Ariel J. Binder and David Lam, Is There a Male Breadwinner Norm? The Hazards of Inferring Preferences from Marriage Market Outcomes, July 2018

# APPENDIX

## *VI.A. Proofs of Propositions*

*Proof of Proposition 1.* Compare strict positive sorting to an alternative allocation in which two couples switch partners. Specifically, consider the *i*th ranked man and woman and the *j*th ranked man and woman, $i<j$, with heights $H_{mi} > H_{mj}$ and $H_{fi}>H_{fj}$. There are two possible pairings of these two men and two women, with the following total payoffs from the two marriages:

$$\text{Payoff from pairing } A\text{: } Z\left(H_{mi}, H_{fi}\right) + Z\left(H_{mj}, H_{fj}\right)$$

$$\text{Payoff from pairing } B\text{: } Z\left(H_{mi}, H_{fj}\right) + Z\left(H_{mj}, H_{fi}\right).$$

Pairing *A* represents strict positive assortative matching, while Pairing *B* represents the deviation.

Simple algebra shows that the total payoff from pairing *A* minus the total payoff from pairing *B* is:

$$\left(f\left(g_{ij}\right) + f\left(g_{ji}\right)\right) - \left(f\left(g_{ii}\right) + f\left(g_{jj}\right)\right) \tag{6}$$

where height gap $g_{ab} = H_{ma} - H_{fb}$ for all $a$ and $b$. Recognize that the sum of the height gaps must be the same in both pairings, as the same 4 individuals are involved in each pairing. What we will now show is that of the 4 gaps, pairing *B* always contains the largest and the smallest.

By definition, man *i* is taller than man *j*, which yields $g_{ij} > g_{jj}$. Similarly, woman *i* is taller than woman *j* by definition, which yields $g_{ij} > g_{ii}$. Thus, by equality of sums, $g_{ij}$ is always the largest gap while $g_{ji}$ is the smallest. Strict convexity of *f* then implies that expression (6) is strictly positive, which is to say that joint marital output is strictly higher under Pairing *A* than under Pairing *B*. Therefore, whenever two men and two women are not positively sorted, a Paretoimproving system of transfers exists to restore perfect positive sorting, and thus perfect positive sorting is the unique equilibrium.

If *f* is merely convex, expression (6) is positive, but not necessarily strictly so. This implies that starting from perfect positive sorting, no profitable exchanges of partners can be made, and so positive sorting is an equilibrium. ■

*Proof of Proposition 2.* By Proposition 1, a marriage market equilibrium characterized by strict positive sorting on height exists, and is unique if the penalty function is strictly convex in the height gap. In a strict positive sorting equilibrium, the spouses of each couple have heights of identical rank in their respective distributions. Therefore, by the FOSD assumption, the husband is taller than the wife in each couple. ■

*VI.B. Simple Marriage Market Example with Non-Transferable Utility*.

This example illustrates the point, introduced on page 11, that even in the case of non-transferable utility, multiple preference structures can be consistent with the same equilibrium sorting of couples. Consider a marriage market with 10 men and 10 women. Male heights are distributed uniformly at 1-inch intervals from 66 inches to 75 inches. Female heights are distributed uniformly from 60 to 69 inches. Assume the same payoff structure as in equation (5): the gains to marriage are some constant, with a penalty for deviating from the ideal height gap that rises convexly in the deviation.

First, suppose that the social norm is for men to be 8 inches taller than their wives. It is easy to show that the prevailing marriage market equilibrium is one in which the 8 tallest men match with the 8 shortest women, as 8 "perfect" matches can be formed with this pairing, leaving the remaining 2 shortest men to pair with the two tallest women. Now, suppose that the social norrm is for women to be 2 inches taller than their husbands. In this case, 2 perfect matches can be created by matching the 2 shortest men with the 2 tallest women (66 inch man with the 68 inch woman; 67 inch man with the 69 inch woman), leaving the remaining 8 tallest men to match with the 8 shortest women. Thus, in both cases, the prevailing equilibrium will be one in which 80 percent of husbands are taller than their wives, and 20 percent are shorter.

## I. References


Attanasio, Orazio, Hamish Low, and Virginia Sanchez-Marcos. 2008. "Explaining Changes in Female Labor Supply in a Life-Cycle Model." *American Economic Review* 98 (4):1517-1522.

