The Colocation Friction:

Dual-Earner Job Search and Labor Market Outcomes

Hanno Foerster (BC) Robert Ulbricht (BC)

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Motivation

- $>60\%$ of U.S. workers are part of a couple, $\approx 50\%$ have a working partner
  (source: ACS 2010-2019)
- Dual-earner households need to find two jobs in one location
- How does this affect matching of workers to jobs?
  - » **Goal:** formalize, characterize, and quantify unique frictions dual-earner couples face
- How do *"colocation frictions"* affect
  - » gender inequality?
  - » internal migration?
  - » welfare?

Standard matching friction
($\rightsquigarrow$ not every application generates a match)

} all workers

+

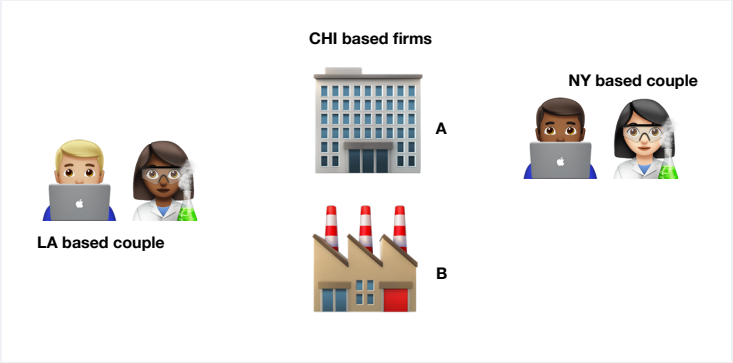
"Colocation problem"
(couples need to find two jobs in one location)

} dual-earners only

$\Downarrow$

"Colocation friction"
$\rightsquigarrow$ **Mismatched job offers across spouses**

Colocation Friction: Intuition



- Consider two couples, assume they have identical productivities

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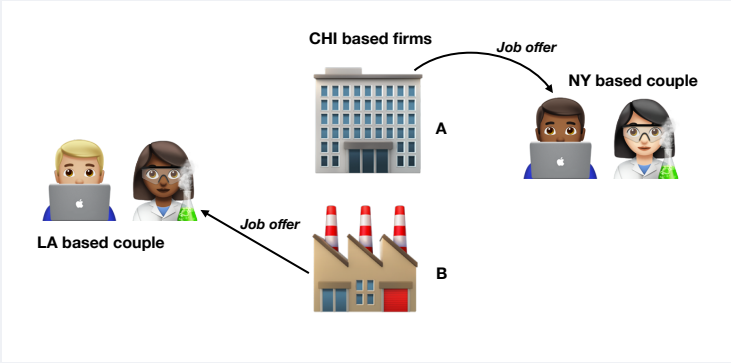

- Two people need to move into unemployment

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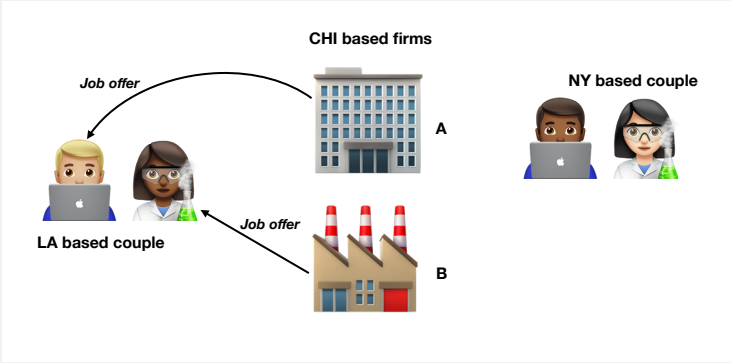

- Thought experiment: compare to coordinated matching
  (= either couple receives 2 job offers with 50% chance)

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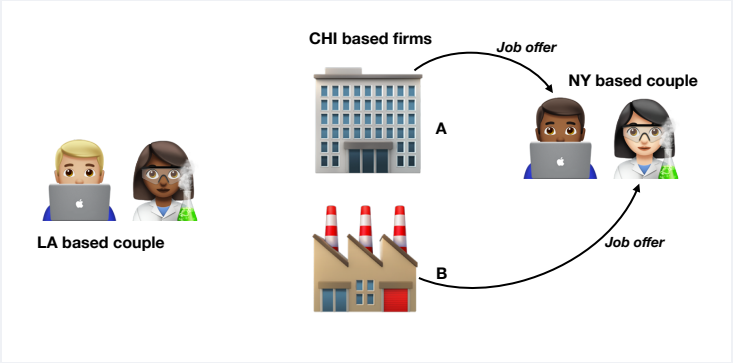

