

The Dual Local Markets: Family, Jobs, and the Spatial Distribution of Skills

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ABFER

Introduction

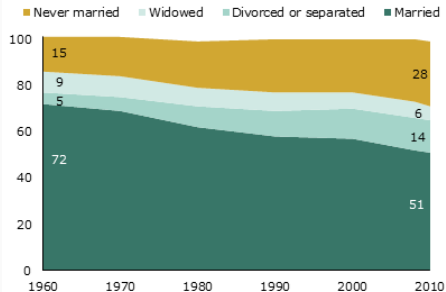
Motivation

- Job and family remain largely 'local'
 - most live with their spouses and within commuting distances from their jobs
 - in choosing where to live, returns from both labor and marriage markets are considered
 - implications for the spatial distribution of economic activity?
- Two trends in the U.S. economy in the past half century
 - increasing disparities between skilled and less-skilled cities ("regional divergence") [▶ evidence](#)
 - declining marriage rate
 - Are these two phenomena related?

Decline of Marriage

Current Marital Status, 1960-2010

%

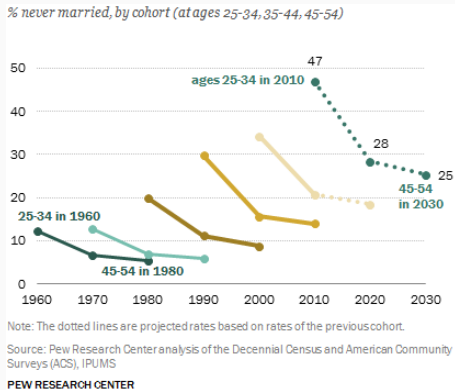


Note: Based on adults ages 18 and older. Percents may not total 100% due to rounding.

Source: Pew Research Center analysis of Decennial Census (1960-2000) and American Community Survey data (2008, 2010), IPUMS.

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Decline of Marriage: Across Cohort at a Given Age



Research Question

- How do the local *labor* market and the local *marriage* market interact to shape the size and productivity of cities
- Do marriage market incentives make the spatial distribution of economic activities more or less concentrated?
 - How important are spillovers and general equilibrium effects?

This Paper

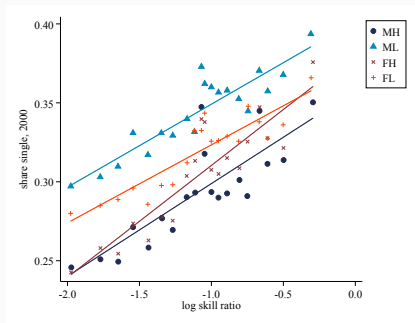
- Builds a spatial equilibrium model with endogenous marriage formation
 - labor and marriage market considerations jointly determine location choices, which in turn affect eqm returns in both markets
 - delivers a sufficient statistic for the **marriage market premium** of a city
- Calibrates the model to the U.S. spatial economy in 2000
 - the model matches the spatial heterogeneity in marriage outcomes well
 - counterfactuals find marriages to be a force of **spatial dispersion**, despite positive assortative matching. Endogenous marriage returns and GE important
- Accounting for the spatial divergence between 1960 and 2000
 - evaluate roles of declining share of married, changing social norm on working wife, narrowing gender pay gap, etc. (Greenwood et al., 2016, 2017)
 - reduced return from marriage accounts for up to a **third** of the spatial divergence over this period

Contributions

- **Quantitative spatial GE models** (e.g., Davis & Dingel, 2019; Fajgelbaum & Gaubert, 2020; reviewed by Redding & Rossi-Hansberg, 2017.)
 - Predominantly modeling *individual* choices
 - **Contribution:** Develop a tractable model with endogenous local marriage markets.
- **Explaining the spatial divergence of U.S. economy** (due to endogenous amenity (diamond, 2016); skill-biased tech. change (Giannone, 2017); housing supply (Hsieh & Moretti, 2019))
 - mostly descriptive evidence on marriage and spatial sorting (Costa & Kahn, 2000; Compton & Pollak, 2007), with exceptions (e.g., Alonzo, 2021)
 - **Contribution:** The declining marriage rate is quantitatively important in spatial divergence.
- **Quantitative transferable utility marriage models** (since Choo & Siow, 2006)
 - mostly do not have a spatial dimension
 - **Contribution:** Extend a workhorse matching model into a multi-region GE setting.

