

The Welfare Consequences of Incoming Remote Workers on Local Residents

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Motivation

- A growing class of place-based policy, Remote Worker Relocation Programs
 - Population declining areas in the United States → 81 localities in recent 5 years
 - E.g. Tulsa Remote, Ascend WV, Think! VT, MakeMyMove
- Incentivize remote workers to come by offering cash grants
 - Rise of remote work: 4% (2019) → 15% (2020) → 18% (2021) → 15% (2022)
- High-income remote workers **consume** local service goods (e.g. restaurants, cafes, hair salons) but **do not take** local jobs in the local economy

Research Question

How does an influx of remote workers induced by the program impact local residents in destination cities?

1. Employment

→ What is the impact on local employment across different industry sectors?

2. Welfare Analysis

→ What are the average and distributional welfare effects of the program?

3. Counterfactual Experiment: Taxation

→ How does 2. change when the program is funded by local taxes?

This Paper

1. **Institutional context:** Remote Worker Relocation Programs

- Case study: Tulsa Remote (the earliest and largest program)

2. **Data:** Tulsa Remote data and various datasets about local residents

3. **Reduced form:**

- Difference-in-differences design leveraging exposure to newly arrived remote workers
- Outcomes: population, local employment, nonemployment, establishments

4. **Structural:** equilibrium effects, welfare analysis, and counterfactual experiment

- Local economy model with selection into local service, tradable, and nonemployment
- Goods markets, labor markets, land market
- Estimation of structural parameters and policy simulation

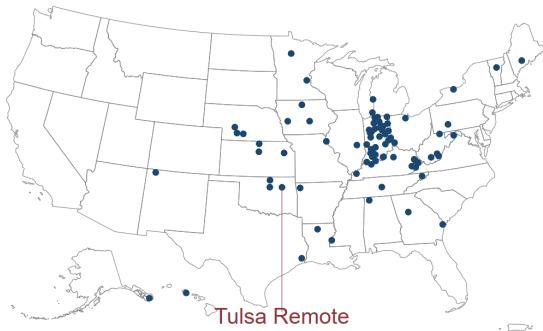
Preview of Results

1. Newly arrived, high-income remote workers driven by the Tulsa Remote program lead to the local service sector growth → sectoral labor reallocation
 - Local service employment increases (by 7.95%)
 - Wholesale trade employment decreases (by 12.6%)
 - Nonemployment decreases (by 1.16%)
2. Tulsa Remote program improves the average welfare of local residents by 1.28%
 - Local service workers and landowners are better off
 - Nonemployed and low-skilled renters in the tradable sector are slightly worse off
3. When the program is funded by local taxes, the average net benefit is substantially reduced

Contributions to the Literature

1. First paper about a Remote Worker Relocation Program
2. Provides direct, empirical evidence on how **remote workers** affect local residents
 - Bloom, Liang, Roberts and Ying (2015); Dingel and Neiman (2020); Althoff, Eckert, Ganapati, and Walsh (2022); Delventhal, Kwon and Parkhomenko (2022); Davis, Ghent, and Gregory (2022); Liu and Su (2023); Monte, Porcher, and Rossi-Hansberg (2023)
3. Examines the effects of **local shocks** with new economic mechanisms
 - Immigration: Card (1990); Borjas (1994, 2003); Cortes (2008); Ottaviano and Peri (2012); Dustmann, Schönberg, and Stuhler (2017); Piyapromdee (2021)
 - Local shock: Diamond (2016); Qian and Tan (2021); Almagro and Dominguez-lino (2022)
4. Studies a recently growing class of **place-based policy**
 - Glaeser and Gottlieb (2008); Greenstone, Hornbeck, and Moretti (2010); Moretti (2011); Busso, Gregory, and Kline (2013); Faggio and Overman (2014); Kline and Moretti (2014); Slattery (2022)

Remote Worker Relocation Program



1. Since 2018, 81 localities (as of 2023)
2. To promote local economic growth
3. Eligibility: full-time remote employment, committed period of residence (1-2 years)
4. Benefits: cash grant (\$3,000-\$19,000)
5. Funding: local government or non-profit organization

