Access Econ
Scholarly communication without the middle men

Submission Number: PET11-11-00079

Evolution of Gender Differences in Occupational Mobility and Wages

Sekyu Choi
Universitat Autònoma de Barcelona, Department of Economics

Kerem Cosar
University of Chicago Booth School of Business

Abstract

The U.S. gender wage gap shrank steadily during the last quarter of the past century. Concurrently, the occupational composition of women converged to that of men as they left the home-sector, entered previously male dominated professional and managerial occupations, and started switching occupations as frequently as their male colleagues. Previous work has associated these gender-related labor market trends with either technological or institutional changes but did not decompose the outcomes in a unified general equilibrium setting. This paper attempts to do that. Our contribution is twofold. First, we structurally estimate gender-specific occupational entry and mobility cost parameters using Current Population Survey data. We find that the cost of switching to professional and managerial occupations relative to clerical occupations is 42% to 67% higher for women than it is for men. We also find a declining gap over time. Second, we simulate the estimated model to address the following question: what is the fraction of the reduced gender wage gap that can be attributed to the decreased mobility costs for women, and to shifts in the occupational wage structure?

Submitted: February 25, 2011.

Evolution of Gender Differences in Occupational Mobility and Wages

Sekyu Choi
Universitat Autònoma de Barcelona

A. Kerem Coşar *
University of Chicago,
Booth School of Business

February 14, 2011

[PRELIMINARY AND INCOMPLETE]

Abstract

The U.S. gender wage gap shrank steadily during the last quarter of the past century. Concurrently, the occupational composition of women converged to that of men as they left the home-sector, entered previously male dominated professional and managerial occupations, and started switching occupations as frequently as their male colleagues. Previous work has associated these gender-related labor market trends with either technological or institutional changes but did not decompose the outcomes in a unified general equilibrium setting. This paper attempts to do that.

Our contribution is twofold. First, we structurally estimate gender-specific occupational entry and mobility cost parameters using Current Population Survey data. We find that the cost of switching to professional and managerial occupations relative to clerical occupations is 42% to 67% higher for women than it is for men. We also find a declining gap over time. Second, we simulate the estimated model to address the following question: what is the fraction of the reduced gender wage gap that can be attributed to the decreased mobility costs for women, and to shifts in the occupational wage structure?

*Email: sekyu.choi@uab.cat, kerem.cosar@chicagobooth.edu. We are grateful for comments and suggestions from ... All errors are our own.

1 Introduction

The U.S. gender wage gap shrank steadily during the last quarter of the past century: in 1975, a female worker earned 45% less than a male with similar level of education and experience. In 2000, the difference was 20%. A concurrent trend was the convergence in the occupational composition, and the catch-up in occupational mobility: as they left the home-sector, women entered previously male dominated professional and managerial occupations, and started switching occupations as frequently as their male colleagues.

Previous work has associated these gender-related labor market trends with either technological or institutional changes but did not decompose the outcomes in a unified general equilibrium setting. Technology driven demand factors explored by the literature include improvements in home technologies allowing women to participate in the labor market (Greenwood et al. (2004)), and brain-biased technological change accentuating the comparative advantage of women in such activities (Rendall (2010)). Institutionally driven demand factors include government's anti-discrimination efforts through enacting and enforcing legislation such as Equal Pay Act and Civil Rights Act. Women responded to these changes by supplying more labor, and entering better paid occupations. The simultaneity of these developments, however, makes it hard to quantify their importance in isolation. This paper attempts to do that.

Our contribution is twofold. First, we structurally estimate gender-specific occupational entry and mobility cost parameters using the CPS data. To do that, we incorporate gender heterogeneity to the model offered by Artuç et al. (2010) (ACM hereafter), and closely follow their estimation technique. This allows us to quantify entry costs into broad occupational groups in terms of average wages. We find that the cost of switching to professional and managerial occupations relative to clerical occupations is 42% to 67% higher for women than it is for men. We also find a declining gap over time. Second, we simulate the estimated model to address the following question: what is the fraction of the reduced gender wage gap that can be attributed to the decreased mobility costs for women, and to shifts in the occupational wage structure. (to be completed)

Relation to the Literature In a decomposition exercise using PSID data between 1979 and 1988, Blau and Kahn (1997) find that about one-third of the decrease in wage gap due to observable characteristics is explained by occupational choices: while the fraction of women employed in higher paying professional-managerial occupations increased from 28% to 35%, the share of lower-paying clerical occupations decreased from 38% to 31%. The other important factor in their study is increased labor market experience of women which accounts for 40% of the catch-up in wages. In our framework, occupational composition changes because of a reduction in mobility costs which in turn allows women to better respond to wage differentials.[1] We also account for the increased labor market participation by incorporating housework as a separate occupation and estimate the utility/disutility associated with it. We do not, however, capture the effect of experience over wages because we do not model human capital.