Spatial Heterogeneity in Local Marriage Markets

More Likely to Be Single in Skill-intensive Cities



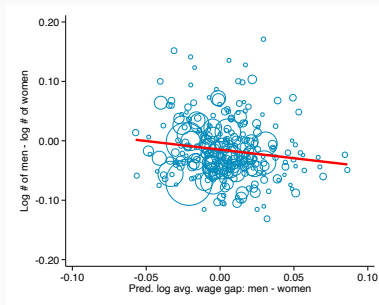
Prob. of Unmarried

Note: Aged 25 and 54 in 2000 Census. MSA-level single rate by gender-skill adjusted for age and race. Marks show MSAs binned by log skill share.

▶▶ Never Married

▶▶ by Age

More Women in Cities with Higher Gender Wage Gaps



Gender Ratio and *Pred.* Relative Wage

Note: Separately for full-time men and women, log earnings regressed on demographics, MSA FE, and industry-occupation FE. Avg ind-occ FEs within MSA indicates gender-specific labor demand.

- Predicted gender wage gaps driven by relative labor demand.
- *More* women in places with higher male wage, consistent with marriage-market considerations in migration (Edlund, 2005).

People migrate to cities with higher earnings gains from marriage

- gender wage gap for skill h/l : $GWG_i^e \equiv \log(w_i^{M,e}) - \log(w_i^{F,e})$
- gender marriage income gap for h/l : $GMIG_i^e \equiv \log(\mathbb{E}hhd_income_i^{M,e}) - \log(\mathbb{E}hhd_income_i^{F,e})$

Specification:

$$\text{gender difference in migration in } i \text{ for skill } e = \beta_0 + \beta_1 \cdot GMIG_i^e + \beta_2 \cdot GWG_i^e + \varepsilon_i$$

- def of gender difference in migration: (of net migration of men - of net migration of women)/(of people of the same skill in MSA)
- expect $\beta_1 > 0$

	gender difference in net-migration rate, 25-34 yo	
	(7)	(8)
Panel A: High-skilled		
gender wage gap	0.034 (0.030)	-0.063 (0.064)
gender gap in hhd income	0.031 (0.045)	0.230 (0.071)
model	OLS	2SLS
<i>N</i>	283	283
Panel B: Low-skilled		
gender gender wage gap	0.051 (0.023)	0.052 (0.027)
gender gap in hhd income	0.229 (0.025)	0.239 (0.036)
model	OLS	2SLS
<i>N</i>	283	283

Note: Data from 2000 Censuses. Each observation is an MSA. Robust standard errors are in parentheses. The dependent variable is the gender difference in net-migration rate among the 25-34 year old, separately for the high-skilled and the low-skilled. It is calculated as (# of net migration of men - # of net migration of women)/(# of people of the same skill in MSA).

Model

Model: Rosen-Roback Meets Becker

- N cities, indexed by d
 - cities differ in *exogenous* components of amenities and productivity, land supply shifter and elasticity
 - agglomeration forces change the endogenous component of amenities, productivity, and rent.
- Young adults choose city
- People in a city participate in the local marriage market
 - (e, e') denote a couple: e the skill of the husband and e' that of the wife
 - singles: (e, \emptyset) or (\emptyset, e')
 - 8 household types

Utility for Singles and Couples

- $\bar{V}_d^{(e,e')}$: the expected utility of household type (e, e') in d
- A couple with a man ω of skill e and a woman ω' of skill e' has unitary household utility:
 $\bar{V}_d^{(e,e')} + \xi_M^{e,e'}(\omega) + \xi_F^{e,e'}(\omega')$
 - $\xi_M^{e,e'}(\omega)$ and $\xi_F^{e,e'}(\omega')$ idiosyncratic taste of the spouses for outcome (e, e')
 - household utility will be split between ω and ω' if they form a couple
 - the exact split depends on the outside option of the two partners
- Utility of ω if remaining single is $\bar{V}_d^{(e,\emptyset)} + \xi_M^{e,\emptyset}(\omega)$
- Utility of ω' if remaining single is $\bar{V}_d^{(\emptyset,e')} + \xi_F^{\emptyset,e'}(\omega')$

