_j\left(N_j^Y, I_j^Y\right)$
    - Q_{ji} exported to city i, iceberg cost $d_{ji} \geq 1$
  - Non Tradables: $H_j = H_j\left(N_j^H, I_j^H\right)$
    - DRS $\rightarrow$housing supply elasticity
  - Bundle of tradables consumed in j
    - $Q\left(Q_{1j,..,}Q_{Nj}\right) = C_j + I_j^Y + I_j^H$

Competitive Equilibrium

- **Problem of a type-θ worker:**

$$\max_{j,c,h} U(c,h)\, a_j^\theta$$
$$s.t.\ P_j c + R_j h = x_j^\theta$$

  - Expenditure: $x_j^\theta = w_j^\theta + b^\theta \Pi + t_j^\theta$

- **Optimality of location decisions:**

$$\frac{x_j^\theta}{\psi(P_j, R_j)} a_j^\theta = u^\theta \textbf{ if } L_j^\theta > 0$$

- **Competitive producers maximize profits:**
  - Wage of a type-θ worker in j: $w_j^\theta = W_j \frac{\partial N\left(z_j^1 L_j^1, \ldots, z_j^\Theta L_j^\Theta\right)}{\partial L_j^\theta}$.

- **Government budget balance = zero net transfers:**

$$\sum_j \sum_\theta L_j^\theta x_j^\theta = \sum_j \sum_\theta L_j^\theta w_j^\theta + \Pi$$

- **+ Market clearing conditions**

Planner's problem

- **Planner chooses** $\{L_j^\theta, c_j^\theta, h_j^\theta, Q_{ji}, I_j^Y, I_j^H\}$ **to solve**

$$\begin{aligned} & \max u^\theta \\ \text{s.t. : } & u^{\theta'} = \underline{u}^{\theta'} \quad \textit{for } \theta' \neq \theta \\ & + \text{feasibility constraints} \\ & + \text{spatial mobility constraint} \end{aligned}$$

  - for arbitrary $\underline{u}^{\theta'}$ (traces out the Pareto frontier)

Next: what characterizes an optimal allocation?

Optimal Expenditure Distribution

If the competitive equilibrium is efficient, then:

$$W_j \frac{dN_j}{dL_j^\theta} + \sum_{\theta'} \frac{x_j^{\theta'} L_j^{\theta'}}{a_j^{\theta'}} \frac{\partial a_j^{\theta'}}{\partial L_j^\theta} - x_j^\theta = E^\theta, \ \forall \text{j with } L_j^\theta > 0 \quad (\mathcal{E}^*)$$

where E^θ are constants that depend on planner weights.

Optimal Expenditure Distribution

If the competitive equilibrium is efficient, then:

$$W_j \frac{dN_j}{dL_j^\theta} + \sum_{\theta'} \frac{x_j^{\theta'} L_j^{\theta'}}{a_j^{\theta'}} \frac{\partial a_j^{\theta'}}{\partial L_j^\theta} - x_j^\theta = E^\theta, \ \forall \text{j with } L_j^\theta > 0 \quad (\mathcal{E}^*)$$

where E^θ are constants that depend on planner weights.

- Intuition: reflects equalization of marginal welfare effect of worker θ in all j. Marginal worker θ in city j:

Optimal Expenditure Distribution

If the competitive equilibrium is efficient, then:

$$W_j \frac{dN_j}{dL_j^{\theta}} + \sum_{\theta'} \frac{x_j^{\theta'} L_j^{\theta'}}{a_j^{\theta'}} \frac{\partial a_j^{\theta'}}{\partial L_j^{\theta}} - x_j^{\theta} = E^{\theta}, \ \forall \text{j with } L_j^{\theta} > 0 \quad (\mathcal{E}^*)$$

where E^{θ} are constants that depend on planner weights.

- Intuition: reflects equalization of marginal welfare effect of worker θ in all j. Marginal worker θ in city j:
  - Increases production and spillovers to other workers' productivity $\left(W_j \frac{dN_j}{dL_j^{\theta}}\right)$

Optimal Expenditure Distribution

If the competitive equilibrium is efficient, then:

$$W_j \frac{dN_j}{dL_j^\theta} + \sum_{\theta'} \frac{x_j^{\theta'} L_j^{\theta'}}{a_j^{\theta'}} \frac{\partial a_j^{\theta'}}{\partial L_j^\theta} - x_j^\theta = E^\theta, \;\; \forall \text{j with } L_j^\theta > 0 \quad (\mathcal{E}^*)$$

where E^θ are constants that depend on planner weights.