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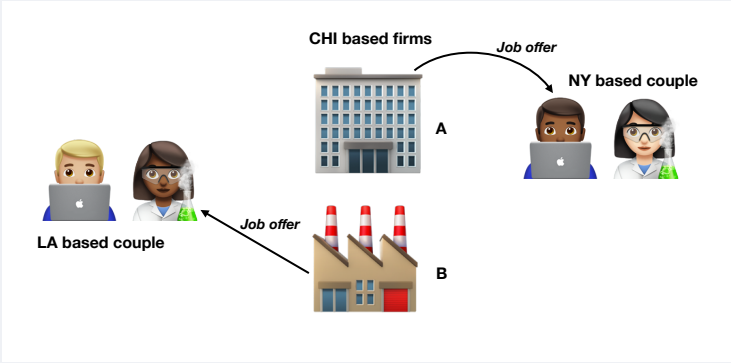

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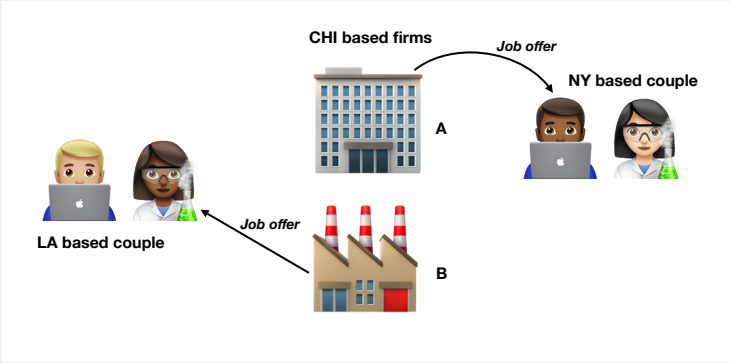


- Thought experiment: compare to coordinated matching
  (= either couple receives 2 job offers with 50% chance)
- Colocation friction $\Leftrightarrow$ Welfare loss from lacking coordination
  Consequences for employment, migration, wages, gender inequality...?

This Paper

- Develop a spatial dual-earner directed search model of the labor market
  - » general setting: formalize/characterize colocation friction
- Quantitative version, calibrate using rich U.S. micro data
  (ACS, CPS, PSID, Opportunity Atlas, web scraped data...)
- Use calibrated model to study consequences of colocation frictions:
  - » women severely affected, friction accounts for 93% of gender gap in migration-gains
  - » discourages migration ($\downarrow 30\%$), especially by power couples
  - » overall welfare cost $\widehat{=}$ 1.4% lifetime earnings

Literature

Labor misallocation:

- Hosios (1990), Galenianos et al. (2011), Rabinovich and Wolthoff (2022), Jarosch et al. (2023), Şahin et al. (2014), Findeisen et al. (2021), and Jovanovic (1979, 1984)
- Our paper: explore how being tied to a spouse adds to misallocation

Joint job search:

- Flinn et al. (2017), Flabbi and Mabli (2018), Pilossoph and Wee (2019, 2021), Bacher et al. (2023), and Fernández-Blanco (2022)
- Our paper: relevance of spatial wage differentials for gender inequality

Dual-earner migration:

- Mincer (1978), Costa and Kahn (2000), Guler et al. (2012), Burke and Miller (2018), Venator (2021), Jayachandran et al. (2023), and Gemici (2011)
- Our paper: characterize/quantify inefficiency + directed search

General Framework

General Framework, Overview

- Ctd. time, effective discount rate ρ [includes retirement rate]
- Finite set of commuting zones $r \in \mathcal{R}$ [amenities, rents, occupation-specific productivities...]
- Households choose:
  - » location specific search efforts $\{\kappa_{i,q}\}_{q\in\mathcal{R},i\in\mathcal{I}}$ [budgets allocated across locations]
  - » submarkets: location specific target wages [trade-off: wage vs. job finding rate]
- Within-submarkets, ψ, job finding rate: $f_{i,q} = \kappa_{i,q}\lambda(\theta_\psi)$
- State vector $\boldsymbol{s} \in \mathcal{S}_1 \times \cdots \times \mathcal{S}_{n_s}$ [occupations, human capital, children...]
- New job may entail migration $(q \neq r) \rightsquigarrow$ mig. cost $\chi(q|\boldsymbol{s}, r) > 0$, trailing spouse $e_{-i} = 0$ (employment status: $\boldsymbol{e} = (e_f, e_m) \in \{0,1\}^2$)