Bailey, Martha J., and Tom A. DiPrete. 2016. "Five Decades of Remarkable, but Slowing, Change in U.S. Women's Economic and Social Status and Political Participation." In *A Half Century of Change in the Lives of American Women*, edited by Martha J. Bailey and Tom A. DiPrete. New York: The Russell Sage Foundation Journal of the Social Sciences.

Becker, Gary S. 1973. "A Theory of Marriage: Part I." *Journal of Political Economy* 81 (4):813-846.

Belot, Michele, and Jan Fidrmuc. 2010. "Anthropometry of Love: Height and Gender asymmetries in Interethnic Marriages." *Economics and Human Biology* 8 (3):361-372.

Belot, Michele, and Marco Francesconi. 2013. "Dating Preferences and Meeting Opportunities in Mate Choice Decisions." *Journal of Human Resources* 48 (2):474-508.

Benedetto, Gary, Martha Stinson, and John M. Abowd. 2013. "The Creation and Use of the SIPP Synthetic Beta." Washington, DC: United States Census Bureau. Retrieved from: https://www.census.gov/content/dam/Census/programs-surveys/sipp/methodology/SSBdescribe_nontechnical.pdf.

Bertrand, Marianne. 2010. "New Perspectives on Gender." In *Handbook of Labor Economics, Volume 4B*, edited by Orley Ashenfelter and David Card, 1545-1592. Philadelphia, PA: Elsevier.

Bertrand, Marianne, Claudia Goldin, and Lawrence F. Katz. 2010. "Dynamics of the Gender Gap for Young Professionals in the Financial and Corporate Sectors." *American Economic Journal: Applied Economics* 2 (3):228-55.

Bertrand, Marianne, Emir Kamenica, and Jessica Pan. 2015. "Gender Identity and Relative Income within Households." *Quarterly Journal of Economics* 130 (3):571-614.

Brennan, Robert T., Rosalind Chair Barnett, and Karen C. Gareis. 2001. "When She Earns More than He Does: A Longitudinal Study of Dual-Earner Couples." *Journal of Marriage and Family* 63 (1):168-182.

Chiappori, Pierre-Andre. 2017. Matching with Transfers: The Economics of Love and Marriage. Princeton, NJ: Princeton University Press.

Chiappori, Pierre-André, and Bernard Salanié. 2016. "The Econometrics of Matching Models." *Journal of Economic Literature* 54 (3):832-61.

Eckstein, Zvi, and Osnat Lifshitz. 2011. "Dynamic Female Labor Supply." *Econometrica* 79 (6):1675-1726.

Gale, D., and L. S. Shapley. 1962. "College Admissions and the Stability of Marriage." *The American Mathematical Monthly* 69 (1):9-15.

Gillis, John Stuart, and Walter E. Avis. 1980. "The Male-Taller Norm in Mate Selection." *Personality and Social Psychology Bulletin* 6 (3):396-401.

Hotchkiss, Julie L., and M. Melinda Pitts. 2007. "The Role of Labor Market Intermittency in Explaining Gender Wage Differentials." *American Economic Review* 97 (2):417-421.

Lam, David. 1988. "Marriage Markets and Assortative Mating with Household Public Goods: Theoretical Results and Empirical Implications." *Journal of Human Resources* 23 (4):462-487.

Lundberg, Shelly, Robert A. Pollak, and Jenna Stearns. 2016. "Family Inequality: Diverging Patterns in Marriage, Cohabitation, and Childbearing." *Journal of Economic Perspectives* 30 (2):79-102.

McCrary, Justin. 2008. "Manipulation of the Running Variable in the Regression Discontinuity Design: A Density Test." *Journal of Econometrics* 142:698-714.

Mincer, Jacob, and Haim Ofek. 1982. "Interrupted Work Careers: Depreciation and Restoration of Human Capital." *Journal of Human Resources* 17 (1):3-24.

Murray-Close, Marta, and Misty L. Heggeness. 2018. "Manning Up and Womaning Down: How Husbands and Wives Report Their Earnings when She Earns More." U.S. Census Bureau Social, Economic, and Housing Statistics Division Working Paper No. 2018-20.

Pollak, Robert A. Forthcoming. "How Bargaining in Marriage Drives Marriage Market Equilibrium." *Journal of Labor Economics*. DOI: 10.1086/698901.