- Intuition: reflects equalization of marginal welfare effect of worker θ in all j. Marginal worker θ in city j:
  - Increases production and spillovers to other workers' productivity $\left(W_j \frac{dN_j}{dL_j^\theta} \right)$
  - Generates amenity spillovers on other workers $(\sum_{\theta'} \frac{x_j^{\theta'} L_j^{\theta'}}{a_j^{\theta'}} \frac{\partial a_j^{\theta'}}{\partial L_j^\theta})$
    - Translated in consumption terms

Optimal Expenditure Distribution

If the competitive equilibrium is efficient, then:

$$W_j \frac{dN_j}{dL_j^\theta} + \sum_{\theta'} \frac{x_j^{\theta'} L_j^{\theta'}}{a_j^{\theta'}} \frac{\partial a_j^{\theta'}}{\partial L_j^\theta} - x_j^\theta = E^\theta, \ \forall \text{j with } L_j^\theta > 0 \quad (\mathcal{E}^*)$$

where E^θ are constants that depend on planner weights.

- Intuition: reflects equalization of marginal welfare effect of worker θ in all j. Marginal worker θ in city j:
  - Increases production and spillovers to other workers' productivity $\left(W_j \frac{dN_j}{dL_j^\theta}\right)$
  - Generates amenity spillovers on other workers $(\sum_{\theta'} \frac{x_j^{\theta'} L_j^{\theta'}}{a_j^{\theta'}} \frac{\partial a_j^{\theta'}}{\partial L_j^\theta})$
    - Translated in consumption terms
  - Consumes locally $\left(x_j^\theta\right)$

Role of Spatial Forces

If the competitive equilibrium is efficient, then:

$$W_j \frac{dN_j}{dL_j^{\theta}} + \sum_{\theta'} \frac{x_j^{\theta'} L_j^{\theta'}}{a_j^{\theta'}} \frac{\partial a_j^{\theta'}}{\partial L_j^{\theta}} - x_j^{\theta} = E^{\theta}, \ \forall \text{j with } L_j^{\theta} > 0 \quad (\mathcal{E}^*)$$

where E^{θ} are constants that depend on planner weights.

- Extension of familiar "MPL=constant" efficiency condition to a spatial economy.

  MPL-MCC=constant

  - MCC: marginal consumption cost
  - Production and consumption decisions are not separable

Role of Spatial Forces

If the competitive equilibrium is efficient, then:

$$W_j \frac{dN_j}{dL_j^{\theta}} + \sum_{\theta'} \frac{x_j^{\theta'} L_j^{\theta'}}{a_j^{\theta'}} \frac{\partial a_j^{\theta'}}{\partial L_j^{\theta}} - x_j^{\theta} = E^{\theta}, \ \forall \text{j with } L_j^{\theta} > 0 \quad (\mathcal{E}^*)$$

where E^{θ} are constants that depend on planner weights.

- Extension of familiar "MPL=constant" efficiency condition to a spatial economy.

  MPL-MCC=constant

  - MCC: marginal consumption cost
  - Production and consumption decisions are not separable
- Spatial forces make MCC non constant across cities:
  - Trade costs
  - City amenities
  - Housing

Role of Spatial Forces

If the competitive equilibrium is efficient, then:

$$W_j \frac{dN_j}{dL_j^\theta} + \sum_{\theta'} \frac{x_j^{\theta'} L_j^{\theta'}}{a_j^{\theta'}} \frac{\partial a_j^{\theta'}}{\partial L_j^\theta} - x_j^\theta = E^\theta, \ \forall \text{j with } L_j^\theta > 0 \quad (\mathcal{E}^*)$$

where E^θ are constants that depend on planner weights.

- Extension of familiar "MPL=constant" efficiency condition to a spatial economy.

  MPL-MCC=constant

  - MCC: marginal consumption cost
  - Production and consumption decisions are not separable
- Spatial forces make MCC non constant across cities:
  - Trade costs
  - City amenities
  - Housing
- Information about $\{x_j^\theta\}$ needed to assess efficiency, on top of $\{w_j^\theta\}$

Role of Spatial Forces

If the competitive equilibrium is efficient, then:

$$W_j \frac{dN_j}{dL_j^\theta} + \sum_{\theta'} \frac{x_j^{\theta'} L_j^{\theta'}}{a_j^{\theta'}} \frac{\partial a_j^{\theta'}}{\partial L_j^\theta} - x_j^\theta = E^\theta, \ \forall j \text{ with } L_j^\theta > 0 \quad (\mathcal{E}^*)$$

where E^θ are constants that depend on planner weights.