▸ long-distance ▸ more

Job search and migration

Joint value function:

$$\rho V(\boldsymbol{e},\boldsymbol{s},r) = u(\boldsymbol{e},\boldsymbol{s},r) + \max_{\{\kappa,y\}} \sum_{i,q} \kappa_{i,q}\lambda(\theta_{i,q}) \underbrace{\left(V(\boldsymbol{e}^{\text{new},i},\boldsymbol{s},q) - \overbrace{y_{i,q}}^{\text{firm's share of the match value}} - \chi(q|\boldsymbol{s},r) - V(\boldsymbol{e},\boldsymbol{s},r)\right)}_{\text{new job}}$$
$$+ \sum_{\boldsymbol{e}',\boldsymbol{s}',r'} \pi(\boldsymbol{e}',\boldsymbol{s}',r'|\boldsymbol{e},\boldsymbol{s},r) \underbrace{\left(V(\boldsymbol{e}',\boldsymbol{s}',r') - V(\boldsymbol{e},\boldsymbol{s},r)\right)}_{\text{exogenous transitions}}$$
$$+ \lim_{\epsilon\to\infty} \epsilon \sum_i \underbrace{\max\{0, V(\boldsymbol{e}^{\text{sep},i},\boldsymbol{s},q) - V(\boldsymbol{e},\boldsymbol{s},q)\}}_{\text{endogenous quits}}$$

subject to:

$$\underbrace{c}_{\text{vacancy posting cost}} = \frac{\lambda(\theta_{i,q})}{\theta_{i,q}} \max\{y_{i,q}, 0\} \quad \text{for all } i,q \qquad \text{(free-entry)}$$

The Colocation Friction: Formal Characterization

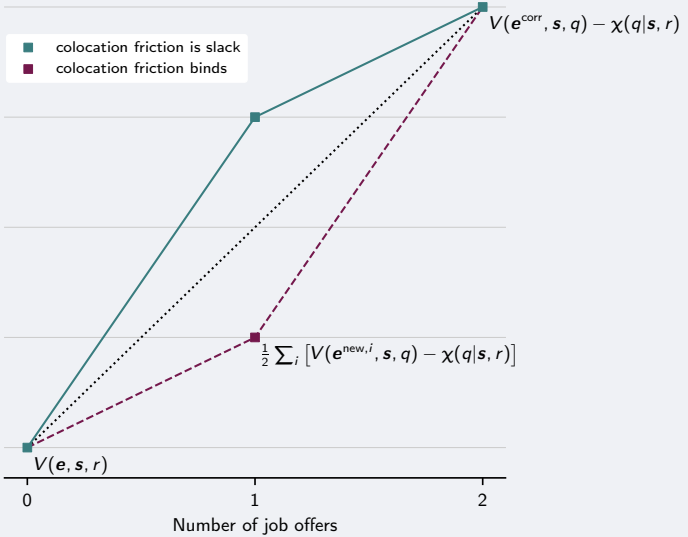
- Colocation friction $\Leftrightarrow$ Welfare loss relative to coordinated matching
- Coordinated matching, formally:

$$\text{correlated matching rate:} \quad \omega_q \in [0, \min_i f_{i,q}] \qquad \text{s.t.} \underbrace{\lambda(\cdot), c, \bar{\kappa}_i(\boldsymbol{e}, \boldsymbol{s})}_{\substack{\text{no change in std.} \\ \text{matching friction!}}}$$

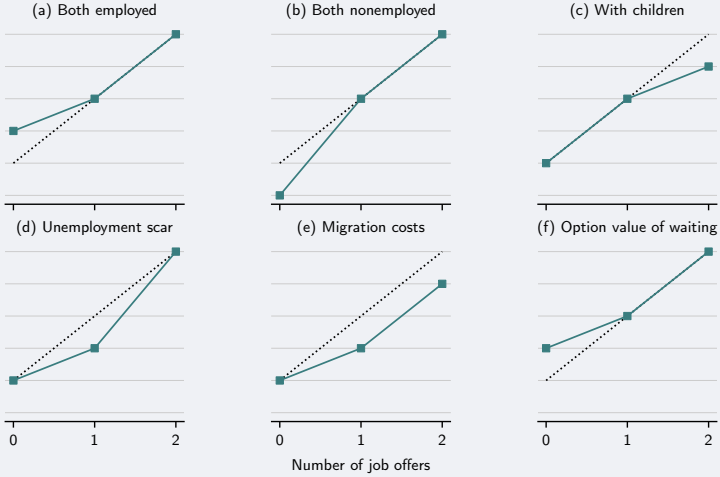
$$\text{individual matching rates:} \quad f_{i,q} - \omega_q$$

- Couples find **two** jobs at rate ω_q
- Prob. of finding ***one*** job drops: $f_{1,q} + f_{2,q} - 2\omega_q$
- Expected no. of matches per couple stays the same!
- No. of matches in the economy stays the same!