Raley, Sara B., Marybeth J. Mattingly, and Suzanne M. Bianchi. 2002. "How Dual are Dual-Income Couples? Documenting Change from 1970 to 2001." *Journal of Marriage and Family* 68 (1):11-28.

Ruggles, Steven, et al. 2015. *Integrated Public Use Microdata Series (Version 6.0) [Machine-Readable database]*.

Schwartz, Christine R., and Pilar Gonalons-Pons. 2016. "Trends in Relative Earnings and Marital Dissolution: Are Wives Who Outearn Their Husbands Still More Likely to Divorce?" *RSF: The Russell Sage Foundation Journal of the Social Sciences* 2 (4):218–236.

Stulp, Gert, Abraham P. Buunk, Thomas V. Pollet, Daniel Nettle, and Simon Verhulst. 2013. "Are Human Mating Preferences with Respect to Height Reflected in Actual Pairings?" *PLoS ONE* 8 (1).

Winkler, Anne W. 1998. "Earnings of Husbands and Wives in Dual-Earner Families." *Monthly Labor Review* 121 (4):42-48.

TABLE I

HEIGHT DIFFERENCES BETWEEN HUSBANDS AND WIVES, UK MILLENNIUM COHORT STUDY

| Husband height minus wife height (cm) | Proportion in actual distribution | Proportion in distribution with random matching | Ratio of actual to random |
|---|---|---|---|
| <-10 | 0.6% | 1.3% | 0.47 |
| -10 to -5 | 1.5% | 2.6% | 0.58 |
| -5 to 0 | 1.9% | 2.5% | 0.77 |
| 0 to 5 | 8.5% | 8.7% | 0.97 |
| 5 to 10 | 16.3% | 14.5% | 1.12 |
| 10 to 15 | 21.3% | 19.2% | 1.11 |
| 15 to 20 | 20.7% | 19.7% | 1.05 |
| 20 to 25 | 15.3% | 15.8% | 0.97 |
| 25 to 30 | 8.8% | 9.4% | 0.94 |
| 30 to 35 | 3.7% | 4.2% | 0.87 |
| >35 | 1.4% | 2.1% | 0.66 |

*Note*: Data taken from Table I in Stulp et al. (2013)

TABLE II

MODEL CALIBRATION

| Parameter | Symbol | Calibrated Value |
|---|---|---|
| Mean male log earnings | $\mu^m$ | 10.35 |
| Standard deviation of male log earnings | $\sigma^m$ | 0.75 |
| Mean female log potential earnings | $\mu^f$ | 10.16 |
| Standard deviation female log potential earnings | $\sigma^f$ | 0.70 |
| Mean disutility of work | $\psi$ | .0019 |
| Standard deviation of disutility of work | $\sigma^{\psi}$ | $\psi/2$ |
| Correlation, disutility of work and female log earnings | $\rho$ | -0.4 |
| Standard deviation of transitory income shock | $\sigma^u$ | 13,000 |
| **Targets in the data** | **Data** | **Model** |
| Mean male log observed income | 10.35 | 10.35 |
| Standard devation male log observed income | 0.75 | 0.75 |
| Mean female log observed income | 10.00 | 9.98 |
| Standard deviation female log observed income | 0.87 | 0.87 |
| Mean gender earnings ratio, all | 0.74 | 0.71 |
| Mean gender earnings ratio, full-timers only | 0.80 | 0.79 |
| Female labor-force participation rate | 0.88 | 0.91 |
| Female full-time labor-force participation rate | 0.67 | 0.67 |

*Notes*: Calibration of marital sorting and female labor supply model discussed in section III.

