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

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This version: November 2021

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A Data and Additional Empirical Results

A.1 Data and Sample

Data sources. The main data used in this paper are the 5% samples of the 1960 and 2000 population censuses from the IPUMS (Ruggles et al., 2021), which are based on the long form of population censuses. They are nationally representative samples and include detailed geographic, demographic, and economic characteristics at the individual and household levels.

Definition of local markets. For quantitative analysis, we define local marriage and labor markets as metropolitan statistical areas (MSAs), which have long been used as the definition of local labor markets. There are 283 identifiable MSAs in the 2000 census and 177 in the 1960 census. The delineations of MSAs change over time. When comparisons of local markets across years are needed, we focus on MSAs that are consistently defined across the two censuses.

An alternative definition of a local market is a commuting zone. Commuting zones cover the entirety of the United States. For main quantitative analyses, we use MSAs instead of commuting zones primarily because a key set of parameters in our model—local land supply elasticities, which is pinned down by indices constructed from land area, geographic features, and zoning regulations—are only available for MSAs (Saiz, 2010; Diamond, 2016).

All reduced-form patterns reported in the paper and this appendix are robust if we define local markets using commuting zones.

Definitions of skill and marriage. A person is high skilled if they appear in Census 2000 and have a college degree; or they appear in Census 1960 and have 4 or more years of college education. Marital statuses classified by the IPUMS include married with or without spouse present, separated, divorced, widowed, or never married. We call an individual married if they report that they are currently married, with or without spouse present.[1] Finally, in showing the change in the marriage rate between 1960 and 2000, we also consider an alternative definition of marriage, which includes cohabitation (see Figure A.5).

In tabulating the composition of households by type, we need to classify couples by spouses' skill levels. For this purpose, we need to identify who is married to whom within a household. For accurate measurements, we focus only on the head couple of a household.[2] We also only focus on traditional families where a marital couple consists of a man and a woman.

Choices of sample groups for estimation. In reality, people make migration, marriage and labor market decisions throughout their lifetime and not in a strict order. For simplicity, we have developed a static model, in which individuals live through three life stages: a pre-period

[1] This definition implicitly treats divorcees and those who are separated from their spouses as singles, which is consistent with the interpretation of our model as for 'successful marriages.' We note that the patterns of single rates and the composition of marriages across cities are similar if we instead focus only on the never-married.

[2] There may be multiple married couples in a household, but often we are unable to identify both spouses. For example, a married son may live with his wife and his parents (the head couple). He is identified as a child of the head, and we can identify that he is a son based on his gender. His wife will be classified as the daughter-in-law of the head. But we cannot identify the couple if there are other sons in the household, so we omit such cases. Such omission is likely negligible because in cases like this, the son and his wife is usually identified as a separate household from the parents, even if they live in the same house. Therefore, co-existence of multiple married couples in a same household is rare.

when individuals choose which city to live in, a period when individuals engage in the marriage market, and one that is after the marriage market is settled and families are formed. Such assumption fits the empirical regularities that the migration rate is highest in one's early 20s and declines rapidly with age, especially after one gets married and has children; similarly, the probability of entering marriage is highest between one's late 20s and early 30s.

In quantification, we estimate parameters governing decisions in different life stages by restring the sample to different age groups that are consistent with the model. In particular, we estimate the female labor force participation (Section 4.2) and marriage preferences (Section 4.3) using people between ages 40 and 54, a group that is above the typical ages of initial marriages but before retirement. When estimating migration costs (Section 4.4), we focus on people between ages 25 and 39.

A.2 Empirical Patterns: Robustness and Additional Results

Marriage rate and spatial divergence in OECD countries. One observation of the paper is that the declining marriage rate goes hand in hand with the increasing spatial concentration in economic activities. Our paper focuses on the United States, but this pattern is prevalent across industrialized countries.

Table A.1 documents relevant statistics for the OECD countries. Between 1970 and 2010, all countries with available data experienced a decrease in the net marriage rate.[3] Accompanying this trend was the increasing concentration of population in big cities, measured using the share of nationwide population residing in large metropolitan areas. We define large metropolitan areas as those among the top 40% of a country's metropolitan size distribution. We obtain countries' metropolitan size over time from the United Nation dataset on the size of urban agglomerations, which includes all urban areas with above 300,000 population in 2018. Table A.1 shows that 26 out of 35 OECD countries saw an increase in the share of their major cities. Our model has the potential in explaining the broad pattern observed in many high-income countries.

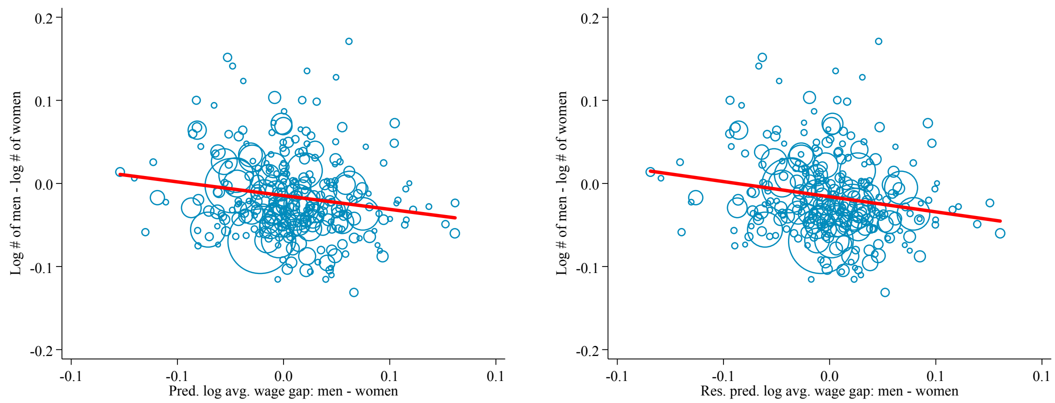
Table A.1: Marriage Rate and Spatial Divergence: OECD countries

