

Domestic Supply, Job-Specialization and Sex-differences in Pay

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Abstract This article proposes an explanation of sex-differences in job-allocation and pay in different institutional contexts. Job-allocation calculations are considered to be related to (1) the distribution of housework and (2) the skill-specialization requirements of jobs. In a context of uncertainty and imperfect information, housework and job-specialization requirements generate a particular incentive structure for each sex. This incentive structure can, however, be altered by governmental action. Welfare policies and services are expected to affect allocation decisions at the micro-level both by reducing the risks of skill-depreciation for women as well as by increasing their intra-household bargaining power. Both effects combined should reduce the economic pay-offs of “traditional” sphere-specialization by sex. This model is tested using a sub-sample of married and cohabiting employees drawn for the second round of the European Social Survey. Results based on nested random-intercept regressions show that sex-differences in job-specialization and housework can explain the wage effects of occupational sex-composition and have a significant direct impact on hourly earnings. Welfare-regime interactions also suggest that the association between housework and earnings is much weaker in societies displaying high levels of defamilialization and decommodification.

Keywords Housework · Job-specialization · Earnings · Division of labor · Welfare states · European Social Survey

1 Introduction

The allocation of men and women into different jobs plays a central role in explaining sex-differences in pay. The sex-composition of occupations appears as one of the largest

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contributors to the gender wage gap in empirical models. Moreover, the more occupations are disaggregated into finer categories (i.e. the more occupational measures approach actual jobs), the largest this contribution seems to be (see, e.g. Blau and Kahn 2000; Boraas and Rodgers 2003; Meyersson-Milgrom et al. 2001; Petersen et al. 1997). Opening up the black-box of the gender wage gap thus requires our focusing on the central association between employees' sex, the jobs they occupy and their earnings.

Many sociological and economic factors are surely involved in the processes linking individuals to jobs and jobs to rewards (see Polavieja 2008a). In this paper I will not review all these possible factors at length but propose instead a simple theoretical model that focuses on incentive structures and assumes common rationality across the sexes. In so doing, the model seeks theoretical efficiency in the belief that efficient models can better unearth the structural nature of gender inequalities—i.e. the inequality component that does not depend on differences in actors' attitudes but on the very structure of economic incentives.

In line with an abundant literature in both economics and sociology, individuals' decisions regarding job-allocation are considered to be related to two crucial factors: (1) the existing amount and the distribution of household tasks (both at the individual and the societal levels); and (2) the structural properties of jobs—in particular, their skill-investment requirements. The former factor imposes different risks/opportunities to men and women, whilst the latter defines the tenure-earning profiles associated with each job-choice and hence the expected returns of the potential job match. The combination of 1 and 2 results in a different opportunity structure for each sex.

Such opportunity structures are expected to be affected by the institutional context. Welfare policies and services can reduce the risks of skill-depreciation for both women and their employers (see, e.g. Estevez-Abe 2005), whilst increasing women's intra-household bargaining power (see, e.g. Evertsson and Neramo 2004; Fuwa 2004). Both effects combined should diminish the economic pay-offs of "traditional" sphere-specialization by sex and lead to more equal labor market outcomes between men and women.

This model is tested using a sub-sample of married and cohabiting individuals drawn from the second round of the European Social Survey (ESS) carried out in 2004. The ESS module on *Family, Work and Welfare* offers an unusually wide range of theoretically relevant indicators that are hardly ever present simultaneously in a cross-national survey. This provides us with a privileged analytical standpoint in order to unpack the empirical association between occupational sex-composition and earnings. By restricting the analysis to married or cohabiting employees, empirical tests focus on the connections between the division of housework within families, job-specialization and individual earnings. The use of unusually rich controls for unobserved heterogeneity, including very-rarely measured personality traits and sex-role attitudes, allow us to interpret the statistical findings as reflecting incentive structures not linked to attitudinal differences by sex.