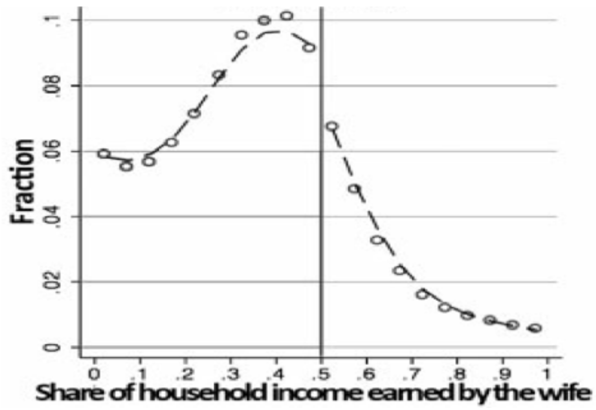
TABLE III

DISCONTINUITY ESTIMATES IN THE GOLD STANDARD FILE

| Bandwidth | Bin size | Treatment of point mass of couples at 0.5 | | |
|---|---|---|---|---|
| | | Right of 0.5 | Left of 0.5 | Kick out 0.5 spike, test for break right at 0.5 |
| .084 | .0016 | ***-.124*** | **.064** | -.034 |
| | | (.031) | (.031) | (.032) |
| .045 | .0016 | ***-.184*** | ***.129*** | -.031 |
| | | (.040) | (.040) | (.043) |
| .023 | .0016 | ***-.310*** | ***.240*** | -.040 |
| | | (.055) | (.055) | (.061) |
| .011 | .0005 | ***-.575*** | ***.451*** | -.078 |
| | | (.078) | (.081) | (.091) |

*Notes*: The first reported bandwidth and bin size correspond to those automatically selected by the McCrary (2008) test algorithm. McCrary (2008) recommends using a smaller bandwidth than the automatically selected one, as is done in the second through fourth rows. Point estimates report the log difference in the height of the density function as one crosses from just left of the supposed breakpoint to just right of it. Bold estimates are statistically significant at the 5 percent level; italicized estimates achieve significance at the 1 percent level. Standard errors appear below point estimates in parentheses.

*A. BKP Figure III*




*B. Replication of BKP Figure III*

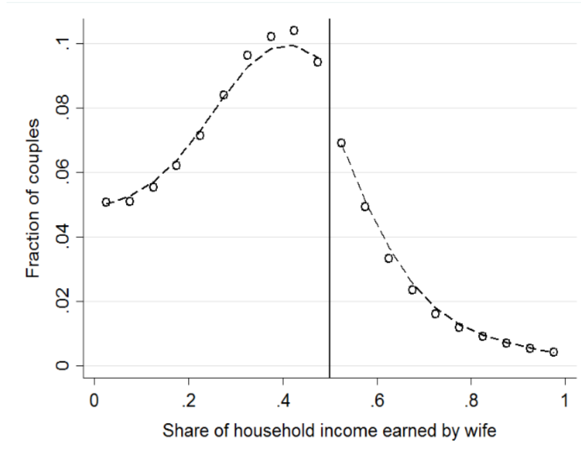



FIGURE I
Distributions of Relative Income, 2000 Census

Graph A is a screenshot of part of Figure III of BKP. Graph B is our replication. Each graph is based on a sample drawn from the 2000 Census consisting of dual-earning couples, in which both the husband and the wife are between 18 and 65 years old. Each graph plots a 20-bin histogram of the distribution of wife's share of a couple's joint income The dashed lines represent the lowess smoother applied to each histogram on either side of 0.5.

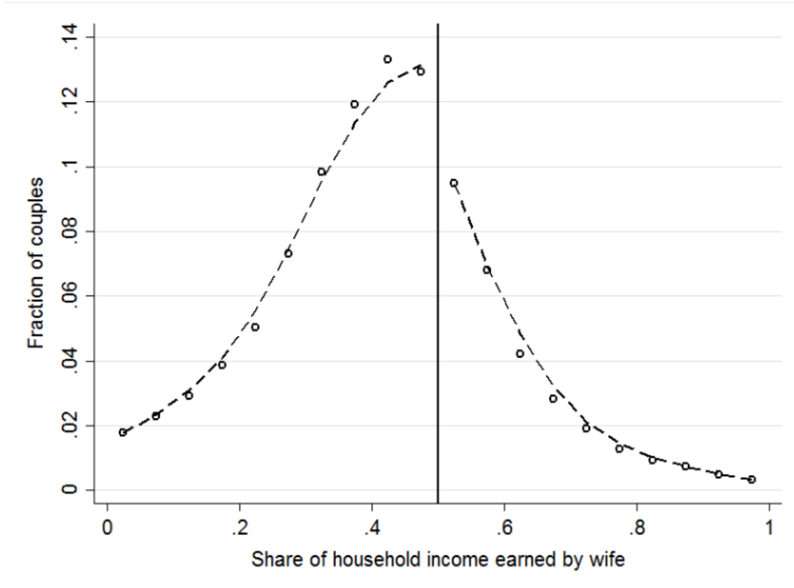



FIGURE II
Distribution of Relative Income, 2000 Census
Couples aged 18-40 without Children

The sample includes dual-earning married couples who do not have children and where both the husband and wife are between 18 and 40 years of age. The figure plots a 20-bin histogram of the observed distribution of the wife's share of total spousal earnings. The dashed lines represent the lowess smoother applied to the histogram on either side of 0.5.