Country	Net marriage rate (# per 1,000 people) Δ btw.1970-2010	Share of pop. in large metro areas (%) Δ btw.1970-2010	Country	Net marriage rate (# per 1,000 people) Δ btw.1970-2010	Share of pop in large metro areas (%) Δ btw.1970-2010
Australia	-5.20	-3.40	Japan	-5.60	12.01
Austria	-3.30	-1.01	Latvia	-3.60	0.85
Belgium	-5.70	1.70	Lithuania	-4.50	5.29
Canada	-4.60[1]	7.12	Mexico	-2.20	10.43
Chile	-4.60[2]	9.60	Netherlands	-6.20	-2.08
Colombia	-	13.39	New Zealand	-5.20	7.23
Costa Rica	-1.0[2]	10.84	Norway	-4.00	1.78
Czech Republic	-5.40	0.76	Poland	-3.10	0.28
Denmark	-2.50	-6.50	Portugal	-8.10	5.66
Estonia	-4.30	2.24	Korea	-4.60	17.27
Finland	-4.40	9.99	Slovakia	-4.60	1.40
France	-0.70[3]	0.63	Spain	-3.70[2]	1.54
Germany	-3.70	-0.36	Sweden	-1.00	0.48
Greece	-3.40	0.24	Switzerland	-3.90	5.07
Hungary	-5.90	-1.48	Turkey	-	17.84
Ireland	-2.50[2]	-1.99	United Kingdom	-5.10	-3.54
Israel	-3.50	11.53	United States	-3.90	0.24
Italy	-4.20	-0.50			

Note: The sample includes OECD countries. Net marriage rate is the crude marriage rate (number of marriages per 1,000 people) minus the crude divorce rate (number of divorces per 1,000 people). Marriage rate and divorce rate data are from the OECD database, Table SF-3-1. Data from select countries are defined slightly differently and indicated by superscripts: [1]1970-2000; [2]raw marriage rate; [3]1995-2018. Population in large metro areas are from the urban agglomeration dataset maintained by the United Nations (population.un.org/wup/Download). 'Large' is defined as among the top 40% biggest cities of a country in the dataset, which include all urban agglomerations with a population more than 300,000 in 2018. Nationwide population is from the World Bank's World Development Indicators.

[3]Data for Canada, Chile, Ireland and Spain are either over a slightly different period, or defined using different variables. See the table note for details.

The relationship between the predicted gender earnings difference and the gender ratio. We use Figure 1b in the paper, which shows that there is no correlation between the relative earnings between men and women in a labor market and the gender ratio, as suggestive evidence that marriage prospects incentivize people to move to places where their earnings potential is not maximized. One concern with this piece of evidence is that the gender earnings difference can be affected by the relative labor supply. To rule out this possibility, we construct the predicted earnings by gender that are derived from the industry-and-occupation structure in the local market.



(a) Predicted Wage

(b) Pred. Wage, Adj. for City Size and Skill Ratio

Figure A.1: Gender Ratio and Predicted Gender Wage Difference

Note: Each bubble represents an MSA in 2000. We restrict the sample to full-time workers between ages 25 and 54. To predict wage, we regress, separately for workers by gender and skill, log annual earnings on a flexible function of age, education, their interactive terms, and a set of industry-occupation indicators. Then we aggregate industry-occupation fixed effects (using their shares of local employment as weights) separately by gender in each MSA. The predicted gender wage gap in an MSA is the difference between men and women in the weighted average of industry-occupation fixed effects. In Panel a, the slope is -0.34 with a robust standard error of 0.13. In Panel b, log gender wage gap is further residualized from log city population size and skill ratio. The slope is -0.36 with a robust standard error of 0.11.

Specifically, from the 2000 census, we obtain the sample of full-time workers between ages 25 and 54. We regress, separately for workers by gender and skill, log annual earnings on flexible functions of age, education, their interactive terms, and a set of industry-occupation indicators. We then use these industry-occupation fixed effects and the weight of different industry-occupation cells in a city to generate wage predictions for men and women in that city. Figure A.1a plots the difference in predicted wages between men and women against the gender ratio. Since the wages are predicted using the industry-occupation structures of cities, the figure can be viewed as the relatively supply curve. It shows that relative prices and relative supply in the local market are not positively correlated, further supporting the hypothesis that marriage market incentives play an important role in people's decision on where to live.[4] One may still be

[4]If anything, the correlation is negative. A hypothesis that can explain this negative correlation is that women might

concerned that other characteristics of the city, such as its size and skill ratio, drive this relationship. In Figure A.1b, we further residualize the predicted log wage difference by regressing it on log population size and log skill ratio. The pattern is essentially unchanged.

Log skill ratio and the probability of being single. Figure 4f of the paper shows a positive correlation between the single rate and the log skill ratio of local markets. One might be concerned that such a pattern could be driven by differences in age compositions across cities. To address this concern, we use individual level data and regress the indicator for being single on city skill ratio, separately for each gender-skill group and controlling for age-by-race fixed effects. Figure A.2 visualizes the finding. The slope of the fitted lines for all groups are positive, economically meaningful, and statistically significantly above zero. On average, increasing the log skill intensity (H/L) by one is associated with a 5.5 percentage point (p.p.) increase in the probability of staying single.