Our empirical motivation is closely related to the evidence provided by Kambourov and Manovskii (2008), and Kambourov et al. (2008). The first paper documents an upward trend in occupational mobility among male workers in the US. The second paper extends the analysis to the case of female workers to document a catching-up in terms of mobility: at the one-digit level, women were 30% less mobile than men during 1970s (7% vs. 10% at annual frequency). The gap shrunk to less than 15% during 1990s (13% vs. 15%). This trend suggests that mobility costs may have a gender-specific component that evolved differentially over time. Indeed, our estimates show that the average inter-occupational switching cost was 45% higher for women in the 1970-1989 period, compared to a 15% in the 1990-2010 period. This drop in relative mobility costs enabled women to be more responsive to wage differentials between occupations. (to be completed)

2 Facts

Our main dataset is the Current Population Survey (CPS), a rotation panel which aims to describe demographics and labor force status of the US population. We use the March supplements for the years 1968 to 2009 inclusive, which contain detailed information on jobs, wages, occupations and working hours of individuals for the period 1967 to 2008 (given the retrospective nature of survey questions). In the rest of our analysis, we focus on real annual earnings for full time workers and occupational codes of jobs at the 1 digit level, computed from the 1950 census categories.[2]

[1] There are two margins affecting the cross-sectional composition of occupations in the data: entry margin of new cohorts versus career mobility of older cohorts. Our benchmark model does not incorporate life-cycles. Hence we do not distinguish initial entry costs from mobility costs.

[2] We also performed our analysis using a 3 digit aggregation level, without finding much differences in results. The choice for the 1950's census categories is simple due to direct availability of the code at our data source, IPUMS.

The considered occupations are: Professional, Managerial, Sales, Craftsmen, Operatives, Services, Laborers and Clerical.

As noted in the introduction, we are interested in both the gender pay gap and the occupational mobility gap. In figure 1 we compute the implied gender wage gap, from a linear regression by gender on the log of annual earnings, for full-time full year workers (those who worked more than 40 weeks and more than 40 hours per week in the previous year) on age, age squared, and a set of dummies for education, household size, race and occupational codes. The solid line is computed by subtracting from the fitted values of the female regression, the fitted values of the male regression. The discontinuous line is the gap implied by maintaining the values of the occupational dummies for females at their initial of sample values.

First, notice that both lines are increasing, which is nothing more than female earnings catching up with those of males. The discontinuous line shows how much of this increase can be attributed to the fact that females are choosing different occupations in this time period.

Next, in figure 2 we show evidence of the convergence in female occupational mobility in time. In a linear probability regression between a dummy variable equal to one if the worker changed occupation between the last year and the present year and a set of independent variable dummies for education, race, family size, metropolitan area status and being female. We plot the coefficient associated to the female dummy and a smooth polynomial fit. As seen from figure 2, the trend in female occupational mobility is increasing and converging to that of males.

In what follows, we use the above variable definitions and sample restrictions to construct wage series for each occupation and each year, as well as flows between all occupations. This information is the basis for the estimation exercise in the next section, where we are interested in calculating the mobility costs across genders.

2.1 Labor Mobility and Wages

In figure 3 we present some facts about the evolution of female employment during our sample period. The figure shows the fraction of female workers within each occupation by year. We can see a clear trend towards higher female participation in the professional and managerial occupations, while the home sector and laborers have seen the major reductions. Further, in figure 4 it is clear that this increase in the share of female workers is not due to a reduction in male participation, but actually a faster trend in female work directed towards those occupations.

In figures 5 and 6, we show occupation specific wage statistics and the correlation between wages and female labor force participation across occupations. The first figure shows that professional and managerial occupations have shown important increases in their average wages (magnitudes are expressed as percentage over clerical wages that year, a normalization we chose given high female labor participation in that occupation category), while most other occupations have shown decreases or flat profiles. The most interesting fact from this figures is the positive trend in the correlation between fraction of female workers and wages across occupations: this means that women are entering increasingly occupations that were both male dominated and higher paying overall.