Proposition: Colocation friction $\iff$ $V(\boldsymbol{e}, \boldsymbol{s}, r)$ satisifies a convexity property



- In a toy version of our model show:



- **Colocation friction** ↑: Both employed, unemployment scar, migration costs, option value of search
- **Colocation friction** ↓: Both nonemployed, child care costs

Quantitative Model

Households and Shocks

- Households: $\boldsymbol{s} = (o_f, o_m, h_f, h_m, k)$
  - occupation $o_f, o_m \in \{1, \ldots, 3\} \times \{1, \ldots, 6\}$ (top A-D occ. groups, 93.5% of ACS)
  - human capital $h_f, h_m \in \{\underline{h}, \overline{h}\}$
  - kids yes/no $k \in \{0, 1\}$
- Shocks:
  - exogenous separations $\delta_i(\boldsymbol{o})$
  - kids arrival/departure $\pi_{k\uparrow}(\boldsymbol{o})$ and $\pi_{k\downarrow}(\boldsymbol{o})$
  - human capital appreciation/depreciation $\pi_{h\uparrow|e}(\boldsymbol{o})$ and $\pi_{h\downarrow|u}(\boldsymbol{o})$
  - location taste shocks $\pi_{q|r}(\boldsymbol{o})$

Preferences, Migration costs, Matching function

- Preferences:

$$u(\boldsymbol{e}, \boldsymbol{s}, r) = \sum_i \underbrace{\left\{ h_i z_i(o_i, r) \cdot \mathbb{1}_{e_i=1} + b_i z_i(o_i, r) \cdot \mathbb{1}_{e_i=0} \right\}}_{\text{labor prod.} + \text{ home production}} + \underbrace{a(k, r) - p(r)}_{\text{amenities} - \text{ rent}} - \underbrace{\xi(r) \cdot \mathbb{1}_{k=e_1=e_2=1}}_{\text{child care cost}}$$

- Migration costs depend on geo-distance and population gap:

$$\chi(q|\boldsymbol{o}, r) = \sum_{k \in \{\text{geo}, \text{pop}\}} \sum_{j \in \{1, \ldots, 4\}} \chi_j^k(\boldsymbol{o}) \cdot \mathbb{1}_{d^k(r,q) \in \text{Bin}_j^k}$$

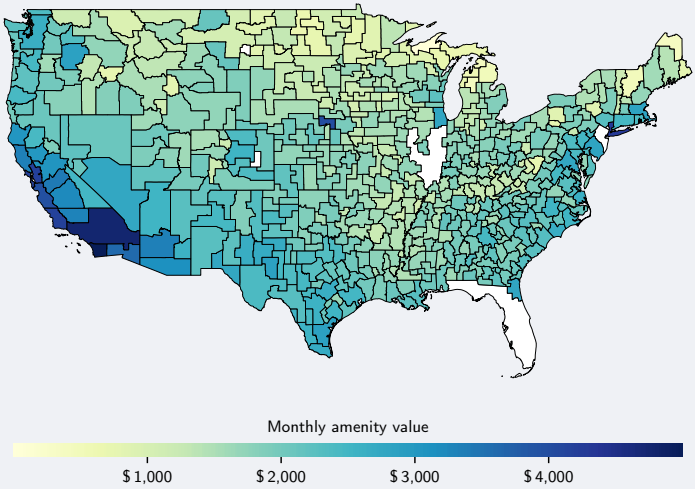
- Matching function, constant returns to scale:

$$\lambda(\theta) = \theta^\gamma$$

Geography

- Geography: $r \in \{1, \ldots, 517\}$ commuting zones, merged by similarity
- Amenities:
  - » web-scraped + Opportunity Atlas [Chetty et al. 2018]
    data on: *crime rates, climate, walkability, beaches, hospital/school quality, local government expenditures, ...*
  - » assume income & "income-equivalent amenities" have same pass-through to rents
  - » back out income-equivalent amenity value