Stable Match in City d

- Given the demographic composition of city d and V , the outcome of the marriage market in city d is a stable match that prescribes who matches with whom, and the distribution of utility: such that
 - Utility of ω : $u_{d,M}^{e,e'}(\omega) = U_{d,M}^{e,e'} + \xi_M^{e,e'}(\omega) = \max_{e'' \in \{H,L,\emptyset\}} [U_{d,M}^{e,e''} + \xi_M^{e,e''}(\omega)]$
 - 'No money left on table'

$$U_{d,M}^{e,e'} + U_{d,F}^{e,e'} = \bar{V}_d^{e,e'} \quad (4 \text{ eqs})$$

$$U_{d,M}^{e,\emptyset} = \bar{V}_d^{e,\emptyset} \quad (2 \text{ eqs})$$

$$U_{d,F}^{\emptyset,e'} = \bar{V}_d^{\emptyset,e'} \quad (2 \text{ eqs})$$

- no excess demand for each type of marriage (4 eqs)

Location and partner choice of young adults

- The expected utility of ω of type (M, e) from city d

$$\bar{U}_{d,M}^e = \mathbb{E} \max_{e' \in \{H,L,\emptyset\}} [U_{d,M}^{(e,e')} + \xi_M^{e,e'}(\omega)]$$

- Similarly, for a women of skill e' :

$$\bar{U}_{d,F}^{e'} = \mathbb{E} \max_{e \in \{H,L,\emptyset\}} [U_{d,F}^{(e,e')} + \xi_F^{e,e'}(\omega)]$$

- Parametric assumption: $\vec{\xi}_M^e(\omega) \equiv (\xi_M^{e,H}(\omega), \xi_M^{e,L}(\omega), \xi_M^{e,\emptyset}(\omega))$ i.i.d. from a Gumbel distribution with parameter κ_M^e

The Marriage Market Premia of Cities

$$\bar{U}_{d,M}^e = \frac{\gamma}{\kappa_M^e} + \underbrace{\bar{V}_d^{e,\emptyset}}_{\text{utility if single}} \underbrace{\left(-\frac{1}{\kappa_M^e} \log(r_{d,M}^{e,\emptyset}) \right)}_{\text{single rate}}$$

the marriage market premia of d

- Fixing $\bar{V}_d^{e,\emptyset}$, higher $r_{d,M}^{e,\emptyset} \implies$ marriages relatively less attractive in $d \implies$ marriage incentive less important a reason for people to choose d
- Implications
 - captures the marriage market premia of cities
 - the change in $\bar{U}_{d,M}^e$ when single rate is set to 1: $-\frac{1}{\kappa_M^e} \log(1) + \frac{1}{\kappa_M^e} \log(r_{d,M}^{e,\emptyset})$
 - Skilled intensive cities have higher single rates \implies marriage is a **dispersion** force in PE

Remaining Household Decisions

- Singles

- Indirect utility given by

$$\bar{V}_{d,s}^e \equiv \max_{h,n} \log \left(A_d^e \cdot (I_{d,s}^e - r_d \cdot h - p_n \cdot n)^{(1-\alpha-\beta)} \cdot h^\alpha \cdot n^\beta \right).$$

where A_d^s is amenities; $I_{d,s}^e$ is income (earnings + transfer); h is housing consumption and r_d rent; n is home goods consumption and p_n its market price

- Couples

- the wife obtains idiosyncratic ζ^H and ζ^W (for home production and work)

$$\begin{aligned} \tilde{V}_d^{e,e'}(\zeta^H, \zeta^W) = & \delta^{e,e'} + \\ & \max_{H,W} \left\{ \zeta^W + \max_{h,n} \log \left(A_d^{e,e'} (I_{d,W}^{e,e'} - r_d h - p_n n)^{(1-\alpha-\beta)} h^\alpha n^\beta \right), \right. \\ & \left. \zeta^H + \max_h \log \left(A_d^{e,e'} (I_{d,H}^{e,e'} - r_d h)^{(1-\alpha-\beta)} h^\alpha (\bar{n}^{e'})^\beta \right) \right\} \end{aligned}$$

What Is a Marriage?