Figures 7 and 8 complete the picture. The earlier shows rates of female mobility out of the considered occupations, with all categories showing stable patterns, with the exception of a slight upward trend in the out-of-clerical occupation probability. The latter figure confirms that this increased mobility has been accompanied by a greater mobility from clerical to managerial and professional jobs.

3 The model

There is a single numeriare good produced by the labor input of N occupations with the production function $F(L_t)$ where L_t is the N-dimensional allocation of labor across occupations at time t. Male and female workers can also produce the final good at home with different productivities represented by b_{mt} and b_{ft}, respectively.[3] Their labor input in the market, however, is perfectly substitutable. Each market occupation is thus paid its marginal product $w_t^i = \partial F(L_t)/\partial L_t^i$ for $i = 1, .., N$. To simply notation, we consider b_{gt} as the wage earned at home occupation and denote by w_{gt} the $N + 1$ dimensional vector $[b_{gt}, w_t^1, ..., w_t^N]$.

Workers are forward-looking and have rational expectations, and discount the future by $\beta \in (0, 1)$. They face a probability $\delta \in (0, 1)$ of death, and those who are hit by this shock are replaced by new workers. All new workers start in the home occupation, and make an initial occupational choice. The gender-specific cost of entering occupation i at the beginning of one's career is $\widehat{c}_g^i$.

[3] We represent this "home occupation" by $i = 0$ to distinguish it from the N other "market occupations" with $i = 1, .., N$.

Incumbent workers also face a gender specific cost c_g^i of moving from any occupation to occupation $i > 0$. Entering the home occupation is costless: $c_g^0 = 0$. Workers draw an idiosyncratic taste shock ϵ_t^i for each occupation. This idiosyncratic element is iid across workers of both genders, occupations and time, has density $f(\epsilon^i)$ and zero mean. ϵ_t is the $n+1$ dimensional vector of idiosyncratic occupational shocks. The net cost of mobility between (i, j) is thus $\epsilon_t^i - \epsilon_t^j + c_g^j$.

Incumbent Workers' Problem At the beginning of each period, workers observe their ϵ_t, produce in the initial sector i and earn w_{gt}^i. At the end of the period, they make an occupational choice. The value of being in occupation i for an incumbent with the state vector (w_{gt}, ϵ_t) is given by

$$U_g^i(w_{gt}, \epsilon_t) \;=\; w_{gt}^i \;+\; \max_j\{\epsilon_t^j - c_g^j \;+\; \beta(1-\delta)E_t V_g^j(w_{gt+1})\}, \tag{1}$$

where $V_g^j(w)$ is the expected value of $U_g^j(w, \epsilon)$ over ϵ:

$$V_g^j(w) = \int_{\epsilon^0} \ldots \int_{\epsilon^n} U^j(w, \epsilon) f(\epsilon^0) \ldots f(\epsilon^n) d\epsilon^0 \ldots d\epsilon^n. \tag{2}$$

Define the expected gain of moving between occupations net of the switching cost as

$$\bar{\epsilon}_{gt}^{ij} \;=\; \beta(1-\delta)E_t[V_g^j(w_{gt+1}) - V_g^i(w_{gt+1})] - c_g^j. \tag{3}$$

We can then rewrite (1) as

$$U_g^i(w_{gt}, \epsilon_t) \;=\; w_{gt}^i \;+\; \beta(1-\delta)E_t V_g^i(w_{gt+1}) \;+\; \max_j\{\epsilon_t^j + \bar{\epsilon}_{gt}^{ij}\}, \tag{4}$$

Taking the expectation of (4) over ϵ, we get

$$V_g^i(w_{gt}) \;=\; w_{gt}^i \;+\; \beta(1-\delta)E_t V_g^i(w_{gt+1}) \;+\; \Omega(\bar{\epsilon}_{gt}^i), \tag{5}$$

where $\bar{\epsilon}_{gt}^i = (\bar{\epsilon}_{gt}^{i0}, \ldots, \bar{\epsilon}_{gt}^{iN})$, and $\Omega(\bar{\epsilon}_{gt}^i)$ is the option value of moving from i to some other occupation. One can iterate (5) and take an expectation to substitute the expected gain term in (3). This yields

$$\bar{\epsilon}_{gt}^{ij} + c_g^j \;=\; \beta(1-\delta)E_t\big[w_{gt+1}^j - w_{gt+1}^i + \bar{\epsilon}_{gt+1}^{ij} + c_g^j + \Omega(\bar{\epsilon}_{gt+1}^j) - \Omega(\bar{\epsilon}_{gt+1}^i)\big]. \tag{6}$$

(6) is the key Euler equation in ACM and constitutes the basis for the estimation. It states that the cost of switching between industries equals the sum of expected wage differential, the cost-saving of having made the switch and the option value differential. Next, we derive a similar expression for new workers.