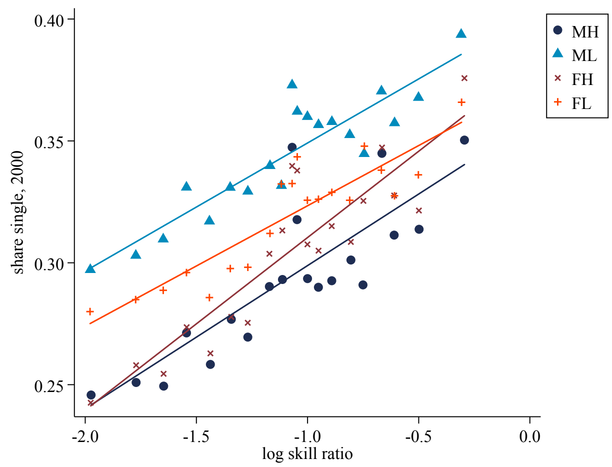


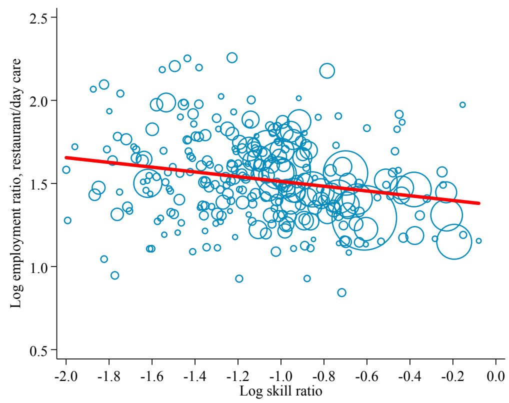
Figure A.2: Prob. of Being Single by Gender-skill, against Local Log Skill Ratio
Note: The sample includes individuals between ages 25 and 54 from Census 2000. The graph shows binned scatter plots and linearly fitted lines separately for each gender-skill group, adjusting for age-by-race fixed effects.

Log skill ratio and differential amenities for singles and married couples. As discussed in the paper, one additional channel for marriage rates to be lower in skill intensive cities is that amenities in these cities appeal more to single people, which can be tractably introduced to the baseline model by assuming $\delta^{e,e'}$ to be a decreasing function of city skill intensity.

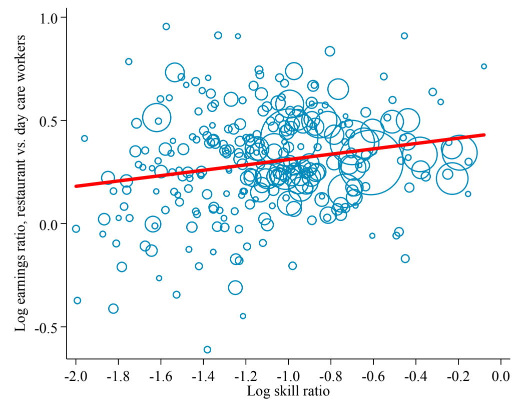
While it is difficult to categorize various amenities to be 'singles-friendly' and 'family-friendly,' it seems reasonable to assume that compared to singles, married couples derive higher utilities fromm the access to affordable childcare than they do from restaurants and bars. We proxy for the accessibility these amenities by the employment in corresponding industries; we proxy for those services using the average earnings of workers in these industries.

be attracted to places where the earnings potential of men is higher for marital reasons (Edlund, 2005). Although this hypothesis is also consistent with our model, we note that the negative slope is relatively weak and our main point is on the lack of a positive slope.

Figure A.3a shows that skill-intensive cities do not necessarily have more restaurants and bars relative to daycare facilities—if any, they have relatively more employment in daycare facilities; Figure A.3b further shows that restaurants are likely more expensive in skill-intensive cities relative to daycare centers. Thus, if we were to use either the accessibility or the cost proxy to estimate the relationship between 'singles-bias' of amenities and log skill ratio of cities, we would have found that this mechanism tends to generate *lower* single rates in skill intensive cities. For this reason, incorporating this mechanism is unlikely to undermine the importance of the main mechanisms in our baseline model.[5]



(a) Differential Amenities: Accessibility



(b) Differential Amenities: Cost

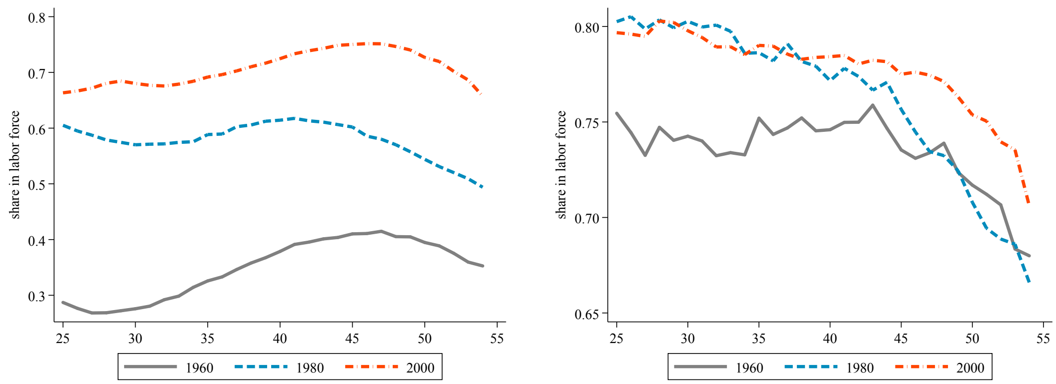
Figure A.3: Amenities Attractive to Singles and Married Couples

Note: Each bubble represents an MSA in 2000. The size of the bubble is proportional to MSA's population. We pick two industries to represent amenities that are particularly valued by singles and married couples. We postulate that unmarried people derive a relatively high value from restaurants and bars (eating and drinking places), while married people derive a relatively high value from childcare services (child daycare centers). Panel (a) shows that more skill-intensive cities do not have amenity compositions that favor singles: number of workers in the eating and drinking industry relative to that of workers in the child daycare industry declines with city's skill intensity. Panel (b) shows that the average earnings in the eating and drinking industry relative to that in the child daycare industry—which serves as a proxy for the relative costs of these two services—increases with the city's skill intensity.