- A unitary household utility function, with household amenities, ($A_d^{e,e'} = (A_d^e A_d^{e'})^{1/2}$) and household-level budget
- The option of having a stay at home spouse, captured by \bar{n}^e
- Love ($\delta^{e,e'}$): as a residual to match the number of the four types of marriages

Closing the Model

- Amenities and city productivity
 - Exogenous: \bar{A}_d^e and \bar{K}_d^e
 - Endogenous: agglomeration for amenities ($\sigma_{e,e'}$) and productivity ($\gamma_{e,e'}$)
- Housing market: shifter \bar{H}_d and return to scale $\epsilon_d < 1$. Profit paid back to household in lump sump t
- Gender wage gap: effective wage for women a β^e fraction of men
- Equilibrium definition: agents optimize, labor/good/housing/marriage clear, expectation consistent with reality

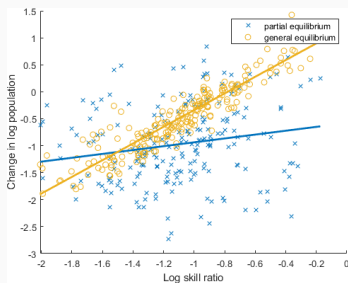
Parameterization and Model Validation

Parameters	Descriptions	Value	Targets/Source
A. Assigned directly			
$\sigma_{e,e'}$	amenity spillovers	$\sigma_{H,H} = 0.77, \sigma_{H,L} = 0.18,$ $\sigma_{L,H} = -1.24, \sigma_{L,L} = -0.43$	} Fajgelbaum and Gaubert (2020)
$\gamma_{e,e'}$	prod. spillovers	$\gamma_{H,H} = 0.05, \gamma_{H,L} = 0.04,$ $\gamma_{L,H} = 0.02, \gamma_{L,L} = 0.003$	
ρ	substitution between skills	0.392	
β_F^e	gender wage gap	$\beta_F^H = 0.76, \beta_F^L = 0.74$	} 2000 Census
α	housing share	0.25	
β	home-good share	0.2	} Diamond (2016)
ϵ_d	housing supply elast.	Figure 2	
θ_s^e	income elast. of migration	$\theta_M^H = \theta_F^H = 4.98,$ $\theta_M^L = \theta_F^L = 3.26$	
B. Estimated independently			
η_F^e	labor force participation.	Table 1	} 2000 Census
κ_s^e	marriage taste shock	Table 2, column 3	
$\tau_{b,s}^e$	migration cost	Table 4	
C. Calibrated jointly			
\bar{H}_d	housing supply shifter	-	rent by city
\bar{A}_d^e	fund. amenities	-	emp by city \times skill
\bar{K}_d^e	fund. prod.	-	wage by city \times skill
$\delta^{e,e'}$	love	$\delta^{H,H} = 1.07, \delta^{H,L} = 0.28,$ $\delta^{L,H} = -1.96, \delta^{L,L} = 1.20$	68% people in marriages; composition: 21% (H,H), 13% (H,L), 9% (L,H), 56% (L,L) labor force participation (83% and 73%)
\bar{n}^e	home prod. pref.	$\bar{n}^H = 0.004, \bar{n}^L = 1.03$	

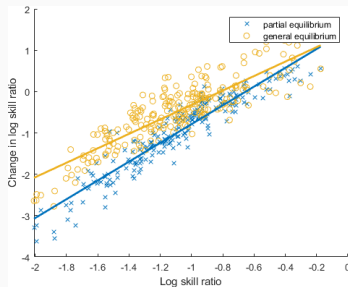
Counterfactuals

The PE and GE Effects of Eliminating Marriages

- PE: Set $r_{e,\emptyset}^{d,M}$ and $r_{\emptyset,e'}^{d,F}$ (single rate) to 1, while holding utility of being single unchanged
- GE: Set $\delta^{e,e'}$ (non-economic return of a match) to sufficient negative



PE versus GE: City Size



PE versus GE: Log Skill Ratio

Comparison Between 1960 and 2000 Economy

- Increasing skill share
- Declining marriage
- Increasing LFP among married women

	2000		1960	
	Target	Parameter	Target	Parameter
Demographics	15% (M,H), 34% (M,L), 14% (F,H), 36% (F,L)	-	5.7% (M,H), 43% (M,L), 3.5% (F,H), 48% (F,L)	-
Marriage patterns	68% people married: HH (21%), HL (13%), LH(9%), LL (56%)	$\delta^{H,H} = 1.06$, $\delta^{H,L} = 0.28$, $\delta^{L,H} = -1.96$, $\delta^{L,L} = 1.20$	83% people married: HH (4%), HL (8%), LH(3%), LL (85%)	$\delta^{H,H} = 1.24$, $\delta^{H,L} = 1.72$, $\delta^{L,H} = -2.13$, $\delta^{L,L} = 3.98$
Gender wage gap	24% for H, 26% for L	$\beta_F^H = 0.76$, $\beta_F^L = 0.74$	36% for H, 38% for L	$\beta_F^H = 0.64$, $\beta_F^L = 0.62$
LFP of married women	83% among H, 73% among L	$\bar{n}^H = 0.004$, $\bar{n}^L = 1.03$	58% among H, 46% among L	$\bar{n}^H = 0.62$, $\bar{n}^L = 2.19$