Geography II



Assigned parameters

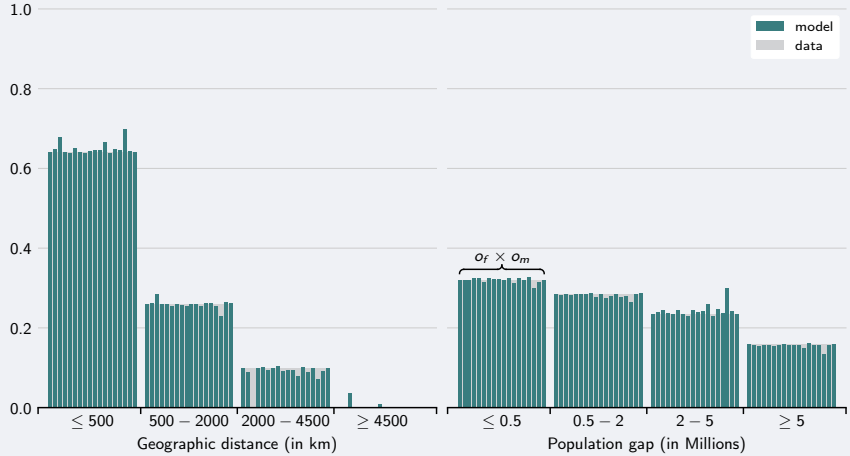
Parameter	Value	Source
Time preference rate, annualized	.05	literature
Retirement rate, annualized	.021	avg. working life of 47 years
Home production, b_m, b_f	.4, .625	Shimer (2005) + ACS
High human capital, $\overline{h}$	1.0	normalization
Low human capital, $\underline{h}$	.4	same as b_m
Search elasticity across locations, η	.0	literature
Matching elasticity, γ	.2	Lange and Papageorgiou (2020)
Child arrival rate $\pi_{k\uparrow}$, annualized	.075	ACS
Child departure rate $\pi_{k\downarrow}$, annualized	.038	ACS
Job separation rates, $\{\delta_i(\boldsymbol{o})\}$	from data	CPS
Rents, $p(r)$	from data	ACS
(Local) labor products, $z_i(o_i, r)$	med. wage by gender/occ/CZ	ACS
Child care costs, $\xi(r)$	$8.5\% \cdot \bar{w}_r$	Guner et al. (2020)

Estimated parameters

Moment	Level	No. of moments	Source	$\approx$ maps to
Job finding rate	$o_f \times o_m \times$ gender	36	CPS	$\bar{\kappa}_i(\boldsymbol{o})$
Wage scar, 1 & 3 yrs	$o_f \times o_m \times$ year	36	Huckfeldt (2022)	$\pi_{h\uparrow}(\boldsymbol{o})$, $\pi_{h\downarrow}(\boldsymbol{o})$
Migration rate, by bin	$o_f \times o_m \times$ bin	144	ACS	$\chi(q\|\boldsymbol{o}, r)$
Distribution over CZs	$o_f \times o_m \times r$	9306	ACS	$\pi_{q\|r}(\boldsymbol{o})$

Model fit: Targeted moments (1/2)

Model fit: Targeted moments (2/2)



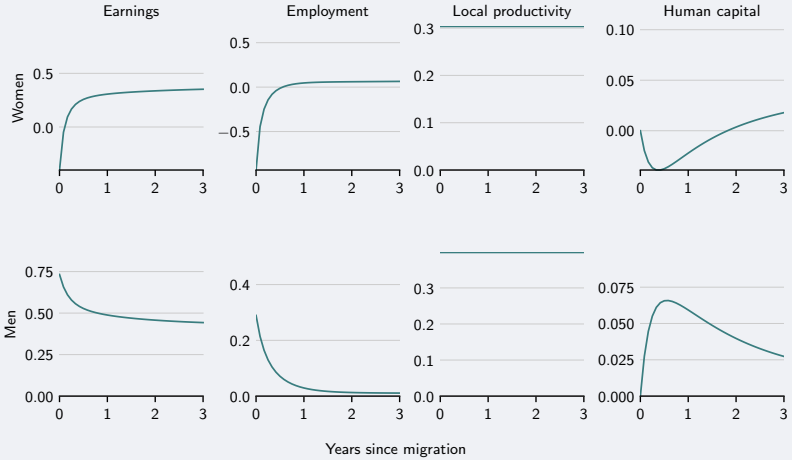
Gender gaps, post-migration (untargeted)