New Workers' Problem For a new worker, (3) can be written as

$$\widehat{\bar{\epsilon}}^{0j}_{gt} \;=\; \beta(1-\delta)E_t[V^j_g(w_{gt+1}) - V^0_g(w_{gt+1})] - \widehat{c}^j_g.$$

Again, we use (3) to substitute the expected gain term, and derive an analog to (6):

$$\widehat{\bar{\epsilon}}^{0j}_{gt} + \widehat{c}^j_g \;=\; \beta(1-\delta)E_t\big[w^j_{gt+1} - w^0_{gt+1} + \bar{\epsilon}^{0j}_{gt+1} + c^j_g + \Omega(\bar{\epsilon}^j_{gt+1}) - \Omega(\bar{\epsilon}^0_{gt+1})\big]. \tag{7}$$

3.1 Estimating Equation

Following ACM, we assume that $f(\epsilon)$ is an extreme-value distribution with parameters $(-\gamma\nu, \nu)$ where γ is the Euler constant:

$$f(\epsilon) = \frac{e^{-\epsilon/\nu-\gamma}}{\nu}\; \exp\{-e^{-\epsilon/\nu-\gamma}\}.$$

As we show in the Appendix, this specification allows us to link the expected gain and option value terms in (6) to observable aggregate gross flows between occupations:

$$\begin{aligned}\bar{\epsilon}^{ij}_{gt} \;&=\; \nu\big[\ln m^{ij}_{gt} - \ln m^{ii}_{gt}\big],\\ \Omega(\bar{\epsilon}^i_{gt+1}) \;&=\; -\nu \ln m^{ii}_{gt},\end{aligned}$$

where $\ln m^{ij}_{gt}$ is the fraction of gender g workers that switch from occupation i to j at time t. Substituting these into (6) and (7), we get moment conditions for incumbent workers,

$$E_t\Bigg[\frac{\beta(1-\delta)}{\nu}(w^j_{gt+1} - w^i_{gt+1}) + \beta(1-\delta)\ln\left(\frac{m^{ij}_{gt+1}}{m^{jj}_{gt+1}}\right) + \frac{\beta(1-\delta)-1}{\nu}\,c^j_g \;-\; \ln\left(\frac{m^{ij}_{gt}}{m^{ii}_{gt}}\right)\Bigg] = 0, \tag{8}$$

and new workers:

$$E_t\left[\frac{\beta(1-\delta)}{\nu}(w^j_{gt+1}-w^0_{gt+1})+\right.$$
$$\left.\beta(1-\delta)\ln\left(\frac{m^{0j}_{gt+1}}{m^{jj}_{gt+1}}\right)+\frac{\beta(1-\delta)}{\nu}\,c^j_g\,-\,\frac{1}{\nu}\,\widetilde{c}^j_g\,-\,\ln\left(\frac{\widehat{m}^{0j}_{gt}}{\widehat{m}^{00}_{gt}}\right)\right]=0, \quad (9)$$

where $\widehat{m}^{0j}_{gt}$ is the fraction of gender g entrants to the workforce who start out in occupation j.

4 Estimation and Results [preliminary]

We first estimate equations (8) and (9) for a benchmark model without the home sector and the life-cycle components using a GMM approach, as proposed by Artuç et al. (2010). In table 1 we present the results of our estimation, where we show estimates for ν, the parameter determining the variance of the distribution function of worker's taste shocks for occupations (first row of estimates) and occupation-specific entry costs.

	Males	Females	% diff.
ν	4.8	6.9	44%
professional	26.1	37.0	42%
managerial	24.6	41.1	67%
clerical	27.1	21.7	-20%
sales	24.5	36.8	50%
craftsmen	21.0	53.9	157%
operatives	17.9	30.5	70%
services	23.0	28.8	26%
laborers	32.4	38.4	18%

Table 1: Estimates of worker's variance in taste shocks and occupation specific entry costs. Third column is the percentage difference between female and male estimates. Calculations based on CPS data, 1970-2009

From the table, we see that the parameter determining the dispersion in worker's idiosyncratic taste shocks for occupations is higher for females, as well as most occupation entry costs, with the exception of the clerical occupation. This results are in line with the presented facts, in that entry costs into managerial and professional occupations are significantly higher for females.