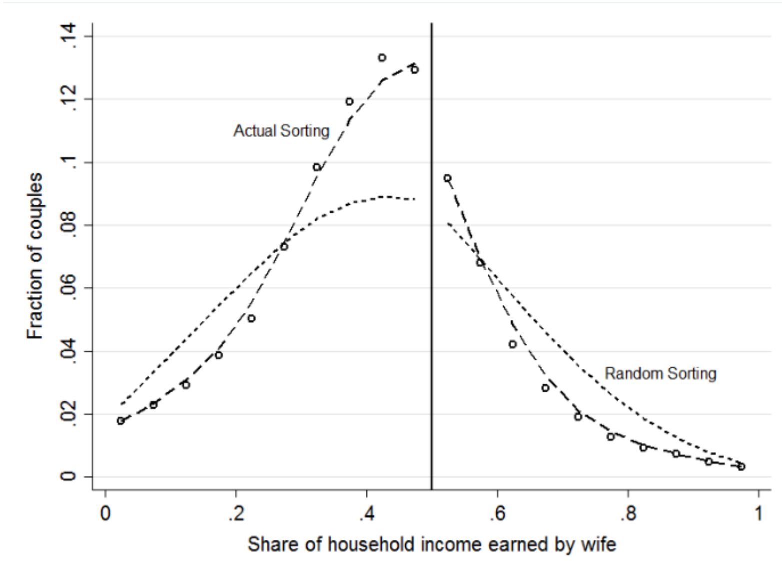



FIGURE III
Relative Income Distributions, 2000 Census: Actual and Random Sorting

The sample is the same as in Figure II. The figure plots 20-bin histograms of the observed distribution of the wife's share of total spousal earnings ("Actual Sorting") and of a simulated distribution based on random sorting of couples in the sample ("Random Sorting"). The dashed lines represent the lowess smoother applied to the histogram on either side of 0.5.

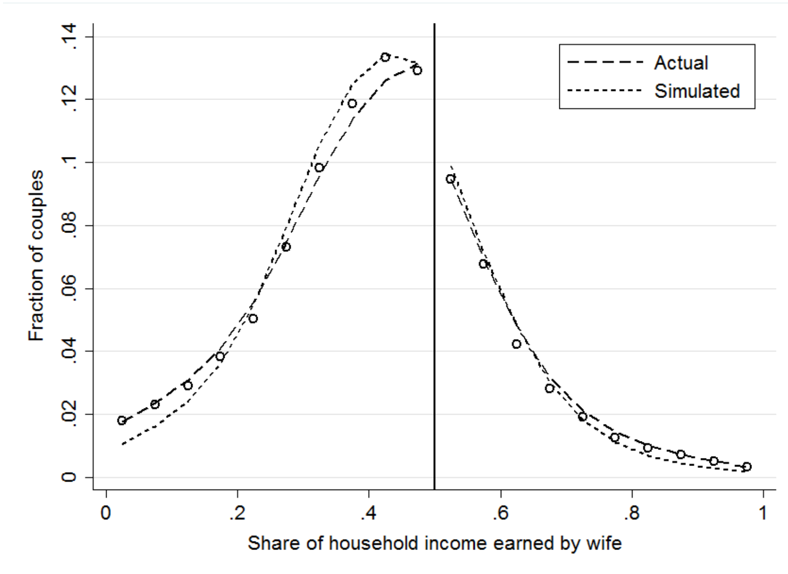



FIGURE IV
Relative Income Distributions, 2000 Census: Actual and Simulated Sorting with Exogenous Earnings

The sample is the same as in Figure II. The figure plots 20-bin histograms of the observed distribution of the wife's share of total spousal earnings ("Actual Sorting") and of a simulated distribution based on positive sorting of couples on observed earnings plus noise ("Simulated Sorting"). See section III for further detail on the simulation. The dashed lines represent the lowess smoother applied to the histogram on either side of 0.5.