Changing Marriage Institution and Spatial Divergence

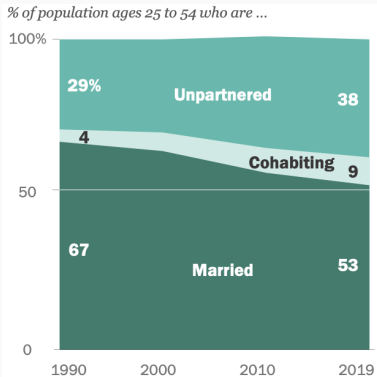
	Model				Data
	(1)	(2)	(3)	(4)	(5)
	home production (p_n, \bar{n}^e)	gender wage gap (β_F^e)	non-econ. return ($\delta^{e,e'}$)	all together	
skill gradient	0.003	0.001	0.028	0.054	0.14
population gradient	0.015	0.003	0.11	0.20	0.33

- Declining non-economic returns of marriage account for 20-30% of the spatial divergence
- Marriage-related model elements accounts for 30-60%

Conclusions

- A new quantitative spatial equilibrium model with endogenous marriage formation
 - a sufficient statistic for the PE impacts of the secular change in marriage
 - tractable quantitative GE analysis
- An application to the U.S. finds
 - marriage is a dispersion force and first-order determinant of the spatial distribution of economic activities
 - changing marriage institution is an important factor driving changes in spatial economics

Decline of Marriage: Not due to Increasing Cohabitation



Note: Unpartnered adults are those who are neither married nor living with an unmarried partner.

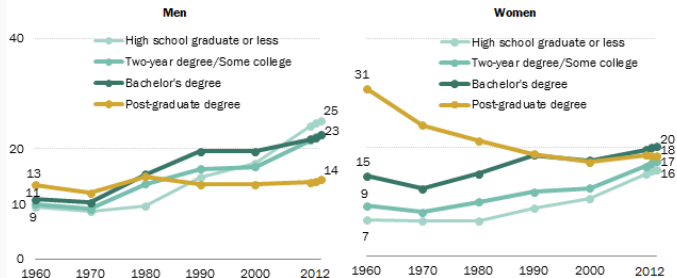
Source: Pew Research Center analysis of 1990 and 2000 decennial census and 2010 and 2019 American Community Survey (IPUMS). "Rising Share of U.S. Adults Are Living Without a Spouse or Partner"

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Decline of Marriage: Across Education Groups

Education and Marriage: Shifting Patterns for Women and Men

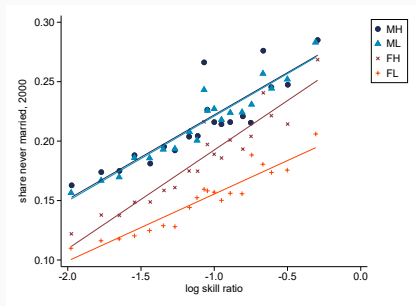
% of men and women ages 25 and older who have never been married, by education



Source: Pew Research Center analysis of the 1960-2000 decennial censuses and 2010-2012 American Community Survey, Integrated Public Use Microdata Series (IPUMS)

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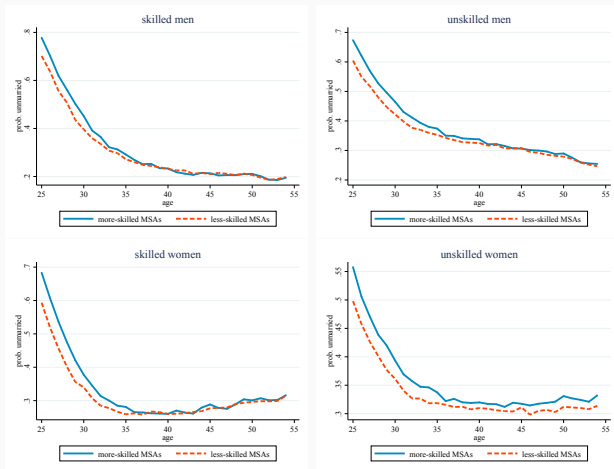
More Never-married people in Skill-intensive Cities