Another interesting fact worth mentioning, is the high entry cost for females to occupations that have seen a decrease in their overall wage level (with respect to clerical wages) such as craftsmen and operatives: the entry costs are 50% and 157% respectively. Hence, these results show that the reduction in the gender wage gap is due both to women entering better paying occupations *and* avoiding poorly payed occupations.

	Females			Males		
	1970-1989	1989-2009	Δ%	1970-1989	1989-2009	Δ%
professional	23.1	38.5	67%	16.7	40.4	142%
managerial	29.0	42.1	45%	16.1	32.6	102%
clerical	11.4	27.0	136%	16.4	40.2	145%
sales	20.3	44.4	119%	13.1	38.9	197%
craftsmen	44.2	59.8	35%	15.3	30.9	102%
operatives	15.7	35.4	125%	12.5	27.7	122%
services	12.6	37.1	193%	13.3	35.2	166%
laborers	22.5	45.8	104%	18.6	52.4	183%

Table 2: Estimates of occupation specific entry costs, by gender and sample period. Calculations based on CPS data, 1970-2009

Our discussion is motivated by the convergence of female occupational mobility with respect to males in the last quarter of a century. In table 2, we present results when we estimate the model for two subsamples of the data: from 1970 to 1989 and from 1989 to 2009. Thus, we try tor provide some evidence on changing entry costs into different occupations and that these changes have been not equal across genders.

From the estimation results in the table, we see that on average, all entry costs have increased in time. However, entry costs for females into professional and managerial occupations have increased significantly less than for males: women have faced an increase of 67% in the entry cost for professional occupations, versus an increase of 142% for men. The numbers for managerial occupations are 45% and 102% for women and men, respectively. (to be completed: home sector, entry costs vs mobility costs

5 Simulations

TBC

6 Appendix

6.1 Figures and Tables

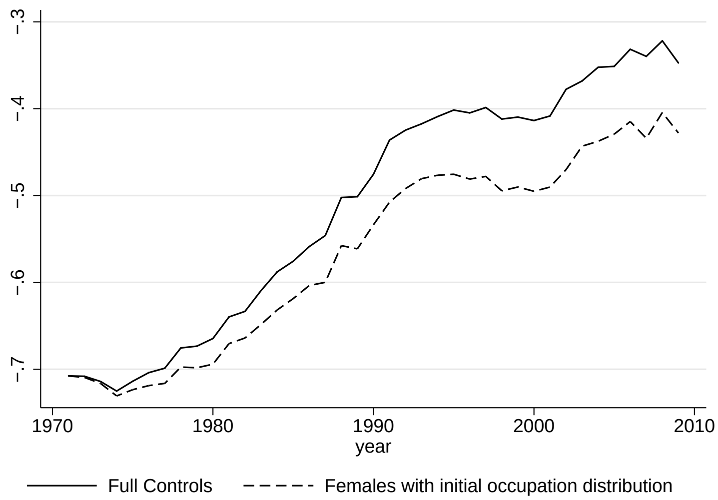

Figure 1: Implied gender wage gap given observables. Dotted line represents the fitted values of the gap when fixing the occupational information for females at the 1970 level.

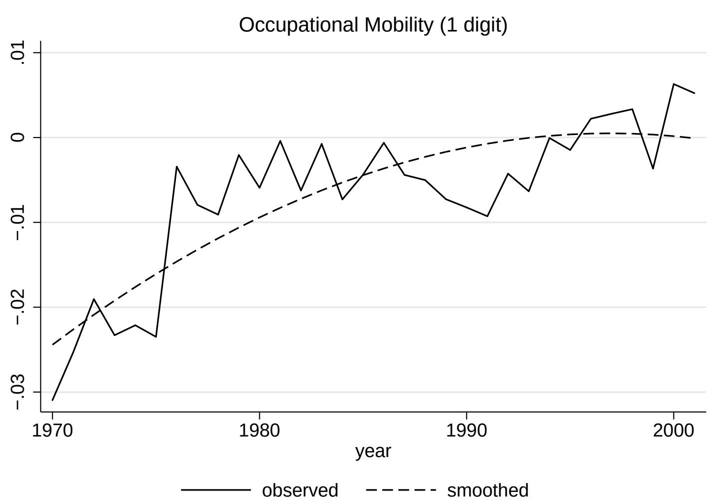

Figure 2: Occupational mobility of females. Coefficient value associated to a female dummy variable, in a linear regression on occupational mobility at the 1 digit aggregation level and a polynomial fit.