- Extension of familiar "MPL=constant" efficiency condition to a spatial economy.

  MPL-MCC=constant

  - MCC: marginal consumption cost
  - Production and consumption decisions are not separable
- Spatial forces make MCC non constant across cities:
  - Trade costs
  - City amenities
  - Housing
- Information about $\{x_j^\theta\}$ needed to assess efficiency, on top of $\{w_j^\theta\}$
- Optimum features transfers: $x_j^\theta \neq w_j^\theta$

Implementation

Next: what policy implements the optimal $\left\{x_j^\theta\right\}$?

- Assume *concavity* of the planner's problem. Then:
- Condition is *sufficient* for efficiency
  - There is a unique market equilibrium where condition $(\mathcal{E}^*)$ holds
- Next: consider a policy that fixes distribution of expenditures x_j^θ conditional on wages w_j^θ
  - Allocation fully determined given x_j^θ

Spillover Elasticities

- Productivity spillover:

$$\gamma_{\theta,\theta'}^{P,j} \equiv \frac{L_j^{\theta}}{z_j^{\theta'}} \frac{\partial z_j^{\theta'}}{\partial L_j^{\theta}}$$

- Amenity spillover:

$$\gamma_{\theta,\theta'}^{A,j} \equiv \frac{L_j^{\theta}}{a_j^{\theta'}} \frac{\partial a_j^{\theta'}}{\partial L_j^{\theta}}$$

Transfers

- Productivity spillover:

$$\gamma_{\theta,\theta'}^{P,j} \equiv \frac{L_j^\theta}{z_j^{\theta'}} \frac{\partial z_j^{\theta'}}{\partial L_j^\theta}$$

- Amenity spillover:

$$\gamma_{\theta,\theta'}^{A,j} \equiv \frac{L_j^\theta}{a_j^{\theta'}} \frac{\partial a_j^{\theta'}}{\partial L_j^\theta}$$

- Transfers:
  - govern distribution of expenditures x_j^θ conditional on wages w_j^θ

$$x_j^\theta - w_j^\theta = \tau_j^\theta w_j^\theta + T_j^\theta$$

Optimal Policies

- Productivity spillover:

$$\gamma^{P,j}_{\theta,\theta'} \equiv \frac{L^{\theta}_j}{z^{\theta'}_j} \frac{\partial z^{\theta'}_j}{\partial L^{\theta}_j}$$

- Amenity spillover:

$$\gamma^{A,j}_{\theta,\theta'} \equiv \frac{L^{\theta}_j}{a^{\theta'}_j} \frac{\partial a^{\theta'}_j}{\partial L^{\theta}_j}$$

- Transfers:

$$x^{\theta}_j - w^{\theta}_j = \tau^{\theta}_j w^{\theta}_j + T^{\theta}_j$$

The optimal allocation can be implemented by the labor income subsidies

$$\tau^{\theta}_j = \frac{\gamma^{P,j}_{\theta,\theta} + \gamma^{A,j}_{\theta,\theta} + \sum_{\theta' \neq \theta} \frac{\gamma^{P,j}_{\theta,\theta'} w^{\theta'}_j + \gamma^{A,j}_{\theta,\theta'} x^{\theta'}_j}{w^{\theta}_j} \frac{L^{\theta'}_j}{L^{\theta}_j}}{1 - \gamma^{A}_{\theta,\theta}}$$

coupled with transfers T^{θ}_j that target planner's Pareto weights.

Special Cases

- Single worker type, constant elasticities:

$$\tau = \frac{\gamma^P + \gamma^A}{1 - \gamma^A}$$

  - (τ, T) constant over space
  - "Place-based" policies not place-specific, but distort allocation

- Two worker types, only cross-productivity spillovers:

$$\tau_j^\theta = \gamma^P_{\theta,\theta'} \left(\frac{w_j^{\theta'} L_j^{\theta'}}{w_j^\theta L_j^\theta} \right)$$

  - If $\gamma^P_{\theta,\theta'} > 0$, type θ subsidized more where "scarce"

- Other applications (in paper)
  - Optimal trade imbalances in economic geography models
  - Monopolistic competition
  - Government spending in local public goods
  - Idiosyncratic preference draws within type