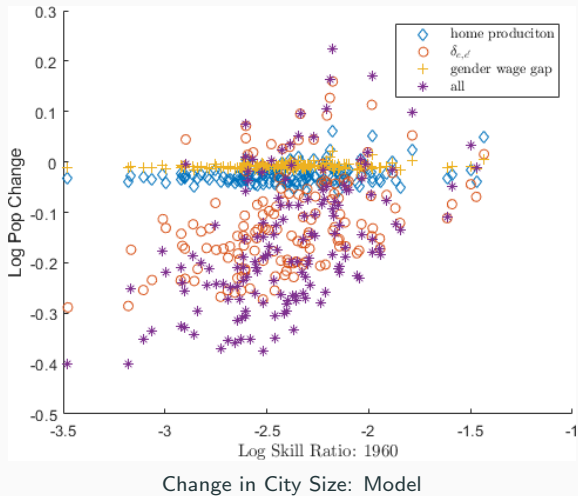
Prob. of Never Married

Note: Aged 25 and 54 in 2000 Census. MSA-level never-married rate by gender-skill adjusted for age and race. Marks show MSAs binned by log skill share.

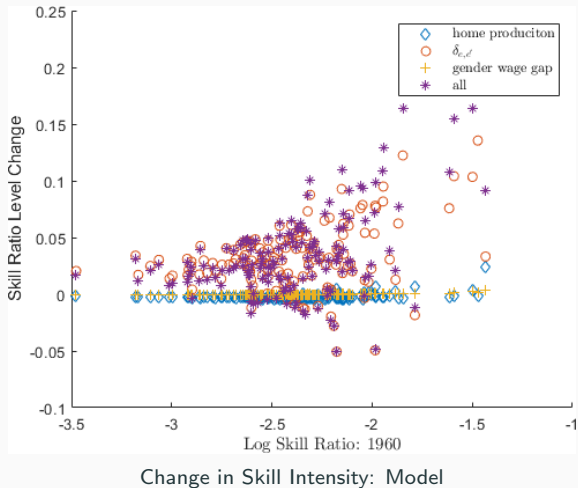
Shares of Unmarried by Age in Skill-intensive and Less Skill-intensive Cities



Changing Marriage Institution and Spatial Divergence



Changing Marriage Institution and Spatial Divergence



Gumbel Parameter in Wife's LFP: η_F^e

$$\log\left(\frac{I_d^{e,e'}}{1 - I_d^{e,e'}}\right) = \eta_F^{e'} \cdot [\log(I_{d,W}^{e,e'}) - \log(I_{d,H}^{e,e'})] + f(\hat{p}_n, \hat{n}^{e'}) + \lambda^{e,e'} + \varepsilon_d^{e,e'}.$$

	(1)	(2)
	$e' = H$	$e' = L$
$\log(I_{d,W}^{e,e'}) - \log(I_{d,H}^{e,e'})$	0.866 (0.407)	3.334 (0.400)
Controls		
log rent	X	X
% having young children	X	X
distr. of husband age	X	X
Household type FE	X	X
	(H, H), (L, H)	(H, L), (L, L)
N	653	654

Gumbel Parameter for Idiosyncratic Marital Pref.: κ_S^e

$$\log(q_d^{H,H}) = g(\mathbf{X}_d^{H,H}) + \frac{1}{\frac{1}{\kappa_M^H} + \frac{1}{\kappa_F^H}} [\alpha \log(r_d) + \frac{1}{\kappa_M^H} \log(q_d^{H,\emptyset}) + \frac{1}{\kappa_F^H} \log(q_d^{\emptyset,H})] + \varepsilon_d^{H,H}$$

$$\log(q_d^{H,L}) = g(\mathbf{X}_d^{H,L}) + \frac{1}{\frac{1}{\kappa_M^H} + \frac{1}{\kappa_F^L}} [\alpha \log(r_d) + \frac{1}{\kappa_M^H} \log(q_d^{H,\emptyset}) + \frac{1}{\kappa_F^L} \log(q_d^{\emptyset,L})] + \varepsilon_d^{H,L}$$

$$\log(q_d^{L,H}) = g(\mathbf{X}_d^{L,H}) + \frac{1}{\frac{1}{\kappa_M^L} + \frac{1}{\kappa_F^H}} [\alpha \log(r_d) + \frac{1}{\kappa_M^L} \log(q_d^{L,\emptyset}) + \frac{1}{\kappa_F^H} \log(q_d^{\emptyset,H})] + \varepsilon_d^{L,H}$$

$$\log(q_d^{L,L}) = g(\mathbf{X}_d^{L,L}) + \frac{1}{\frac{1}{\kappa_M^L} + \frac{1}{\kappa_F^L}} [\alpha \log(r_d) + \frac{1}{\kappa_M^L} \log(q_d^{L,\emptyset}) + \frac{1}{\kappa_F^L} \log(q_d^{\emptyset,L})] + \varepsilon_d^{L,L}.$$