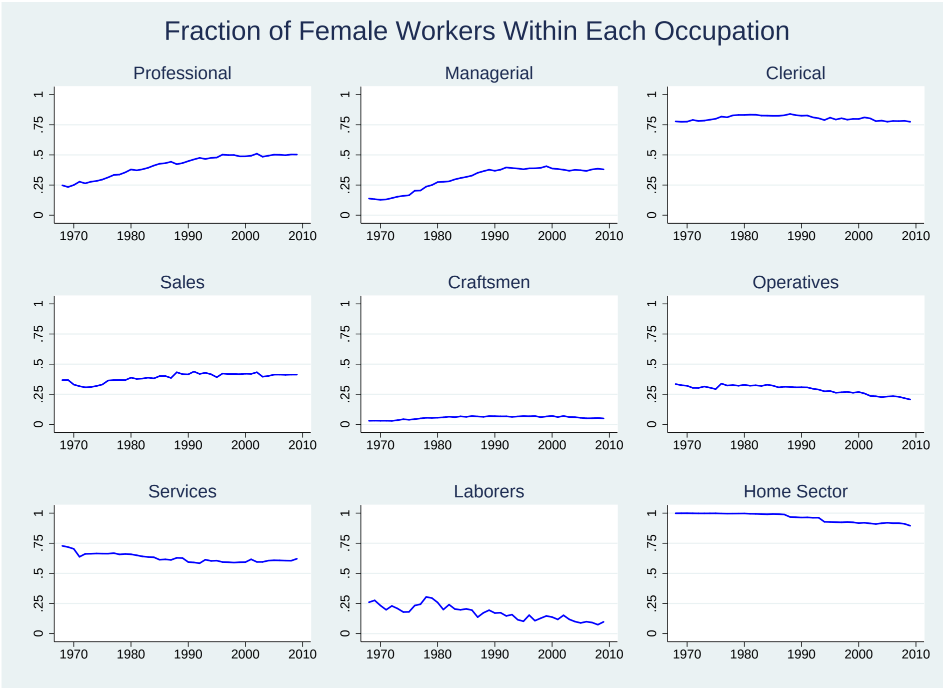

Figure 3: Fraction of female workers in each occupation, CPS data

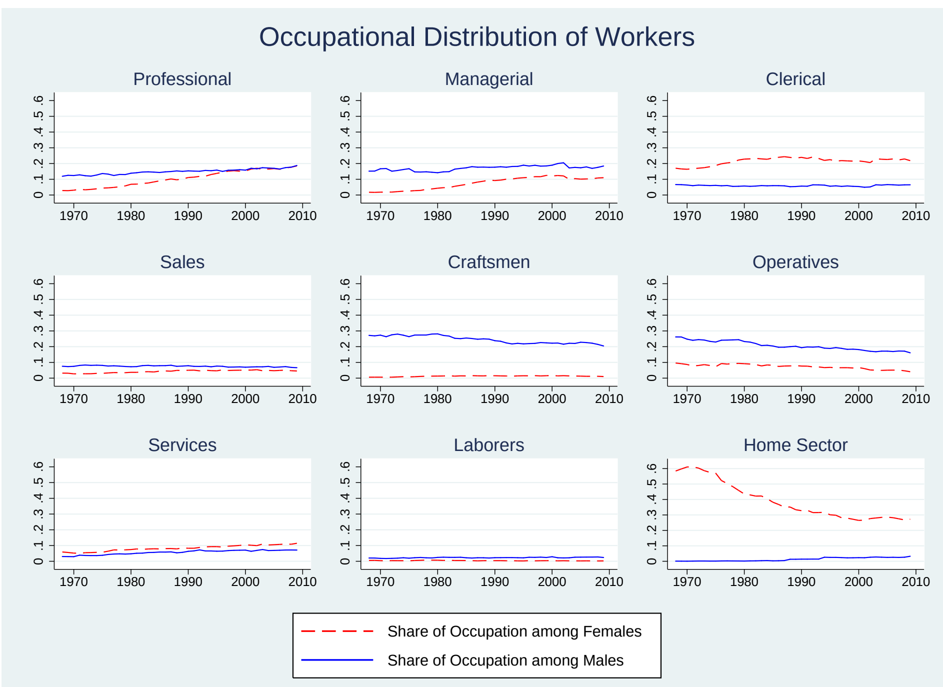

Figure 4: Fraction of females and males in each occupation, CPS data

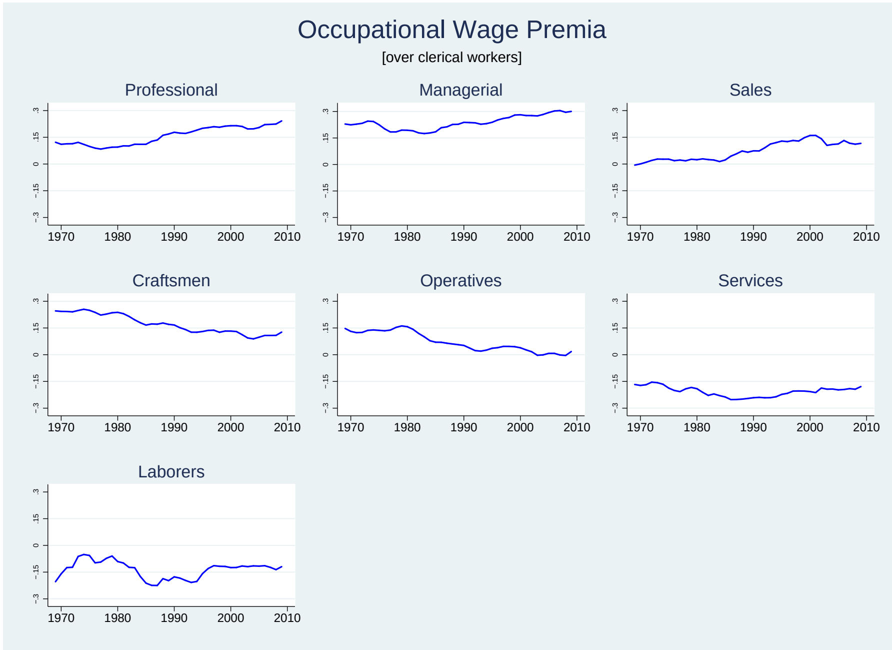

Figure 5: year-occupation interaction effects from