Secular trends in the female labor force participation by marital status. Figure 8b in the paper shows that women's labor force participation has increased substantially between 1960 and 2000. Figure A.4a and Figure A.4b show changes in women's labor force participation between 1960 and 2000 by age and by marital status. Much larger increases are observed among married women, whose labor force participation rates increased between 30 and 40 p.p., depending on the age. Unmarried women's labor force participation also increased, but by a much lesser degree (around 5 p.p.). This observation motivates the focus of our model on the labor force participation decision of married women only.

Incorporating cohabitation in marriages. Figure 8a in the paper shows that the share of

[5] This evidence is suggestive because the quality of services are not accounted for, and we only consider two modal amenities, from which married and single families may derive substantially different utility.



(a) Married

(b) Unmarried

Figure A.4: Female Labor Force Participation, 1960-2000, by marital status
Note: Data from the 1960, 1980, and 2000 censuses. The graphs show the share of women between ages 25 and 54, by age and marital status, who are currently in the labor force. Panel a shows those who are currently married. Panel b shows those who are not married.

people in a marriage has been declining for all age groups in the second half of the 20th centruy. During the same time period, there has been an increase in cohabitation. We focus on marriages because cohabitation is less consistently defined in the data. Here we show in Figure A.5 that including cohabitation only slightly offset the reduction in marriages.

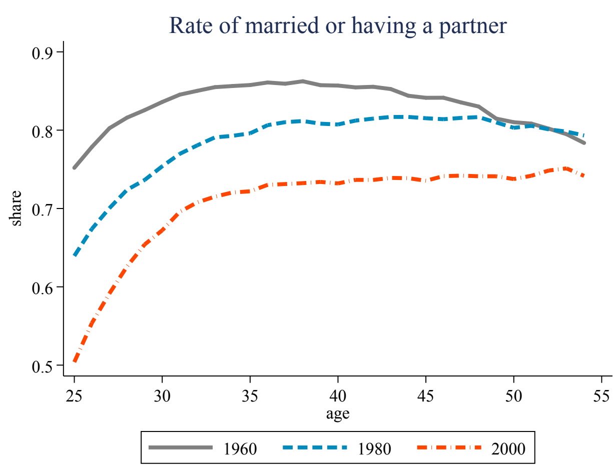
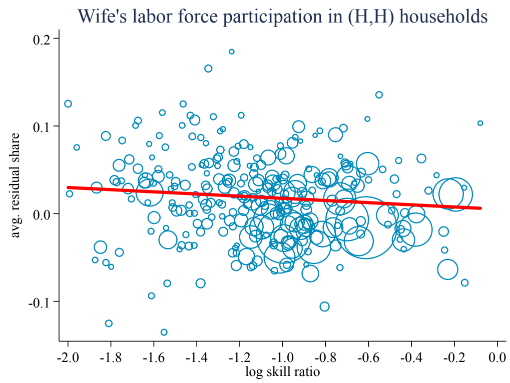
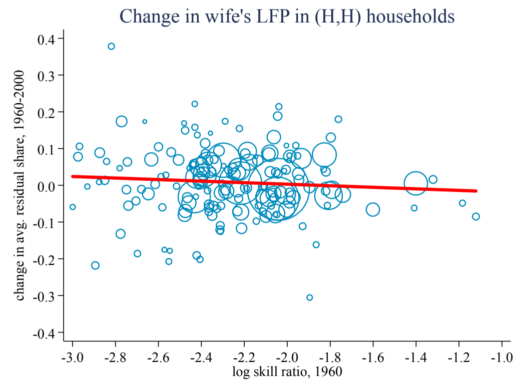


Figure A.5: Share of Married or Cohabiting, 1960 - 2000
Note: The sample includes those between 25 and 54 years old in the 1960, 1980, and 2000 censuses. The figure plots the share of people who is either married or cohabiting. A person is considered married if he or she is married with or without the spouse present. A person is considered as cohabiting with the head of the household if he or she is defined as a 'partner or friend' in 1960, a 'partner or roommate' in 1980, or a 'unmarried partner' in 2000.

Wife's labor supply among power couples, by local skill composition. In Section 6.2 we explain that one reason our finding differs from that of Costa and Kahn (2000) is that, in our model, the effect of increasing female labor force participation on location choice depends on the



(a) 2000



(b) Change between 1960 and 2000

Figure A.6: Share in Labor Force Among Wives in 'Power Couple' Households

Note: Each bubble represents an MSA. The sample includes wives in households in which both the husband and the wife have college degrees. Labor force participation is adjusted by age and the presence and the number of children under 6. Panel a shows the relationship between log skill ratio and wives' labor force participation rate among MSAs in 2000. Panel b shows the relationship between the log skill ratio in 1960 and the change in wives' labor force participation rate among consistently defined MSAs between 1960 and 2000, thus a smaller number of MSAs in panel b.

extent to which the participation rate differs across cities. Contrary to the common perception, however, Figure A.6a shows that the labor force participation of wives in power couples is not higher in more skill intensive cities. Figure A.6b further shows that the *increase* in the wife's labor force participation rate among power couples between 1960 and 2000 is also not faster in initially more skill-intensive cities. Through the lens of our model, this pattern implies the increasing participation by itself does not have a first-order impact on spatial divergence.