⇒ Tulsa Remote: remote workers relocated to downtown Tulsa in 2019

Data

- **Tulsa Remote Data**
 - Demographic and working information of remote workers (aggregated level)
 - Geographic residential distribution (zip code level)
- **American Community Survey (ACS)**
 - Individual-level demographic, working, and geographic information
- **LEHD Origin-Destination Employment Statistics (LODES)**
 - Jobs totaled by work census block in NAICS code
- **Your Economy Time Series (YTS)**
 - Yearly panel of establishments in the United States (coordinates, NAICS code)
- **SafeGraph**
 - Total visits, total visitors, place coordinates, NAICS code
- **Federal Housing Finance Agency Housing Price Index (FHFA HPI)**
- **Zillow Observed Rent Index (ZORI)**

Data

- **Tulsa Remote Data** → *Relocated remote workers*
 - Demographic and working information of remote workers (aggregated level)
 - Geographic residential distribution (zip code level)
- **American Community Survey (ACS)** → *Local residents' characteristics*
 - Individual-level demographic, working, and geographic information
- **LEHD Origin-Destination Employment Statistics** → *Employment*
 - Jobs totaled by work census block in NAICS sector
- **Your Economy Time Series (YTS)** → *Establishments*
 - Yearly panel of establishments in the United States (coordinates, NAICS code)
- **SafeGraph** → *Consumption*
 - Total visits, total visitors, place coordinates, NAICS code
- **FHFA Housing Price Index (HPI)** → *Housing Price*
- **Zillow Observed Rent Index (ZORI)** → *Rent Price*

Causal Evidence of Tulsa Remote on Downtown Tulsa

Figure: Population (ACS)

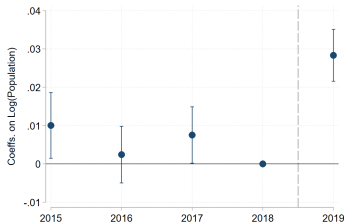


Figure: Income Per Capita (ACS)

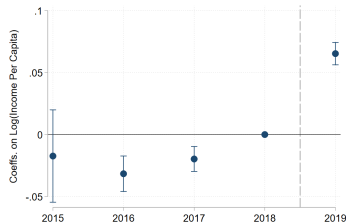


Figure: Local Service Jobs

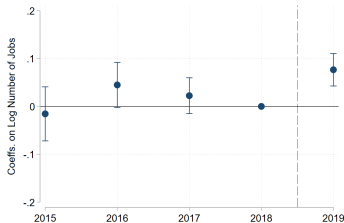
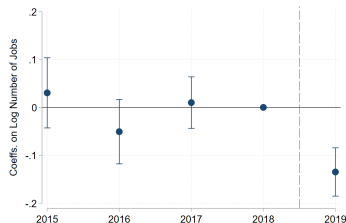


Figure: Warehouse Jobs (LODES)



- Event Study design
- Control group: MSAs in Oklahoma



- + 2.87% population
- + 6.44% income
- + 7.95% local service jobs (low-skilled more elastic)
- 12.6% warehouse jobs (low-skilled more elastic)

Summary of Reduced Form Analysis

1. Newly arrived remote workers increase local spending and this leads to labor reallocation among local residents

- High income remote workers arrived (source: Tulsa Remote) (source: NHGIS)
- Consumption increase for local service goods (source: SafeGraph)
- Sectoral labor reallocation: local service \uparrow & wholesale trade \downarrow
- Local service establishments \uparrow (source: YTS)

2. Heterogeneous employment response in earning groups in each sector

(source: LODS)

- The lower the earnings, the larger the employment increase in service jobs
- The lower the earnings, the larger the employment decrease in wholesale trade jobs

3. No statistically significant change in rent price and housing price (source:

FHFA & Zillow)

- Attributable to the high housing supply elasticity (Saiz, 2010)