	(1)	(2)	(3)
κ_M^H	2.37 (0.35)	1.84 (0.37)	1.62 (0.40)
κ_F^H	2.13 (0.40)	1.64 (0.39)	1.66 (0.47)
κ_M^L	1.21 (0.27)	0.87 (0.24)	0.71 (0.24)
κ_F^L	5.13 (1.39)	3.53 (1.08)	2.61 (0.91)
$\log\left(\frac{I_d^{e,e'}}{I_{d,M}^e \cdot I_{d,F}^{e'}}\right)$	X	X	X
$\log(I_d^{e,e'})$	X	X	X
$\hat{\rho}_n$	X	X	X
$\log(\hat{A}_d)$			
climate		X	X
services			X
N	1181	1181	1181

Migration cost: $d_{od,s}^o$

- Parameterize migration cost by distance bins

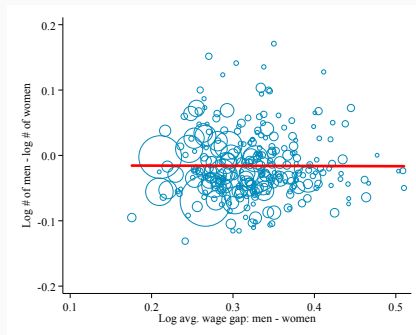
$$d_{od,s}^e = \mathbb{I}_{S(o) \neq S(d)} \cdot \sum_{b=1}^5 \tau_{b,s}^e \cdot \mathbb{I}_b$$

- Combining with migration flow function

$$\log(N_{od,s}^e) = \lambda_{o,s}^e + \lambda_{d,s}^e - \theta_s^e \cdot \mathbb{I}_{S(o) \neq S(d)} \cdot \sum_{b=1}^5 \tau_{b,s}^e \cdot \mathbb{I}_b + \varepsilon_{od,s}^e,$$

	(1)	(2)	(3)	(4)
	male		female	
dep var: $\log(N_{od,s}^e)$	high	low	high	low
$\theta_s^e \cdot \tau_{1,s}^e$	1.870 (0.112)	2.224 (0.135)	1.957 (0.114)	2.148 (0.141)
$\theta_s^e \cdot \tau_{2,s}^e$	2.621 (0.051)	3.312 (0.062)	2.713 (0.053)	3.260 (0.061)
$\theta_s^e \cdot \tau_{3,s}^e$	3.510 (0.048)	4.315 (0.058)	3.638 (0.050)	4.280 (0.058)
$\theta_s^e \cdot \tau_{4,s}^e$	4.025 (0.048)	4.888 (0.059)	4.161 (0.050)	4.868 (0.058)
$\theta_s^e \cdot \tau_{5,s}^e$	4.346 (0.050)	5.378 (0.061)	4.529 (0.052)	5.365 (0.060)
destination MSA FE ($\lambda_{d,s}^e$)	X	X	X	X
state-of-origin FE ($\lambda_{o,s}^e$)	X	X	X	X
N	11099	13529	11436	13586

Value of Marriage Market Options in Location Choices

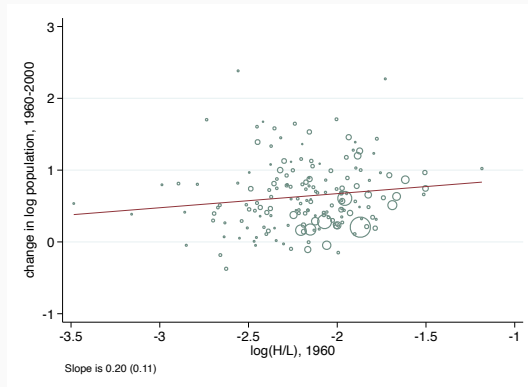


Gender Ratio and Relative Wage

Note: Aged 25 and 54 in 2000 Census. Log gender wage gap is calculated from full-time workers and is adjusted for age, race, and detailed education levels.