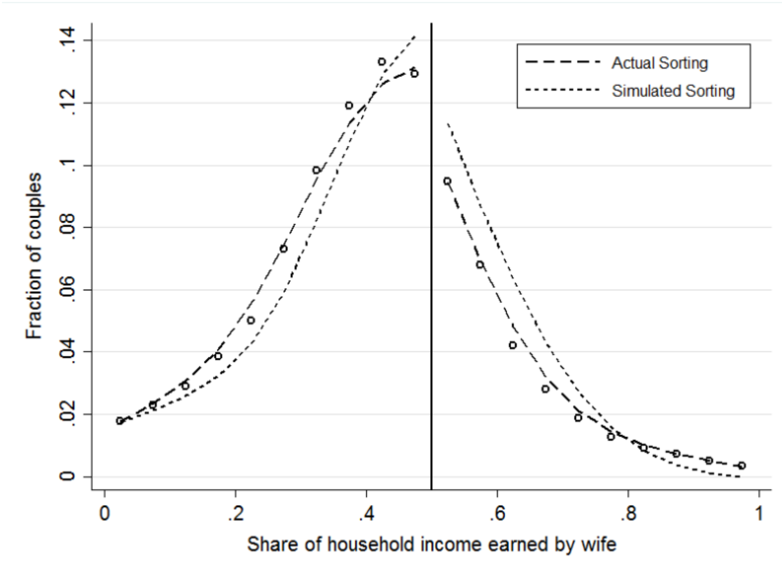
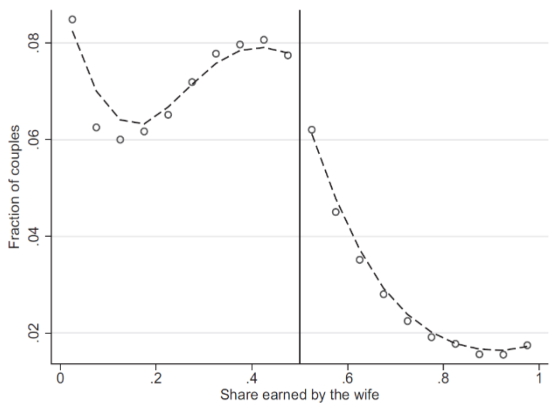



FIGURE V.
Relative Income Distributions, 2000 Census: Actual and Simulated Sorting with Endogenous Earnings

The sample is the same as in Figure II. The figure plots 20-bin histograms of the observed distribution of the wife's share of total spousal earnings ("Actual Sorting") and of a simulated distribution based on positive sorting of couples on potential earnings plus noise ("Simulated Sorting")—and in which the wife's observed earnings are endogenized via a labor supply decision. See section III for further detail on the simulation. The dashed lines represent the lowess smoother applied to the histogram on either side of 0.5.

*A. BKP Figure I*




*B. Replication of BKP Figure I*

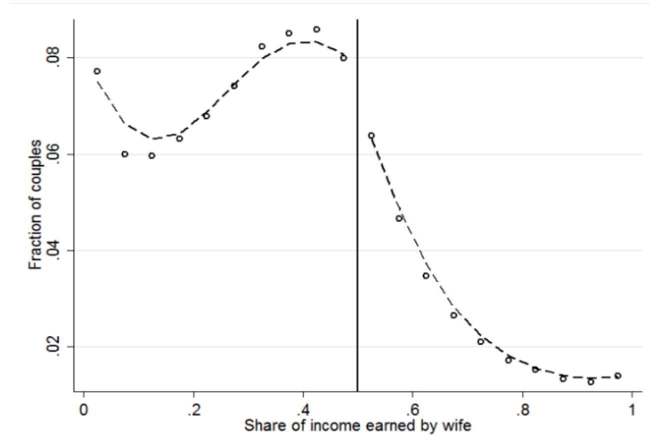



FIGURE VI
Relative Income Distributions in Administrative Data

Graph A is a screenshot of Figure I of BKP. The data underlying this graph are administrative income data from the SIPP/SSA Gold Standard File covering the 1990 to 2004 SIPP panels. Graph B is our replication of Figure I of BKP. We use the latest version of the Gold Standard File, which includes the 1984 and 2008 SIPP panels as well. For both graphs the sample includes all dual-earning couples aged 18 to 65, with income information taken from the first year the couple was observed in the SIPP panel. Both graphs plot 20-bin histograms of the observed distribution of the wife's share of total spousal earnings. The dashed lines represent the lowess smoother applied to each histogram on either side of 0.5.