▸ emp. levels

	Steady State	Steady State	$t = 0$		$t = 3$ months	
Moment	Model	Data	Model	Data	Model	Data
Earnings gap	.55	.55	.17	n/a	.37	.32
Wage gap	.68	.66	.67	n/a	.56	.51
Employment gap	.81	.83	.25	n/a	.66	.65
Dual earner share	.70	.65	.00	n/a	.47	.52

- Migration **widens** employment gap (model matches *untargeted* data)
- Migration initiated by job offer to men in 80% of cases (model)

Direct Effect on Post-Migration Employment (log-differences to no migration control group)



- Unequal distrib. of migration gains (3yr NPV earnings gains: women 16%, men 77%)

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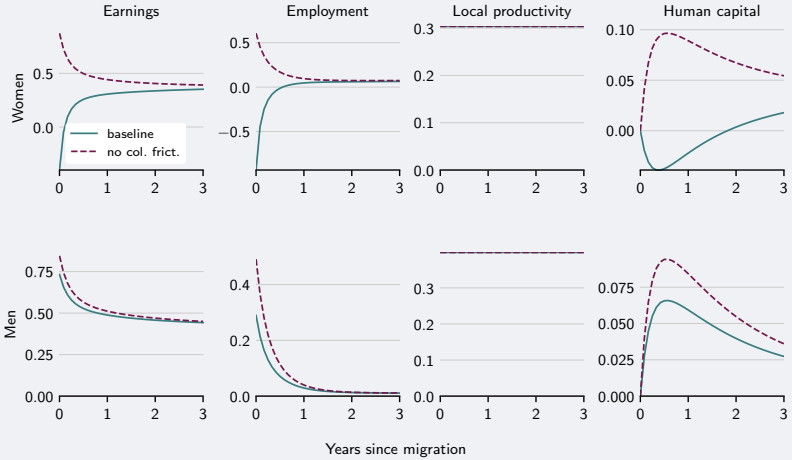

- Unequal distrib. of migration gains (3yr NPV earnings gains: women 16%, men 77%)
- Colocation friction accounts for 93% of the gender gap in gains from migration

Discouraged Migration (aka the "Mincer Hypothesis")

▸ transition dynamics

	Migrating	Discouraged	Pop. avg.
Both employed	.34	.84	.70
Both nonemployed	.23	.01	.02
Household income	1.18	2.11	2.00
Employment rate			
women	.51	.91	.75
men	.60	.92	.93
Human capital			
women	.76	1.00	.76
men	.90	.98	.87

- Removing colocation friction: short-run migration ↑ 38% (long-run ↑ 14%)
- Lifetime earnings among additional migrants ↑ 11%
- Most discouraged by friction are high human capital, dual- employed couples

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Long-Run Impact on Earnings and Welfare

- Long-run effects of removing colocation frition:

	Women	Men
Earnings	2.18 %	.60 %
Employment	1.12 %	.16 %
Local productivity	.36 %	.34 %
Human capital	1.02 %	.17 %

- Steady-state earnings of women $\uparrow$ 2.2%, men $\uparrow$ 0.6%
- Welfare loss from colocation frictions $\widehat{=}$ 1.4% lifetime earnings

Conclusions

- Novel framework of dual-earner's ***directed*** job search and migration

1. Are there distinct frictions dual-earner households are faced with?
   - » Key mechanism: lack of coordination in **hiring**
   - » Characterize what contributes to welfare loss from frictions
     [e.g., unemployment scar, migration costs, option value of search...]

2. Do they matter quantitatively?
   - » Yes!
   - » Reduced migration gains for women, discouraged migrants: power couples, overall welfare loss

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- endogenous search efforts $\{\kappa_{f,q}, \kappa_{m,q}\}_{q\in\mathcal{R}}$, allocated across locations

$$\left(\sum_{q\in\mathcal{R}} \kappa_{i,q}^{\frac{1+\eta}{\eta}}\right)^{\frac{\eta}{1+\eta}} \leq \bar{\kappa}_i(\boldsymbol{e}, \boldsymbol{s}) \qquad \text{(search-tech)}$$

- $\eta =$ EOS btwn locations, single location search for $\eta \to \infty$, free diversification for $\eta = 0$.