mincer equation, dropped occupation is clerical, so magnitudes are percentage wage premium over clerical wages that year.

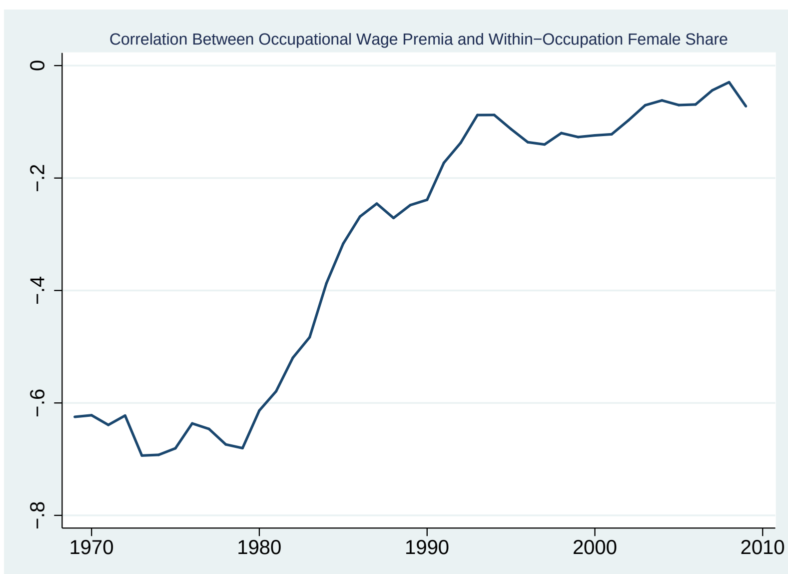

Figure 6: year-by-year correlation between the occupational wage premia above and the share of women in the overall workforce in each occupation