Overview

- **A static local economy model**
 - **Workers** given a skill type
 - with a choice of (1) local service, (2) tradable, and (3) nonemployment
 - **Firms:** local service and tradable firms
 - **Immobile landowners** (Redding and Rossi-Hansberg, 2017)
 - Remote workers are taken as exogenous to the local economy
- **Key mechanism**
 - Asymmetric propagated effects onto local service and tradable sectors
 - Varieties of local service goods
- Generate **two local economy equilibria** under two regimes
 - Baseline equilibrium
 - Post-equilibrium under the program regime

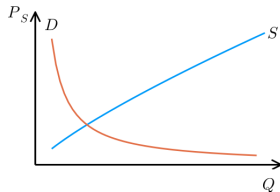
Stylized Illustration: Local Economy Model

Baseline: without the program

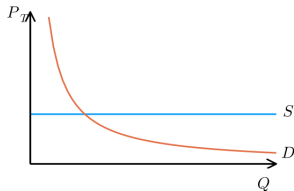
Stylized Illustration: Local Economy Model

Baseline: without the program

- Service Goods Market



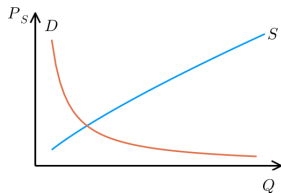
- Tradable Goods Market



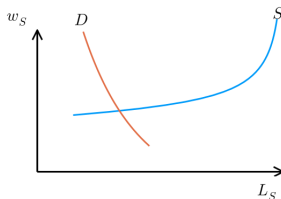
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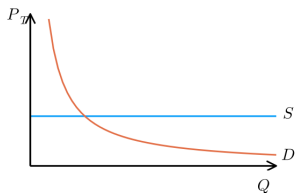
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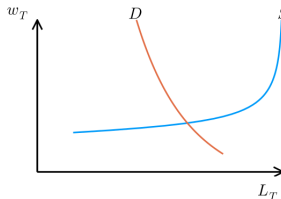
- Service Labor Market



- Tradable Goods Market



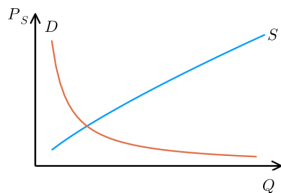
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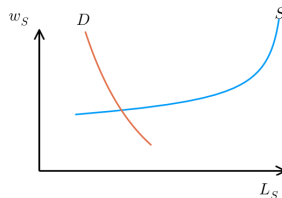
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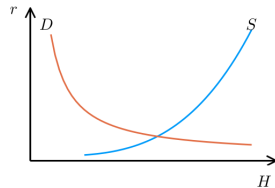
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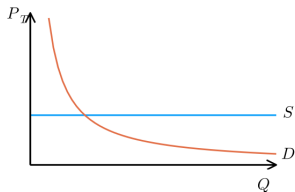
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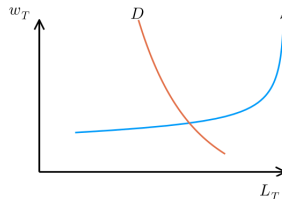
- Land Market



- Tradable Goods Market



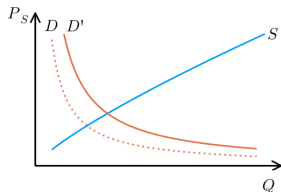
- Tradable Labor Market



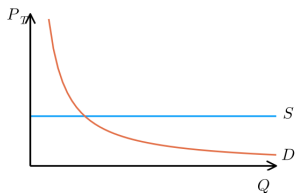
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Post: with the program

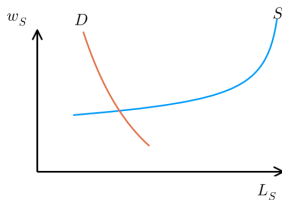
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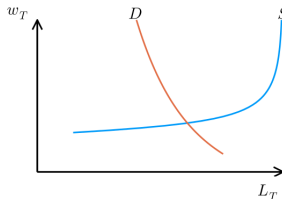
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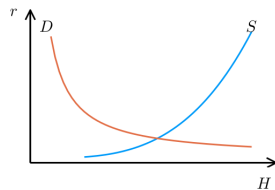
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- Tradable Labor Market