B Theory

B.1 Proof of Lemma 1

Proof. Setting $U_{d,M}^{e,\varnothing} = \overline{V}_d^{e,\varnothing}$ and $U_{d,F}^{\varnothing,e'} = \overline{V}_d^{\varnothing,e'}$, one can verify that part 1 of the lemma holds. Below we prove parts 2 and 3 of the lemma.

Consider two couples in the stable match with the exact same skill composition, i.e., (ω, ω') and $(\tilde{\omega}, \tilde{\omega}')$ such that the two husbands ω and $\tilde{\omega}$ has the same skill e, and the two wives $\tilde{\omega}$ and $\tilde{\omega}'$ has the same skill e'. From conditions 4 and 5 of Definition 1 in the text, we have:

$$\begin{aligned} u_d^{M,e}(\omega) + u_d^{F,e'}(\omega') &= \overline{V}_d^{e,e'} + \xi_M^{e,e'}(\omega) + \xi_F^{e,e'}(\omega) \\ u_d^{M,e}(\omega) + u_d^{F,e'}(\tilde{\omega}') &\geq \overline{V}_d^{e,e'} + \xi_M^{e,e'}(\omega) + \xi_F^{e,e'}(\tilde{\omega}') \\ u_d^{M,e}(\tilde{\omega}) + u_d^{F,e'}(\tilde{\omega}') &= \overline{V}_d^{e,e'} + \xi_M^{e,e'}(\tilde{\omega}) + \xi_F^{e,e'}(\tilde{\omega}') \\ u_d^{M,e}(\tilde{\omega}) + u_d^{F,e'}(\omega') &\geq \overline{V}_d^{e,e'} + \xi_M^{e,e'}(\tilde{\omega}) + \xi_F^{e,e'}(\omega') \end{aligned} \tag{B.1}$$

Taking the difference between the first two and the last two lines of equation (B.1) gives

$$\xi_F^{e,e'}(\omega) - \xi_F^{e,e'}(\tilde{\omega}') \geq u_d^{F,e'}(\omega') - u_d^{F,e'}(\tilde{\omega}') \geq \xi_F^{e,e'}(\omega) - \xi_F^{e,e'}(\tilde{\omega}'),$$

which implies $u_d^{F,e'}(\omega') - \xi_F^{e,e'}(\omega) = u_d^{F,e'}(\tilde{\omega}') - \xi_F^{e,e'}(\tilde{\omega}')$, that is, the difference between the utility of the wife and their idiosyncratic preference for that assignment is a constant independent of the draws of both the husband and the wife for that assignment. Similarly, the same holds for husbands, i.e., $u_d^{M,e}(\omega) - \xi_M^{e,e'}(\omega) = u_d^{M,e}(\tilde{\omega}) - \xi_M^{e,e'}(\tilde{\omega})$.

Define $U_{d,F}^{e,e'} \equiv u_d^{F,e'}(\omega') - \xi_F^{e,e'}(\omega)$ and $U_{d,M}^{e,e'} \equiv u_d^{M,e}(\omega) - \xi_M^{e,e'}(\omega)$, these two scalers then satisfy conditions 2 and 3 of the lemma. □

B.2 Proof of Proposition 1

Proof. We prove this proposition for a male ω of skill e married to a woman of skill e' in the stable match. Proof for other types of individuals is analogous. By Lemma 1, we have:

$$u_d^{M,e}(\omega) = U_{d,M}^{e,e'} + \xi_M^{e,e'}(\omega).$$

Lemma 1 and condition 2 of Definition 1 together imply:

$$u_d^{M,e}(\omega) \geq \overline{V}_d^{e,\varnothing} + \xi_M^{e,\varnothing}(\omega) = U_{d,M}^{e,\varnothing} + \xi_M^{e,\varnothing}(\omega).$$

It remains to show that

$$U_{d,M}^{e,e'} + \xi_M^{e,e'}(\omega) \geq U_{d,M}^{e,e''} + \xi_M^{e,e''}(\omega),\ e'' \neq e.$$

Suppose the opposite is true, then ω can 'lure' away a woman of type e'' who is in a type (e, e'') type marriage in the stable match, which violates condition 5 of Definition 1. This completes the proof of equation (6). □

B.3 Deriving Equation (28)

From equations (8) and (9), we have:

$$\frac{q_d^{e,e'}}{q_d^{e,\varnothing}} = \frac{r_{d,M}^{e,e'}}{r_{d,M}^{e,\varnothing}} = \frac{\exp(\kappa_M^e \cdot U_{d,M}^{e,e'})}{\exp(\kappa_M^e \cdot U_{d,M}^{e,\varnothing})} \Rightarrow q_d^{e,e'} = q_d^{e,\varnothing} \cdot \frac{\exp(\kappa_M^e \cdot U_{d,M}^{e,e'})}{\exp(\kappa_M^e \cdot U_{d,M}^{e,\varnothing})}.$$

Similarly,

$$\frac{q_d^{e,e'}}{q_d^{\varnothing,e'}} = \frac{r_{d,F}^{e,e'}}{r_{d,F}^{\varnothing,e'}} = \frac{\exp(\kappa_F^{e'} \cdot U_{d,F}^{e,e'})}{\exp(\kappa_F^{e'} \cdot U_{d,F}^{\varnothing,e'})} \Rightarrow q_d^{e,e'} = q_d^{\varnothing,e'} \cdot \frac{\exp(\kappa_F^{e'} \cdot U_{d,F}^{e,e'})}{\exp(\kappa_F^{e'} \cdot U_{d,F}^{\varnothing,e'})}.$$