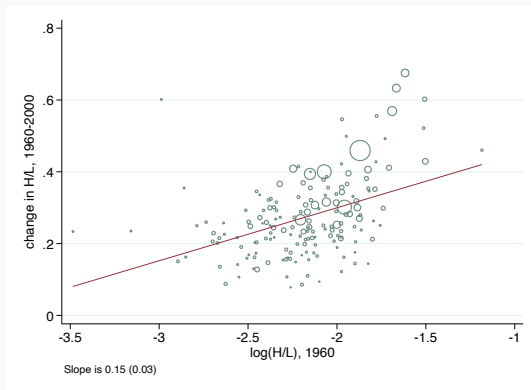
- The flat relation is at odds with workhorse spatial equilibrium models
- Consistent with marriage prospects affecting location choices

Regional Divergence: Skilled Cities Grew Faster



Note: 5% sample of 1960 and 2000 population censuses. Each circle represents an MSA. The size of the circle corresponds to the size of the working age population. H/L is the employment skill ratio.

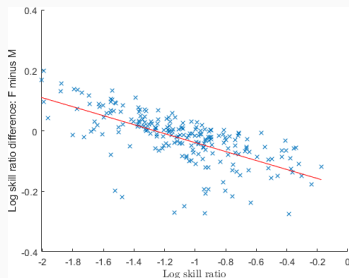
Regional Divergence: Skilled Cities Grew Even More Skilled



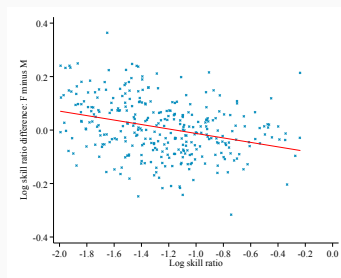
Note: 5% sample of 1960 and 2000 population censuses. Each circle represents an MSA. The size of the circle corresponds to the size of the working age population. H/L is the employment skill ratio.

Model Validation: Gender Composition of Skills

- Calibration targets skill share (H/L) in each city, but not the *gender composition* of skills in each city



Log Relative Skill Ratio: Model

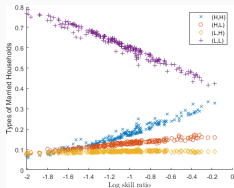


Data

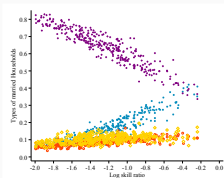
Vertical axis: $\log\left(\frac{\# \text{ of high skill women}}{\# \text{ of low skill women}}\right) - \log\left(\frac{\# \text{ of high skill men}}{\# \text{ of low skill men}}\right)$.

Model Validation: Composition of Households

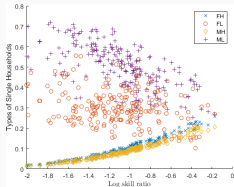
- Calibration targets the composition of marriages in the aggregate, but not by city



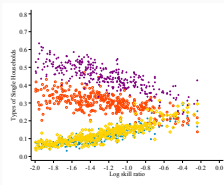
Married Hhds: Model



Data

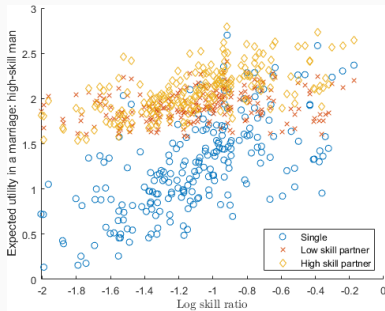


Single Hhds: Model

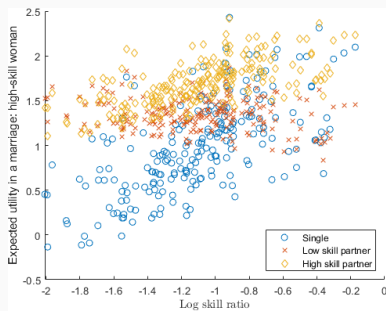


Data

Utility in Different Marriage Outcomes ($U_{d,s}^{e,e'}$)



High-skill Men



High-skill Women

- utility for both the single and the married increases with skill intensity, but the former increases faster
- marrying an H may be more attractive than other outcomes on average, but the premium decreases with skill intensity, so the single rate increases
- underscores the importance of endogenous marital surplus and its division