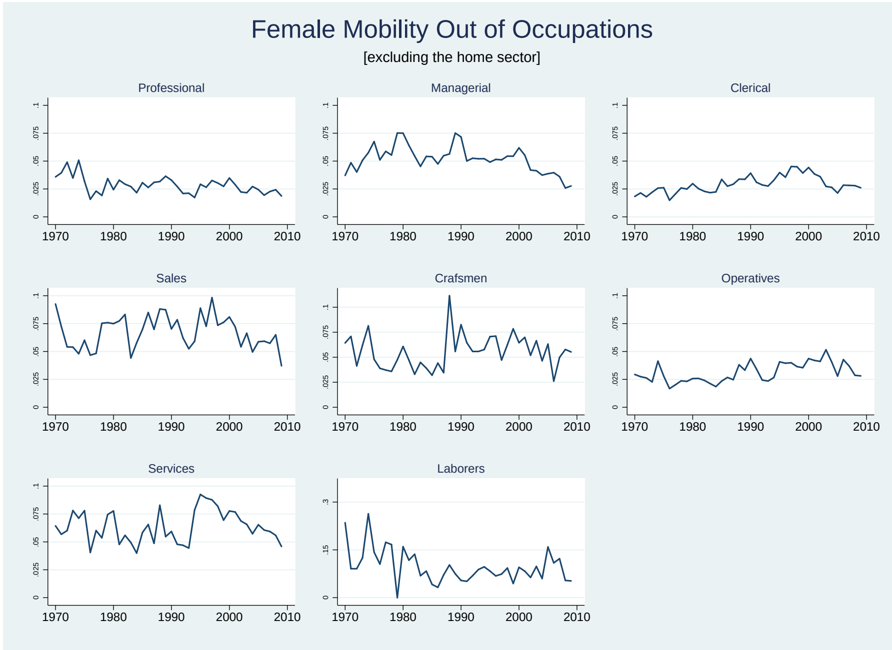

Figure 7: Female labor flows out of each occupation, CPS data

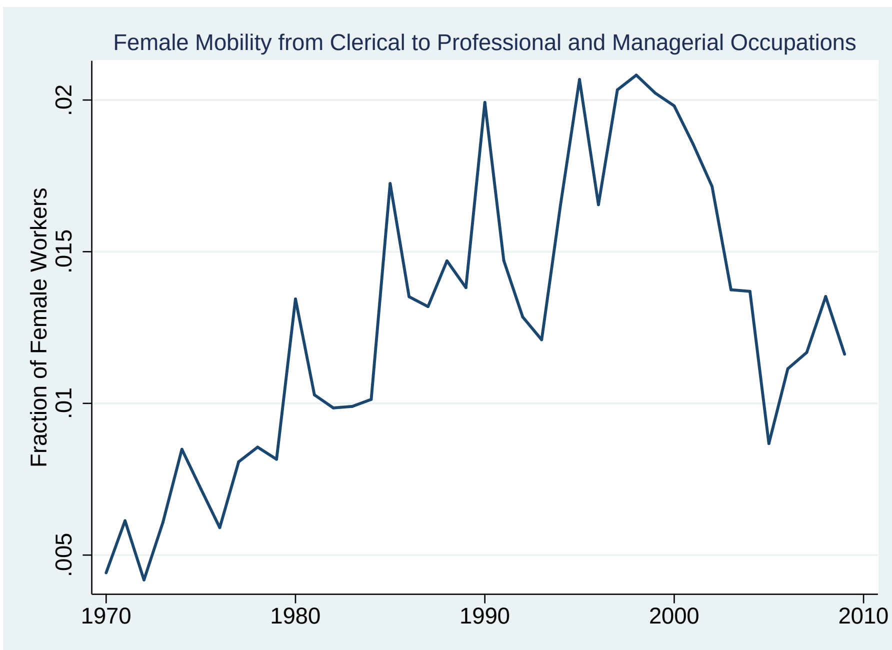

Figure 8: Fraction of female workings moving from clerical to professional or managerial positions, CPS data

References

E. Artuç, S. Chaudhuri, and J. McLaren. Trade shocks and labor adjustment: A structural empirical approach. *American Economic Review*, 100(3):1008–1045, 2010.

F. Blau and L.M Kahn. Swimming upstream: Trends in the gender wage differential in the 1980s. *Journal of Labor Economics*, 15(1):1–42, 1997.

J. Greenwood, A. Seshadri, and M. Yorukoglu. Engines of liberation. *Review of Economic Studies*, 72(1):109–133, 2004.

G. Kambourov and I. Manovskii. Rising occupational and industry mobility in the united states: 1968-1997. *International Economic Review*, 49(1):41–79, 2008.

G. Kambourov, I. Manovskii, and I.A. Telyukova. Families and careers. In P. Rupert, editor, *Frontiers of Family Economics, Volume 1*, pages 217–256, Bingley, 2008. Emerald Group Publishing Limited.

M. Rendall. Brain versus brawn: The realization of women's comparative advantage. *Unpublished Mimeo*, 2010.