Combining the two gives us:

$$q_d^{e,e'} = [q_d^{e,\varnothing} \cdot \frac{\exp(\kappa_M^e U_{d,M}^{e,e'})}{\exp(\kappa_M^e U_{d,M}^{e,\varnothing})}]^{\frac{\frac{1}{\kappa_M^e}}{\frac{1}{\kappa_M^e}+\frac{1}{\kappa_F^{e'}}}} \cdot [q_d^{\varnothing,e'} \cdot \frac{\exp(\kappa_F^{e'} U_{d,F}^{e,e'})}{\exp(\kappa_F^{e'} U_{d,F}^{\varnothing,e'})}]^{\frac{\frac{1}{\kappa_F^{e'}}}{\frac{1}{\kappa_M^e}+\frac{1}{\kappa_F^{e'}}}}.$$

Taking logarithm on both sides, we have

$$\begin{aligned}
\log(q_d^{e,e'}) &= \frac{1}{\frac{1}{\kappa_M^e}+\frac{1}{\kappa_F^{e'}}} \cdot (U_{d,M}^{e,e'} + U_{d,F}^{e,e'} - U_{d,M}^{e,\varnothing} - U_{d,F}^{\varnothing,e'}) + \frac{\frac{1}{\kappa_M^e}}{\frac{1}{\kappa_M^e}+\frac{1}{\kappa_F^{e'}}} \log(q_d^{e,\varnothing}) + \frac{\frac{1}{\kappa_F^{e'}}}{\frac{1}{\kappa_M^e}+\frac{1}{\kappa_F^{e'}}} \log(q_d^{\varnothing,e'}) \\
&\quad \text{(using equation (5))} \\
&= \frac{1}{\frac{1}{\kappa_M^e}+\frac{1}{\kappa_F^{e'}}} \cdot (\overline{V}_d^{e,e'} - \overline{V}_d^{e,\varnothing} - \overline{V}_d^{\varnothing,e'}) + \frac{\frac{1}{\kappa_M^e}}{\frac{1}{\kappa_M^e}+\frac{1}{\kappa_F^{e'}}} \log(q_d^{e,\varnothing}) + \frac{\frac{1}{\kappa_F^{e'}}}{\frac{1}{\kappa_M^e}+\frac{1}{\kappa_F^{e'}}} \log(q_d^{\varnothing,e'}).
\end{aligned}$$

C Quantitative Implementation

This section describes how we calibrate and solve the model.

C.1 Solving the Model

In solving the model, we take as given the following fundamental parameters: the exogenous components of city productivity and amenities $\{\bar{A}_d^e,\ \bar{K}_d^e\}$, local land supply shifter and elasticity, $\{\bar{H}_d,\ \epsilon_d\}$, the endowments of the four types of workers in each city $\{L_{o,s}^e\}$, the non-economic component of marriage surplus $\{\delta^{e,e'}\}$, the parameters governing idiosyncratic taste draws $\{\kappa_s^e, \theta_s^e, \eta^e\}$, gender biases and home production value $\{\bar{n}^e, \beta_F^e\}$, migration costs $\{d_{od}^e\}$, spillover elasticities $\{\gamma_{e,e'},\ \sigma_{e,e'}\}$, and utility function parameters $\alpha,\ \beta$.

Given these parameters, we solve for a set of prices and quantities, including migration decision π_{od}^e; the utility of different households $\{\overline{V}_d^{e,\varnothing}, \overline{V}_d^{\varnothing,e}, \overline{V}_d^{e,e'}\}$, the division of household utility between the spouses $\{U_{d,M}^{e,e'}, U_{d,F}^{e,e'}, U_{s,M}^{e,\varnothing}, U_{d,F}^{\varnothing,e'}\}$ and the expected utility of a city $\{\overline{U}_{d,s}^e\}$; the labor force participation decision of married women $\{l_d^{e,e'}\}$; total effective labor supply in a city $\{E_d\}$ and wage $\{W_{d,s}^e\}$; housing supply $\{H_d\}$ and rent $\{r_d\}$; government transfer t. We obtain these prices and allocation as solution to a system of equations, described below:

Problem C.1. *The following system of equations defines a solution to the competitive equilibrium of the model:*

1. *Equation (2): migration decision is optimal.*
2. *Equations (5), (8), (9) and (10): each local marriage market is a stable match.*
3. *Equations (13), (14), and (15), i.e., household utility and labor force participation decisions are consistent with local wages, rents, and amenities.*
4. *Equations (16) and (17): migration and labor supply are consistent with population and labor distribution*
5. *Equations (19), (22), and (23): amenities, productivity, and wags are consistent with individual decisions*
6. *Equations (24) and (25): the housing market clears*
7. *Equation (26): government budget balances*

C.2 Calibrating the Model

As summarized in panel C of Table 5, our calibration matches the level of rent by city, and the numbers and wages of high- and low-skill people by city, which pins down $\{\bar{H}_d\}$, $\{\bar{A}_d^e\}$, and $\{\bar{K}_d^e\}$, respectively. To calibrate the model, we find $\{\bar{H}_d\}$, $\{\bar{A}_d^e\}$, and $\{\bar{K}_d^e\}$, along with all endogenous variables described in Section C.1, as a solution to the following system of equations.