Post-Migration employment dynamics

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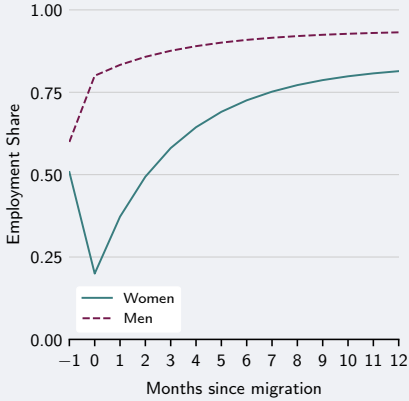

- Majority of trailing spouses find jobs within first 12 months
- Indirect inference on employment gap after 3m: 0.66 (model) vs 0.65 (data)

Transition dynamics: Migration rates

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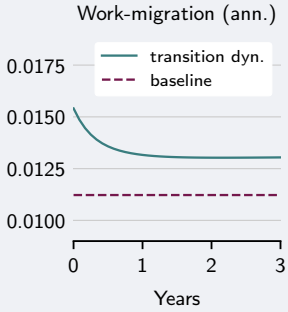

Long-distance households and migration

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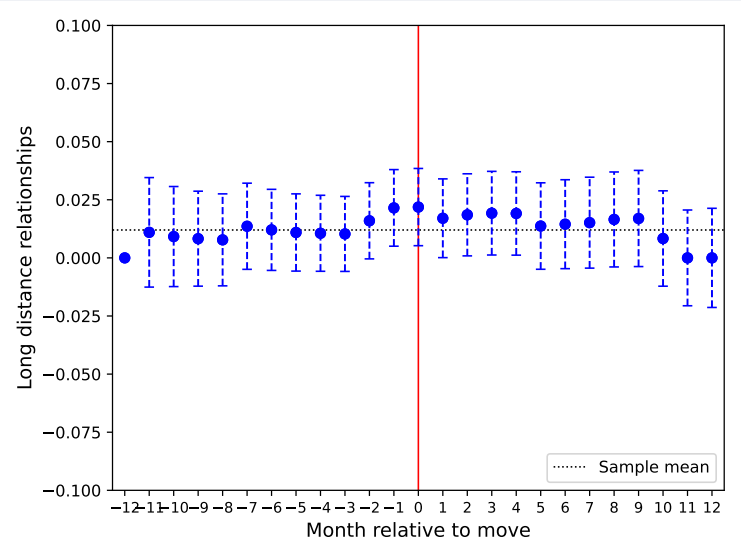
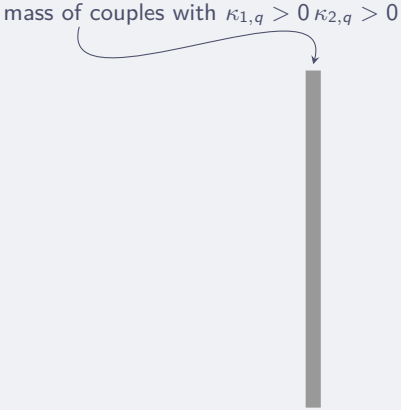


The Colocation Friction: Characterization (consider small $\Delta t > 0$)



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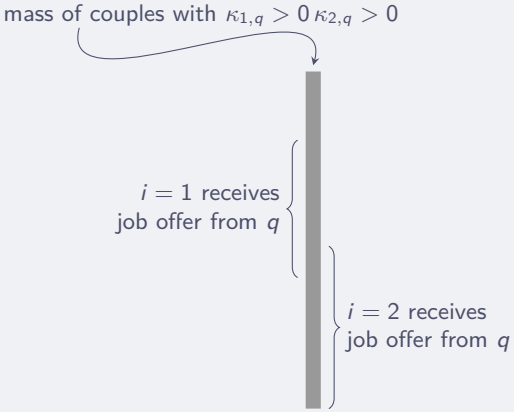

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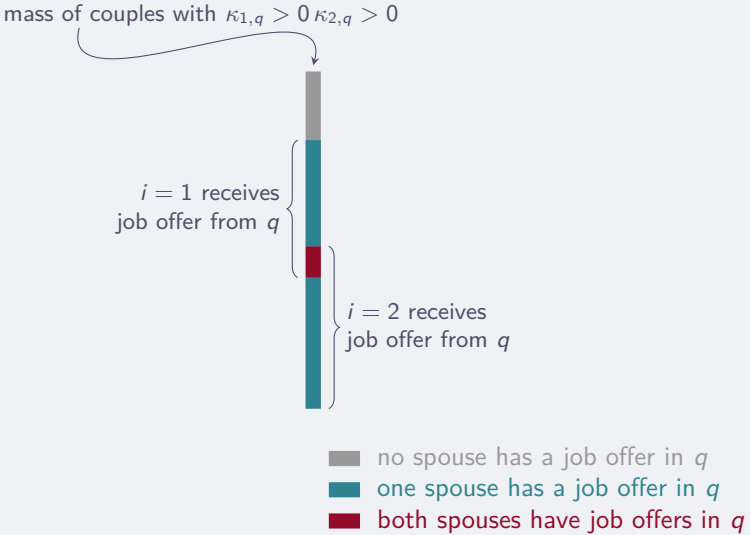