- Land Market

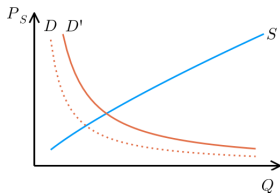


► Demand $\uparrow \Rightarrow P_S \uparrow$

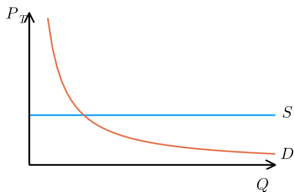
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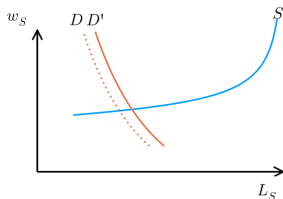
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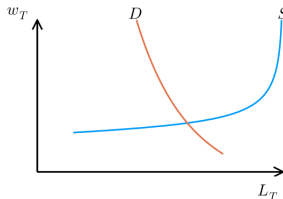
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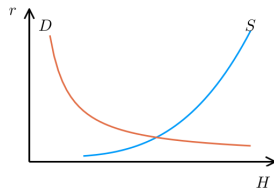
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- Land Market



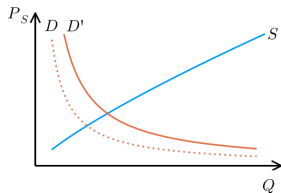
▶ $P_S \uparrow$

▶ Demand $\uparrow \Rightarrow w_S \uparrow$

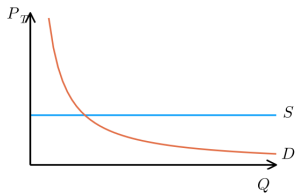
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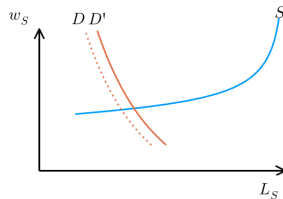
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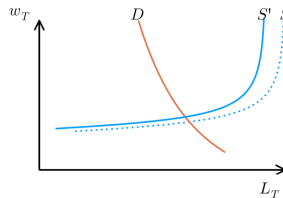
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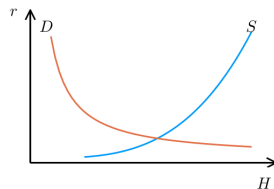
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- Land Market



▶ $P_S \uparrow$

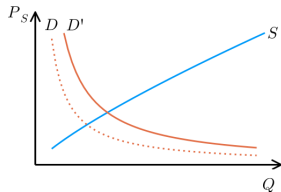
▶ $w_S \uparrow$

▶ Supply $\downarrow \Rightarrow w_T \uparrow$

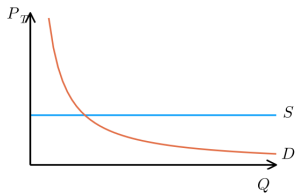
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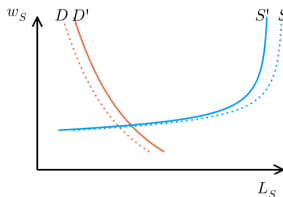
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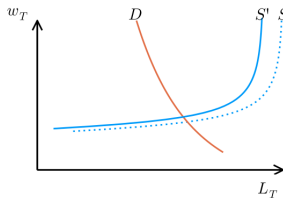
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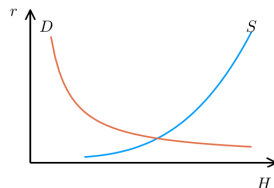
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▶ $P_S \uparrow$

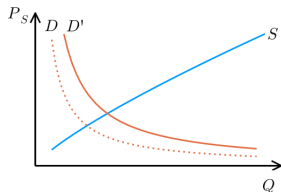
▶ $w_S \uparrow$

▶ $w_T \uparrow$

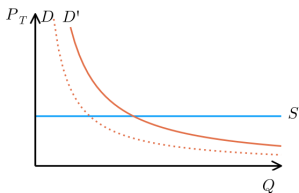
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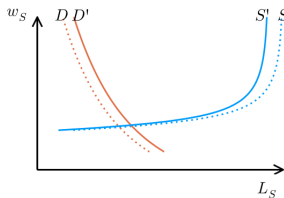
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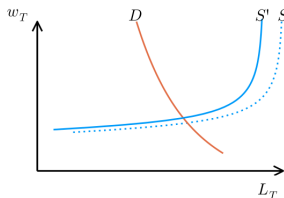
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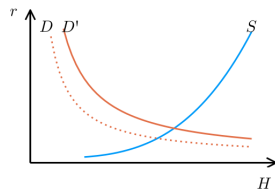
- Service Labor Market