Quantitative Implementation

1. Assume constant elasticity (CES or CD) functional forms for all functions

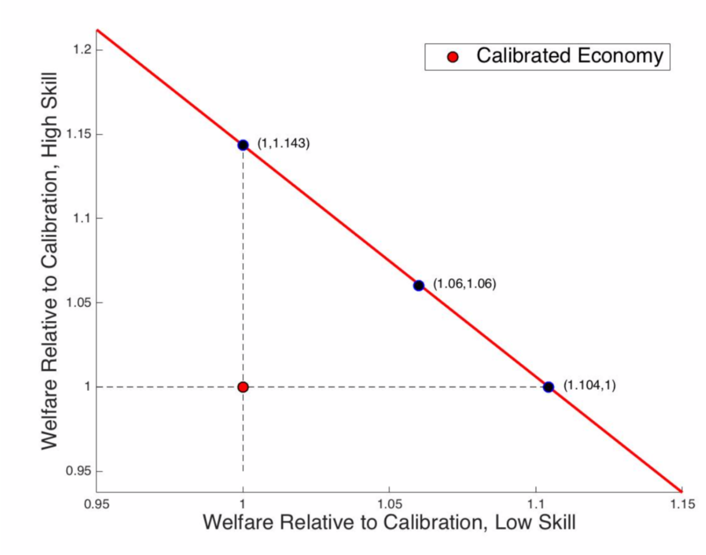
2. Derive concavity condition on spillover elasticites $\left(\gamma^{A}_{\theta',\theta}, \gamma^{P}_{\theta',\theta}\right)$

3. Sufficient data to implement model given elasticities
    - Wages, employment and expenditure over types and cities
    - Trade flows over cities

4. U.S. data across MSA's for college and non-college workers in 2007
    - By MSA: BEA Regional Economic Accounts
        - Income, Taxes, Transfers -> Disposable Income
    - Breakdown by skill group: March CPS
        - Controlling for socio-demographic characteristics

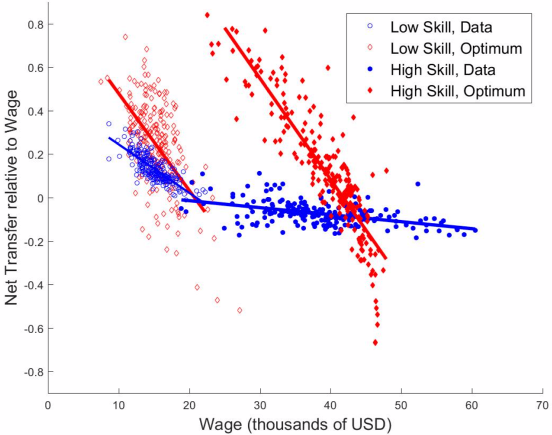
5. Spillover elasticities $\left(\gamma^{A}_{\theta',\theta}, \gamma^{P}_{\theta',\theta}\right)$ to match prior estimates
    - Diamond (2016)
    - Ciccone and Hall (1996), Kline and Moretti (2014)
    - $(\gamma^{A}_{U,U}, \gamma^{A}_{S,U}, \gamma^{A}_{U,S}, \gamma^{A}_{S,S}) = (-0.43, 0.18, -1.24, 0.77)$
    - $(\gamma^{P}_{U,U}, \gamma^{P}_{S,U}, \gamma^{P}_{U,S}, \gamma^{P}_{S,S}) = (0.003, 0.044, 0.02, 0.053)$

Utility Frontier



Actual vs. Optimal Transfers

Spatial efficiency requires stronger redistribution, in particular for high skill workers

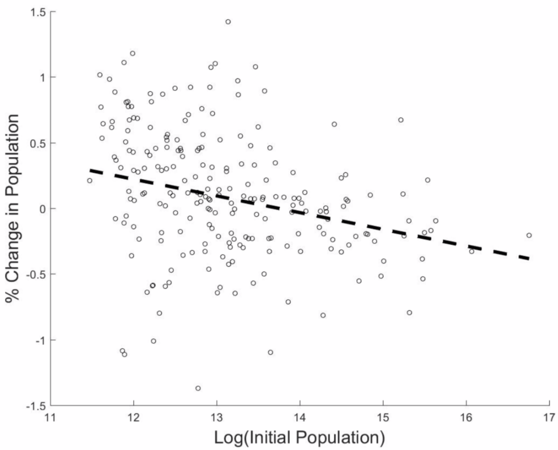


Slope Low Skill: -0.02; -0.04

Slope High Skill: -0.003; -0.05

Reallocation to Smaller Cities

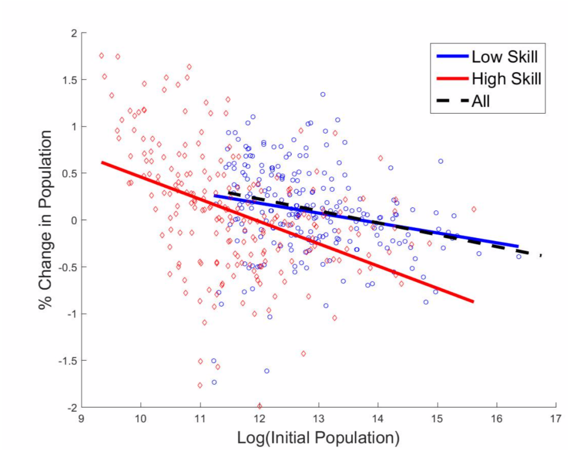
Smaller cities grow more...



