State subsidies and the spatial allocation of production: Evidence from the US manufacturing industry

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Overview

Introduction

Model

Calibration

A world without subsidies
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A world without subsidies
Place-based subsidies are ubiquitous and controversial

Amazon HQ2: How New York and Virginia Won the Beauty Contest
Eager candidates offered name changes, helipads and even cactuses to entice the company into setting up shop.

Wisconsin’s Deal With Foxconn Was as Bad as They Come
The state offered billions to win a big factory.

Opportunity Zones: Can a tax break for rich people really help poor people?

Apple's 22-Year Tax Break Part of Billions in California Bounty
Where are subsidies important?

Ratio of total manufacturing subsidies to total manufacturing output

Source: Good Jobs First Subsidy Tracker database; Commodity Flow Survey
Relevant literature

- Local and state governments spend $30-40 billion per year on place-based subsidies (Moretti 2011)

- Firm location decisions are sensitive to government policy:
  - State and local subsidies attract increased business activity (Simone et al. 2019, Harger and Ross 2014);
  - Subsidiary location decisions for multinational corporations are sensitive to bilateral tax rates (Barrios et al. 2012);
  - US firm location choice varies based on state corporate and income tax (Fajgelbaum et al. 2019);

- Subsidies increase local labor demand (Busso, Gregory, Kline 2013; Criscuolo et al. 2019)

⇒ What are the general equilibrium impacts of state and local production subsidies?
Preview of results

- Build a general equilibrium model to assess trade-offs between increased local labor demand and aggregate distortions induced by state production subsidies;
  - Build on model of firm location choice in Arkolakis et al. 2017
  - Validate key model predictions in the data
- Calibrate with microdata on firm productivity and subsidy payments in the US manufacturing industry;
  - Low productivity states tend to offer higher subsidies;
- Eliminating subsidies increases total welfare by 1.1% – but creates both winners and losers
  - States with high subsidies mostly experience welfare losses
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Model setup

- **Geography:** The country is partitioned into discrete regions (states);

- **Consumers:**
  - Representative consumer in each region has CES preferences over a continuum of goods;
  - Fixed labor endowment inelastically supplied in each region.

- **Production:**
  - Firms produce differentiated product using labor as only input;
  - National firms receive correlated productivity draw in each region;
  - To sell in each destination market, firms can either:
    1. Produce in same location as headquarters;
    2. Open subsidiary to produce in destination market;
    3. Open subsidiary in third location, and ship to destination.
  - For each destination market, firms choose production location that maximizes profit.
Supply chain

\[ \text{Headquarters} \]
\[ \text{Subsidiary} \]
\[ \text{Destination} \]

\[ \text{Draw} \]
\[ (z_1, \ldots, z_N) \in G_i \]

\[ \text{Produce at cost} \]
\[ s_l \ast \left( \gamma_{il}w_l \right) / z_l \]

\[ \text{Sell at price} \]
\[ \sigma \ast s_l \ast \left( \gamma_{il}w_l \tau_{ln} \right) / z_l \]
Structure of production subsidies

States exogenously offer iceberg subsidies $s_l$ according to the following rule:

$$s_l = \frac{A_l}{z_l^\beta}$$

- $A_l$ represents a state-specific shifter;
- $\beta$ captures preference for subsidizing more productive firms.

**Prediction:** The total subsidy paid to any individual firm is increasing in: (1) total wages paid to employees; and (2) total productivity

⇒ Supported in sample of firm-specific subsidy records from Good Jobs First matched to Orbis BvD balance-sheet data
Distribution of productivity levels

Assume that productivity vector drawn from $G_i$, where:

$$G_i(z) = \Pr(Z_1 \leq z_1, \ldots, Z_N \leq z_N) = 1 - \left( \sum_{k=1}^{N} \left( T_l(z_k) - \theta \right)^{\frac{1}{1-\rho}} \right)^{1-\rho}$$

- Pareto Type I marginal CDFs with regional shifter $T_k$ and shape parameter $\theta$;
- Correlation across states governed by $\rho$

**Prediction:** Raising subsidy payments increases the likelihood that firms locate in a given state

$\Rightarrow$ Supported using conditional fixed effects logit regression on Orbis BvD panel of subsidiary location choices for multi-establishment US firms
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Calibration procedure

- **Productivity parameters**: Two-step procedure (using Orbis BvD microdata):
  - Estimate shifters $T_i$ and shape parameter $\theta$ using quantiles estimator, with adjustments to make data representative of population of US firms;
  - Estimate correlation parameter $\rho$ using maximum likelihood.

- **Subsidy parameters**: Match model-generated ratio of total subsidy to total production in each state to the data, and discipline using microdata estimates in matched subsidy - balance sheet sample;

- **Trade costs, MP costs, marketing costs**: Standard gravity techniques;

- **Elasticity of substitution**: Average markups.
Model fit

Production shares, model vs. data

- Log data production shares vs. Log model production shares

- The data points are generally close to the line, indicating a good fit of the model to the data.
Where are subsidies important?

Ratio of total manufacturing subsidies to total manufacturing output

Source: Good Jobs First Subsidy Tracker database; Commodity Flow Survey
Baseline welfare levels

Baseline welfare by state

Legend
Real spending per capita

Low
High
Higher productivity is associated with higher welfare...
...low productivity states offer higher subsidies

Relationship between productivity and subsidy level
(Sample: states in the bottom 50% of productivity dist)
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Eliminating subsidies creates winners and losers...

Total impact: +1.1%
...including states with high subsidies

Relationship between change in welfare and subsidy level
(Sample: states with the top 50% of productivity subsidized)
Summary

- Model with heterogeneous, multistate firms and variable per-unit production subsidies;
- Important model predictions fit features of the US manufacturing industry;
- Calibrated model using firm balance sheet and subsidy microdata:
  - States use subsidies to compensate for low productivity endowments
- Counterfactual experiment: What’s the impact of eliminating subsidies?
  - Overall increase in welfare of 1%
  - Produces winners and losers – especially in states with high subsidy levels
- Policy implications: policies to mitigate the impact of subsidies may be efficient, but will create real costs in high-subsidy places