- Tradable Labor Market



- Land Market



- ▶ $P_S \uparrow$
- ▶ $w_S \uparrow$
- ▶ $w_T \uparrow$
- ▶ Demand $\uparrow \Rightarrow r \uparrow$

Estimation Overview

Indirect Inference (Gourieroux, Monfort, and Renault, 1993)

- Parameters are jointly estimated

Model estimated without the program

- Location parameters in taste
 $(\mu_{h,S}, \mu_{\ell,S}, \mu_{h,T}, \mu_{\ell,S})$
 - ← Relative wage btw. sectors
(American Community Survey)
- Consumption share for local service goods
 $(\alpha_h^S, \alpha_\ell^S)$
 - ← Labor share for service workers
(American Community Survey)
- Human capital rental rate (τ^S, τ^T)
 - ← Relative wage btw skill types
(American Community Survey)

Conditional on parameters above, I simulate the post equilibrium

- Scale, correlation parameters in taste
 $(\sigma, \rho_h, \rho_\ell)$
 - ← Event study estimates
(LODES, NHGIS)

Welfare Analysis

- Classified by (i) **skill type**

	A. High-skilled	B. Low-skilled
	Share (%)	Share (%)
Total	52.61	47.39

Welfare Analysis

- Classified by (i) skill type, (ii) working sectors

	A. High-skilled	B. Low-skilled
	Share (%)	Share (%)
a. Non-employed	5.31	8.59
b. Newly employed workers	0.06	0.10
c. Always local service workers	4.23	4.61
d. Switchers	0.12	0.33
e. Always tradable workers	28.48	18.76
Total	52.61	47.39

Welfare Analysis

- Classified by (i) skill type, (ii) working sectors, **(iii) landownership**

	A. High-skilled	B. Low-skilled
	Share (%)	Share (%)
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e. Always tradable workers	28.48	18.76
f. Landowners	14.40	14.99
Total	52.61	47.39

Welfare Analysis

- Classified by (i) skill type, (ii) working sectors, (iii) landownership, **(iv) homeownership**

	A. High-skilled	B. Low-skilled
	Share (%)	Share (%)
a. Non-employed	5.31	8.59
b. Newly employed workers	0.06	0.10
c. Always local service workers	4.23	4.61
(% Homeowners)	(56.01)	(41.04)
d. Switchers	0.12	0.33
e. Always tradable workers	28.48	18.76
(% Homeowners)	(62.53)	(45.62)
f. Landowners	14.40	14.99
Total	52.61	47.39
Weighted average		

Welfare Analysis

- Welfare is measured by % CE/Income

	A. High-skilled		B. Low-skilled	
	Share (%)	Welfare (%)	Share (%)	Welfare (%)
	Baseline		Baseline	
a. Non-employed	5.31	-0.16	8.59	-0.27
b. Newly employed workers	0.06	0.11	0.10	0.18
c. Always local service workers (% Homeowners)	4.23 (56.01)	0.83	4.61 (41.04)	0.72
d. Switchers	0.12	0.43	0.33	0.32
e. Always tradable workers (% Homeowners)	28.48 (62.53)	0.04	18.76 (45.62)	-0.07
f. Landowners	14.40	—	14.99	—
Total	52.61		47.39	
Weighted average		0.10		-0.01

Welfare Analysis

- Welfare is measured by % CE/Income

	A. High-skilled		B. Low-skilled	
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e. Always tradable workers	28.48	+0.04	18.76	-0.07
(% Homeowners)	(62.53)		(45.62)	
f. Landowners	14.40	—	14.99	—
Total	52.61		47.39	
Weighted average		0.10		-0.01