Problem C.2. *The following system of equations calibrates the competitive equilibrium of the model to the data:*

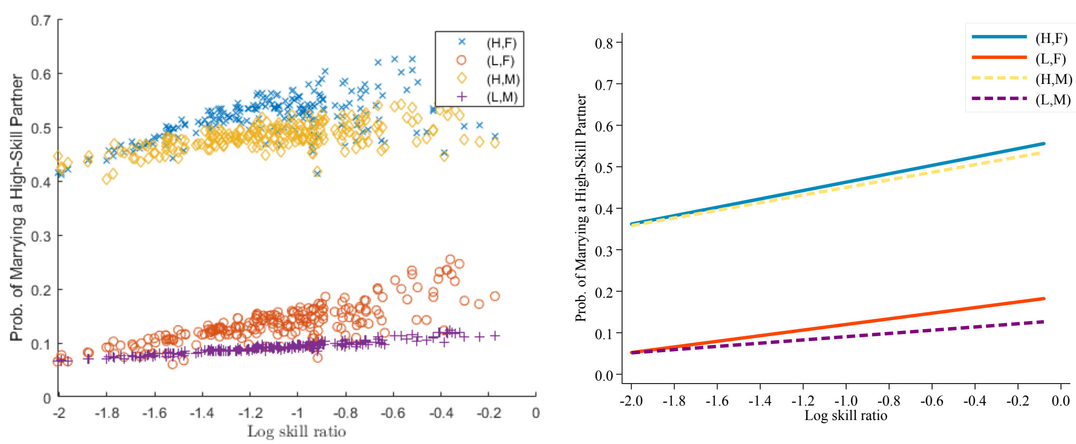
1. *All equations listed in Problem C.1*
2. *Average wage for skill type e in city d equals its data counterpart:* $W^e_d(\bar{K}^e_d) = \underbrace{\hat{W}^e_d}_{data}$
3. *Rent in city d equals its data counterparts:* $r_d(\bar{H}_d) = \underbrace{\hat{r}_d}_{data}$
4. *The number of skill e people in d equals its data counterpart:* $\tilde{N}^e_d(\bar{A}^e_d) = \underbrace{\hat{\tilde{N}}^e_d}_{data}$.

In this problem, we write $W^e_d(\bar{K}^e_d)$, $r_d(\bar{H}_d)$, and $\tilde{N}^e_d(\bar{A}^e_d)$ as functions of fundamental parameters to highlight what identifies each set of parameters. The empirical counterparts of the model outcomes are denoted with a hat. Compared to Problem C.1, Problem C.2 has three additional sets of unknowns and three additional sets of equations.

To calibrate the model, we solve the system of equations listed in Problem C.2. Once we have obtained the solution, we can solve Problem C.1 for counterfactual equilibria.

C.3 Additional Results from Quantitative Experiments

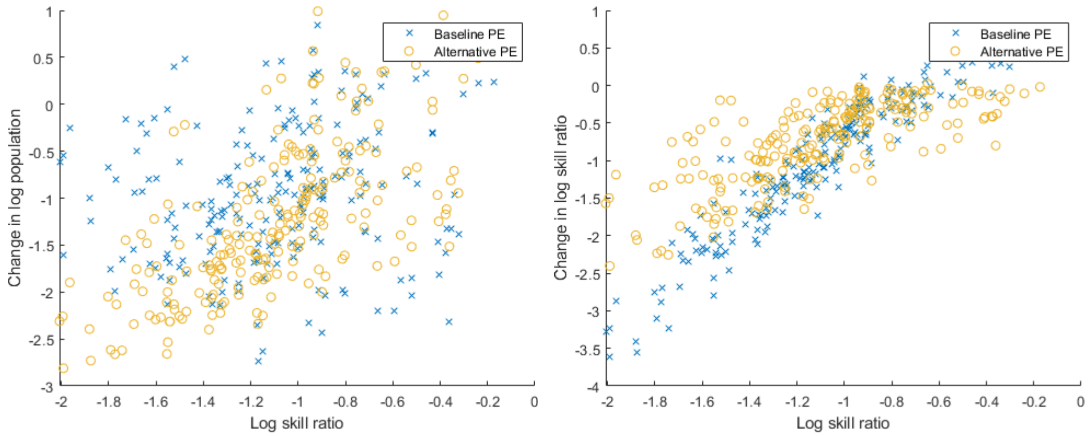
The model fits the probability of marrying a high-skill spouse. One might be concerned that our model might have failed to match that in big and skill intensive cities, people have a higher chance of marrying a high-skill spouse. If so, it could explain why marriages could be a force of dispersion despite being highly assortative in the data. Figure C.1 shows that this is not the case. The left panel of the figure is the model predicted probability of marrying a high-skill spouse as a function of the log skill ratio of cities; the right panel is the corresponding empirical estimates. The model aligns closely with the data.



(a) Model (b) Data

Figure C.1: Prob. of Marrying a Skilled Spouse: Data and Model

The left panel is the model's prediction on the probability of marrying a high-skill spouse. The right panel is the probability of an individual marrying a high-skill spouse in the data, see notes under Figure 1 for detail.



(a) City Size (b) Log Skill Ratio

Figure C.2: Comparison between Baseline and Alternative Partial Equilibrium Experiments
The figures compare the baseline partial equilibrium (PE) experiment from Figure 5 with an alternative PE experiment, in which we calculate the counterfactual expected utility under the assumption that the single rate of low-skill people in each city is the same as the single rate of high-skill people in the same city. Thus, in this alternative experiment, the different responses in high- and low-skill people is not due to their having different single rates.