Slope: -0.12 (0.03)

Stronger Reallocation for High Skill Workers

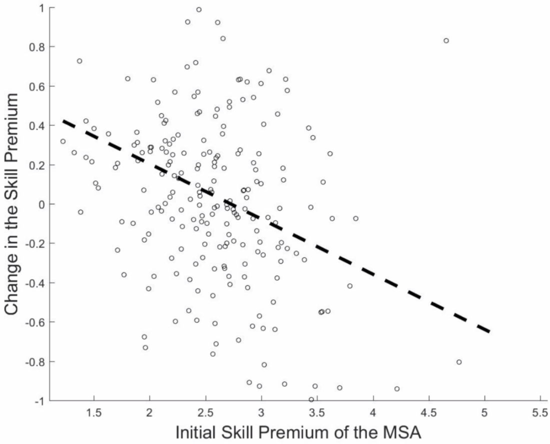
...in particular through reallocation of high skill workers...



All workers : -0.12 (0.03)
High skill: -0.24 (0.04)
Low Skill: -0.10 (0.03)

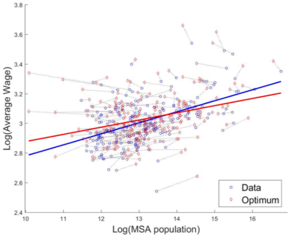
Changes in Skill Premium

...leading to a fall in skill premium in initially more unequal cities.

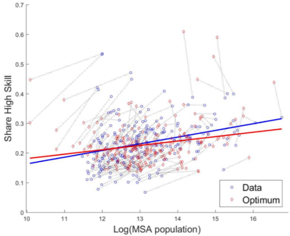


Slope: -0.27 (0.06)

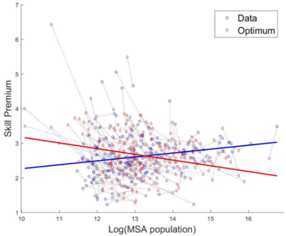
Urban Premia: Data and Optimal Allocation



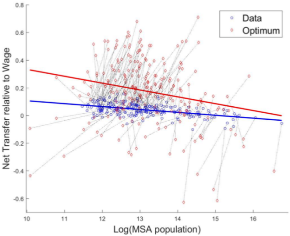
(e) Wage



(f) High Skill Share



(g) Skill Wage Premium



(h) Transfers relative to Wages

Summary: Fajgelbaum and Gaubert (2020)

- **Develop framework nesting:**
  - Quantitative economic geography
  - Heterogeneous workers with spillovers
  - Key generalization: arbitrary transfers across regions and workers
- **Characterization of first best allocation and optimal transfers**
  - Key role for expenditure distribution in driving efficiency
  - Constant subsidy over space implements first best with homogeneous workers
  - Spillovers across heterogeneous workers create a rationale for place-specific policies
- **Quantification**
  - 6.1% welfare gains from optimal reallocation for all workers
  - Optimal spatial transfers feature stronger redistribution to low-income cities
    - weaker sorting
    - no urban skill premium
  - Key role of skill heterogeneity and spillovers across worker types

More Recent Work on Place-Based Policies

- Fajgelbaum and Schaal (ECMA, 2020):
  - Study optimal placement of transportation infrastructure linkages (and hence entire networks)
  - General problem would be intractable (combinatorial programming—like "traveling salesman" on steroids, squared)
  - But F&S (2020) studies an interesting sub-problem of smooth investment (all links considered have interior solution) in which always enough congestion on each link that overall planner's problem is smooth and concave
  - Ends up being highly tractable
  - Best alternative is heuristics approach, like Adler (2017)
- Gaubert, Kline and Yagan (2020):
  - Back to general place-based policy problem like F&G (2020
  - But now explicitly redistributional motive
  - And can only tax income linearly (Mirrlees problem), rules out lump-sum tax/transfer
  - Place can act as a "tag" (Akerlof, 1978), so optimal tax scheme depends on both income and place