Decomposition Exercise: Welfare for Renters in Tradable Sector

$$\frac{CE}{I_{ek}} \approx \log\left(1 + \frac{CE}{I_{ek}}\right)$$

Figure: High-skilled Renters in Tradable

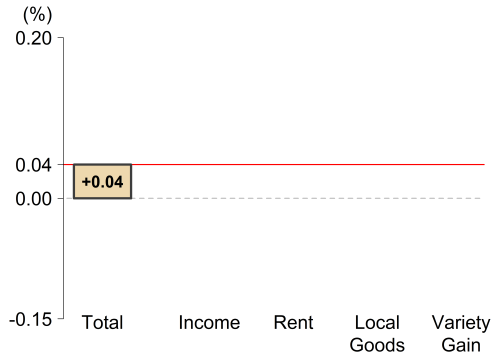
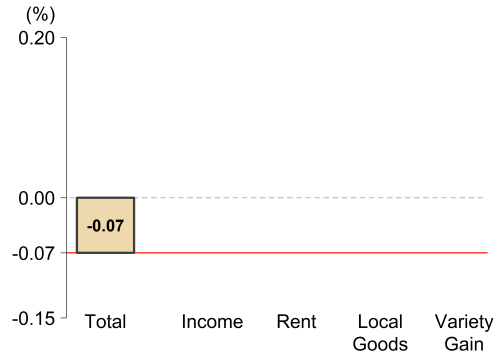


Figure: Low-skilled Renters in Tradable



Decomposition Exercise: Welfare for Renters in Tradable Sector

$$\frac{CE}{I_{ek}} \approx \log\left(1 + \frac{CE}{I_{ek}}\right) = + \log\left(\frac{I'_{ek}}{I_{ek}}\right)$$

Figure: High-skilled Renters in Tradable

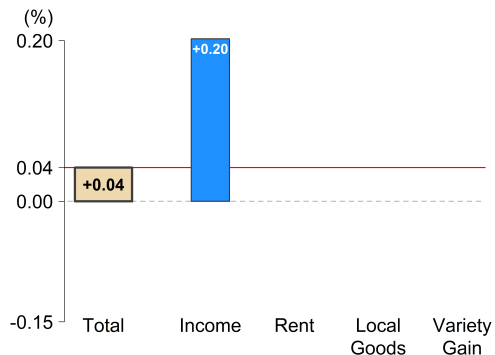
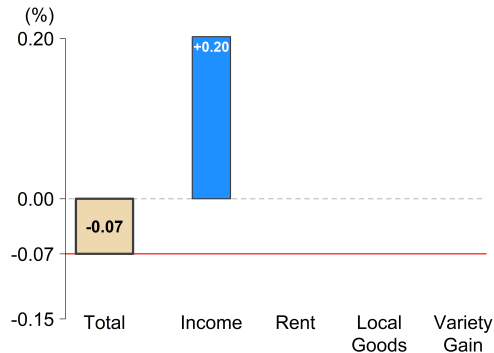


Figure: Low-skilled Renters in Tradable



Decomposition Exercise: Welfare for Renters in Tradable Sector

$$\frac{CE}{I_{ek}} \approx \log\left(1 + \frac{CE}{I_{ek}}\right) = + \log\left(\frac{I'_{ek}}{I_{ek}}\right) - \alpha_e^H \log\left(\frac{r'}{r}\right)$$

Figure: High-skilled Renters in Tradable

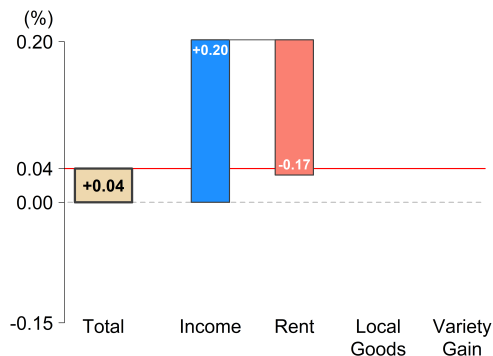
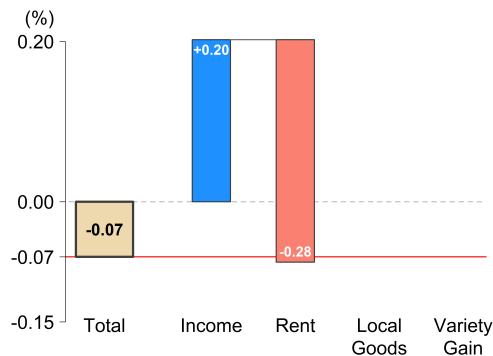