Baseline versus alternative partial equilibrium experiments. We find that eliminating the marriage premia of cities in partial equilibrium increases the size and the skill share of currently skill-intensive cities. To understand what accounts for the differential responses of high- and low-skill people in this experiment, we conduct an alternative partial equilibrium experiment.

In this alternative experiment, we change the expected utility governing the migration decision of high-skill people in the same way as in the baseline experiment, i.e., by calculating their migration decision (equation (2)) assuming $\overline{U}^{H}_{d,s}$ is given by:

$$\overline{U}^{H}_{d,M} = \frac{\gamma}{\kappa^{H}_{M}} + \overline{V}^{H,\varnothing}_{d} - \frac{1}{\kappa^{H}_{M}} \log(1) = \frac{\gamma}{\kappa^{H}_{M}} + \overline{V}^{H,\varnothing}_{d}$$
$$\overline{U}^{H}_{d,F} = \frac{\gamma}{\kappa^{H}_{F}} + \overline{V}^{\varnothing,H}_{d} - \frac{1}{\kappa^{H}_{F}} \log(1) = \frac{\gamma}{\kappa^{H}_{F}} + \overline{V}^{\varnothing,H}_{d}.$$

We change the expected utility governing the migration decision of low-skill people to below:

$$\overline{U}^{L}_{d,M} = \frac{\gamma}{\kappa^{L}_{M}} + \overline{V}^{H,\varnothing}_{d} - \frac{1}{\kappa^{L}_{M}} \log(r^{L,\varnothing}_{d,M}) + \frac{1}{\kappa^{L}_{M}} \log(r^{H,\varnothing}_{d,M})$$
$$\overline{U}^{L}_{d,F} = \frac{\gamma}{\kappa^{L}_{F}} + \overline{V}^{\varnothing,L}_{d} - \frac{1}{\kappa^{L}_{F}} \log(r^{\varnothing,L}_{d,F}) + \frac{1}{\kappa^{L}_{F}} \log(r^{\varnothing,H}_{d,F}).$$

This experiment effectively calculates the hypothetical partial equilibrium migration decision for low skill people assuming their single rate in a city is the same as the high-skill people in the same city. Therefore it purges out the difference between the response of high- and low-skill people to the removal of marriage market premia due to their different single rates.

Figure C.2 compares the result from this alternative experiment to that from the baseline experiment. It shows that this alternative experiments generates a skill gradient that is only slightly weaker than in the baseline experiment. This suggests that the increase in skill concentration from the baseline equilibrium is not due to the differences in single rates across types, but rather due to different migration frictions and birth states.

C.4 Sensitivity Analysis

In this subsection we show that the main quantitative results are insensitive to external choice of β (the home good share) and the value of p_n (the price for the market alternative of home goods) in 1960.

We report two exercises. First, we consider different values of β in calibrating the model to the 2000 economy. We show that the choice of β does not matter for the quantitative impacts of eliminating marriages on spatial concentration from the 2000 economy. Second, we consider different values for p_n for 1960 (while always assuming $p_n = 1$ for 2000). We show that different choices do not affect the impact of the fundamental changes between 1960 and 2000 on spatial divergence.

Eliminating marriages on the basis of the 2000 economy. Table C.1 shows that given the observed female labor force participation rate, different choices of β lead to different inferred values for $\bar{n}^e$. However, eliminating marriages from these economies generate the same results, as summarized by the two gradient metrics in column 6 of Table 6.

Table C.1: Eliminating Marriages from the 2000 Economy

	Baseline ($\beta = 0.2$)	$\beta = 0.1$	$\beta = 0.3$
Calibrated $\bar{n}^e$			
$\bar{n}^H$	0.0043	0.0059	0.0034
$\bar{n}^L$	1.03	1.40	0.82
Results from counterfactuals			
The gradient of $\Delta \ln(pop)$ w.r.t. $\ln(\frac{H}{L})$	1.55	1.55	1.55
The gradient of $\Delta \ln(\frac{H}{L})$ w.r.t. $\ln(\frac{H}{L})$	1.75	1.75	1.75

Note: The table reports the main result under different choice of β. The upper panel reports the calibrated $\bar{n}^e$ corresponding to different values of β; the lower panel reports the counterfactuals from eliminating marriages.

The changes between 1960 and 2000. In Table C.2, we re-calibrate the model to match the 1960 data under different choices of p_n for 1960. Recalling that we normalize p_n to 1 in the 2000 economy, our choices in Table C.2 (p_n ranges from 1.5 to 3) thus implies a decrease in p_n between 1960 and 2000 that ranges between 33% to 66% (the baseline calibration assumes a 50% decease). The upper panel of the table shows that these choices lead to different values of $\bar{n}^e$ for 1960. The lower panel shows that, regardless of these values, once we feed the implied changes in p_n, $\bar{n}^e_h$ into the model, the model predicts the same increase in spatial divergence (see column 4 of Table 8).

Table C.2: Spatial Divergence between 1960 and 2000

	Baseline ($p_n = 2$ in 1960)	$p_n = 1.5$ in 1960	$p_n = 3$ in 1960
Calibrated 1960 $\bar{n}^e$			
$\bar{n}^H$	0.62	0.78	0.45
$\bar{n}^L$	2.19	2.76	1.58
Results from counterfactuals			
The gradient of skill	0.054	0.054	0.054
The gradient of population	0.20	0.20	0.20

Note: The table reports the calibrated $\bar{n}^e$ for 1960 under different choices of p_n for 1960. It also shows that despite the difference in inferred $\bar{n}^e$, alternative calibrations imply the same spatial divergence between 1960 and 2000.