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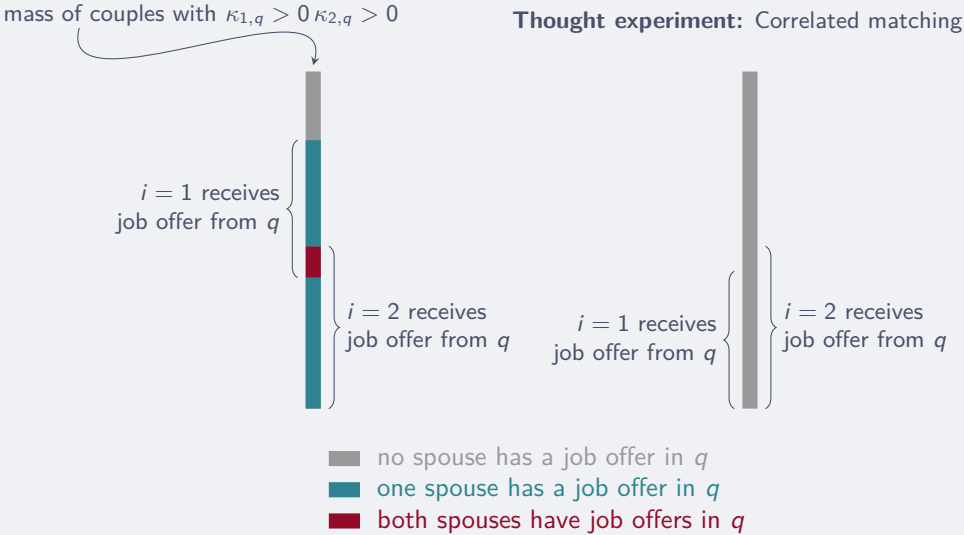

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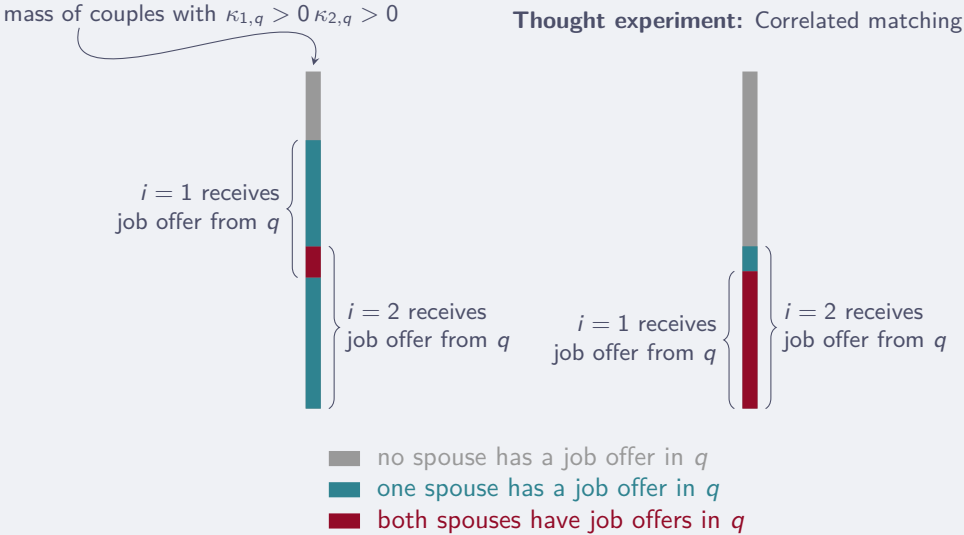

The Colocation Friction: Formal Characterization

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- Would couples benefit from coordinated matching?
- Coordinated matching, formally:

$$\text{correlated matching rate:} \quad \omega_q \in [0, \min_i f_{i,q}] \qquad \text{s.t. } \underbrace{\lambda(\cdot), c, \bar{\kappa}_i(\boldsymbol{e}, \boldsymbol{s})}_{\text{no change in std. matching friction!}}$$

$$\text{individual matching rates:} \quad f_{i,q} - \omega_q$$

- Couples receive **two** job offers at rate ω_q
- But the chance of receiving *at least one* job offer is reduced!