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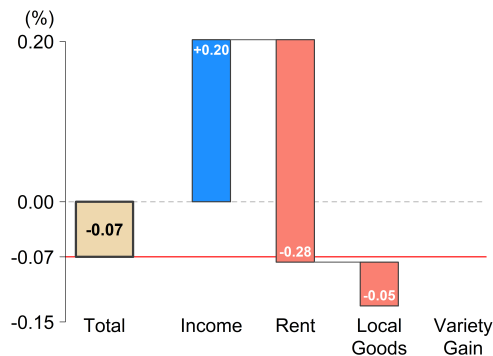
Decomposition Exercise: Welfare for Renters in Tradable Sector

$$\frac{CE}{I_{ek}} \approx \log\left(1 + \frac{CE}{I_{ek}}\right) = + \log\left(\frac{I'_{ek}}{I_{ek}}\right) - \alpha_e^H \log\left(\frac{r'}{r}\right) - \alpha_e^S \log\left(\frac{p'_S}{p_S}\right)$$

Figure: High-skilled Renters in Tradable



Figure: Low-skilled Renters in Tradable



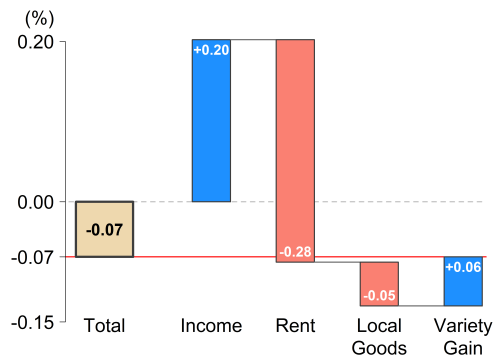
Decomposition Exercise: Welfare for Renters in Tradable Sector

$$\frac{CE}{I_{ek}} \approx \log\left(1 + \frac{CE}{I_{ek}}\right) = + \log\left(\frac{I'_{ek}}{I_{ek}}\right) - \alpha_e^H \log\left(\frac{r'}{r}\right) - \alpha_e^S \log\left(\frac{p'_S}{p_S}\right) + \frac{\alpha_e^S}{\epsilon - 1} \log\left(\frac{M'_S}{M_S}\right)$$

Figure: High-skilled Renters in Tradable



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Welfare Analysis

- Welfare is measured by % CE/Income

	A. High-skilled			B. Low-skilled		
	Share (%)	% CE/Income		Share (%)	% CE/Income	
		Baseline	\bar{w}_T +Home owners		Baseline	\bar{w}_T +Home owners
a. Non-employed	5.31	-0.16	-0.16	8.59	-0.27	-0.27
b. Newly employed workers	0.06	0.11	-0.01	0.10	0.18	0.09
c. Always local service workers (% Homeowners)	4.23 (56.01)	0.83	0.83	4.61 (41.04)	0.72	0.72
d. Switchers	0.12	0.43	0.43	0.33	0.32	0.32
e. Always tradable workers (% Homeowners)	28.48 (62.53)	0.04	-0.16	18.76 (45.62)	-0.07	-0.27
f. Landowners	14.40	—	—	14.99	—	—
Total	52.61			47.39		
Weighted average		0.10	-0.05		-0.01	-0.12

Welfare Analysis

- The weighted average is **1.28%** (1.33% for high-skilled and 1.22% for low-skilled)