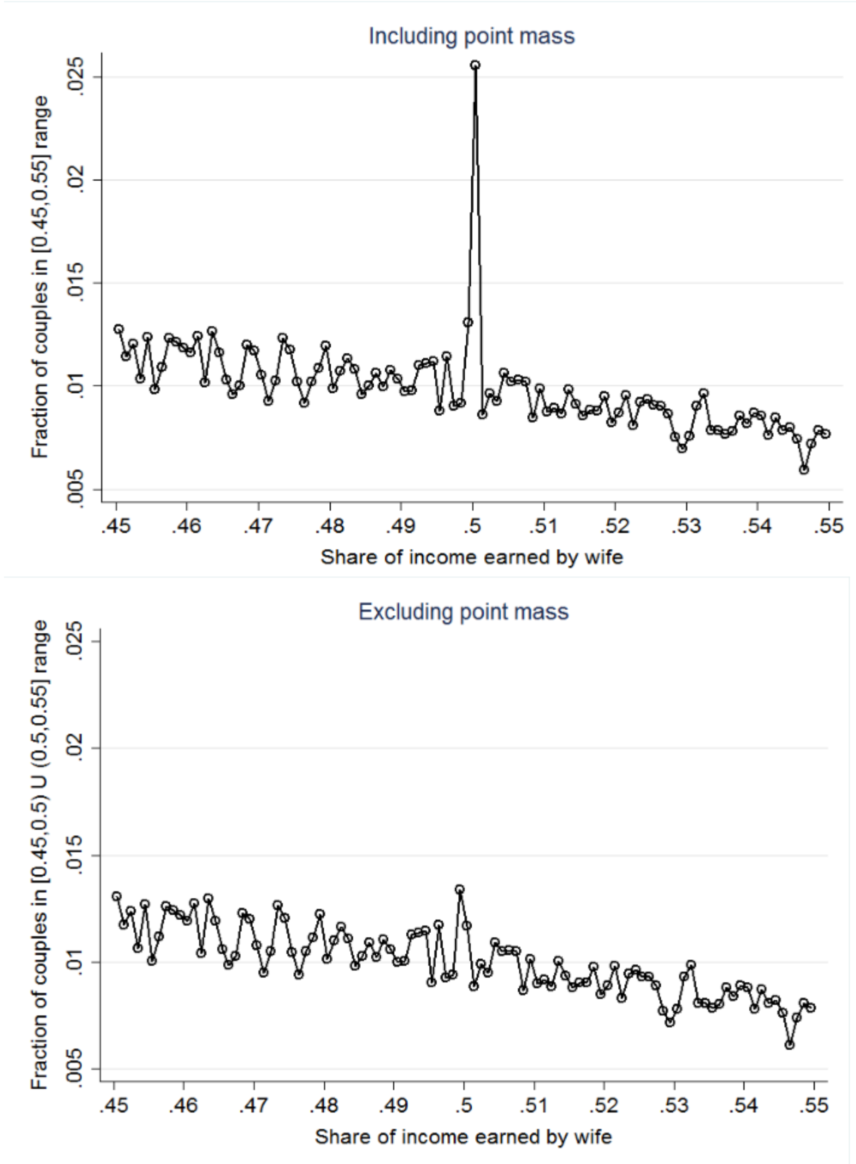



FIGURE VII

Relative Income Distributions in Administrative Data in Neighborhood of 50 Percent

The data underlying this graph are administrative income data from the SIPP/SSA Gold Standard File covering the 1984 and 1990 thru 2008 SIPP panels. For both graphs the sample includes all dual-earning couples aged 18 to 65, with earnings information taken from the first year the couple was observed in the SIPP panel. Both graphs plot histograms of the observed distribution of wife's share of total spousal earnings, restricting the sample to couples in which the wife earns between 45 and 55 percent. The graph in the top panel retains the point mass of couples earning identical incomes; the graph in the bottom panel excludes it. The bin size used in both graphs is .001; each graph contains 100 bins.