	A. High-skilled				B. Low-skilled			
	Share (%)	% CE/Income			Share (%)	% CE/Income		
		Baseline	\bar{w}_T	+Home owners		Baseline	\bar{w}_T	+Home owners
a. Non-employed	5.31	-0.16	-0.16	-0.16	8.59	-0.27	-0.27	-0.27
b. Newly employed workers	0.06	0.11	-0.01	0.11	0.10	0.18	0.09	0.18
c. Always local service workers (% Homeowners)	4.23 (56.01)	0.83	0.83	0.86	4.61 (41.04)	0.72	0.72	0.78
d. Switchers	0.12	0.43	0.43	0.43	0.33	0.32	0.32	0.32
e. Always tradable workers (% Homeowners)	28.48 (62.53)	0.04	-0.16	0.46	18.76 (45.62)	-0.07	-0.27	0.29
f. Landowners	14.40	—	—	3.71	14.99	—	—	3.71
Total	52.61				47.39			
Weighted average		0.10	-0.05	1.33		-0.01	-0.12	1.22

Counterfactual: Subsidizing Remote Workers through Taxation

Question: What if the program is financed by local taxes?

Government's balanced budget constraint:

$$\begin{aligned}
 \tau \times \left(\underbrace{\sum_{e \in \{h, \ell\}, k \in \{S, T\}} w_{ek} \times L_{ek}}_{\text{Workers}} + \underbrace{\sum_{e \in \{h, \ell\}} \pi_e^{\text{landlords}} \times I^{\text{landlords}}}_{\text{Landowners}} + \underbrace{w_R \times L_R}_{\text{Remote workers}} \right) \\
 = \underbrace{r \times (1.2 \times S) \times R(S) \times \frac{1}{o}}_{\text{Interest payment}} + \underbrace{(0.4 \times S) \times R(S) \times \frac{1}{o}}_{\text{Annual fixed cost}}
 \end{aligned}$$

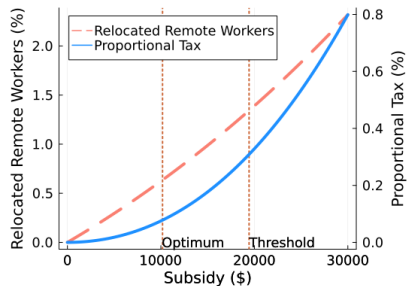
Endogenizing the number of relocated remote workers:

$$R(\mathbf{S}) = \bar{R} \times \left(\frac{w_R + \mathbf{S}}{w_R} \right)^\psi$$

- $\psi = 3.3$ (Monte, Redding, and Rossi-Hansberg, 2018)

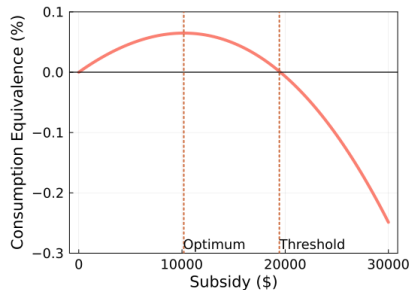
Counterfactual: Remote Worker Relocation Program Funded by Taxes

Figure: Remote Workers and Proportional Tax



- The higher the subsidy
 - The more remote workers come
 - The higher tax imposed

Figure: Welfare Effect on Local Residents



- 1.28% (Tulsa Remote) \rightarrow 0.06%
- Beneficial to local residents up to a threshold

Conclusion: Summary

Tulsa Remote: the first and largest Remote Worker Relocation Program

1. Increase in local service jobs
 - Labor reallocation between local service, tradable, and nonemployment
 - More responsive among low-skilled workers
2. Positive welfare impact on local residents on average
 - High-skilled workers are all better off
 - Slightly negative effect on nonemployed and low-skilled renters in the tradable sector
3. When the program is funded by local taxes, the average net benefit is substantially reduced

Conclusion: Implications

1. Remote Worker Relocation Programs have recently become a widely adopted policy tool
2. The program can benefit local residents on average
3. Generally, policy evaluations of Remote Worker Relocation Programs should consider
 - Equilibrium effects: labor reallocation, price effects
 - Distributional effects: skill heterogeneity, homeownership, landownership
 - Local economic conditions: industry composition, housing supply elasticity
 - Public finance perspective
4. This paper does not address the welfare change in other cities where remote workers left