The paper is divided into five sections including this introduction. Section 2 presents the theoretical model and derives various empirical hypotheses from it; Sect. 3 explains the data, the variables and the methodology used to test them; empirical findings are discussed in Sect. 4; and, finally, Sect. 5 concludes.

2 The Model

Individuals consider the expected costs and benefits of their job matching decisions both at the supply and at the demand-side of the labor market. Such decisions have, in turn, crucial earning consequences over time. Jobs therefore play a central role in this model.

In line with the economic literature on training in imperfect markets, investments in all types of skills acquired on the job, including general skills, are regarded as involving costs and benefits for both firms and employees¹ (see, e.g. Acemoglu and Pischke 1998, 1999; Loewenstein and Spletzer 1998). Acquiring job-specific skills entails costs for employees because learning requires effort—and effort is a limited resource. Skill-acquisition on the job is also costly for firms, as employees' learning takes at the very least time (which amounts to employees' forgone productivity) and, in most cases, involves actual training investments on the employer's side. These investments can be considerable for some jobs.

Various economic and sociological theories explain why job-specific investments made by firms should lead to the closure of the employment relationship to outside competition (see, e.g. Goldthorpe 2000: ch. 10; Lazear 1995: ch. 4; Sorensen 1994; Williamson 1985: ch. 10). Put it simply, employers will insure their investments in workers' job-specific training by generating incentives for employees to stay in the firm after such training-investments have been made.² Long-term employment contracts are an obvious tool to this end. Yet closing the employment relation might create disincentives for workers to put forth productive effort. Employers thus face the question of how to ensure that workers protected from market competition do not shirk. There are various solutions to this problem—discussed for example by Lazear (1995: ch. 4) and Sorensen (1994)—but the one typically stressed in the sociological literature is the use of upward-sloping tenure-earning profiles (see, e.g. Breen 1997; Goldthorpe 2000: ch. 10; Sorensen 2000). By linking rewards to tenure employers shift the returns to employees' job-specific investments to the end of their employment careers. The typical incentive-compatible compensation profile will thus be one where workers are paid less than they are worth at low levels of tenure but more than they are worth as they accumulate seniority (Lazear 1995: 239–242). Such system will promote both employees' durability in the firm as well as their sustained effort over time. Tilted compensation acts therefore as an incentive device in employment relations that have been closed by job-specific skill investments.

There are jobs that do not require such skill investments as they entail very little requirements in terms of job-specific training. Hence there is no economic reason that these jobs provide their incumbents with steep tenure-earning profiles. For simplicity, we can therefore assume only two types of jobs: high specific-skilled jobs (H) and low specific-skilled jobs (L) for individuals with the same schooling levels. The expected returns per unit of effort (e) for these two types of jobs are represented graphically in Fig. 1.

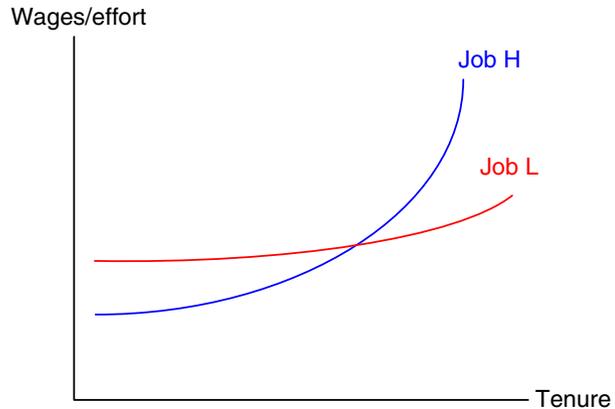
A central idea in this model is that returns per effort will be lower at the early stages of the employment contract in job H than in job L.³ Yet as workers accumulate tenure, returns over effort increase very notably in the former but remain very much unchanged in the latter. L-type jobs are therefore “easy” jobs to perform for every level of schooling

¹ There is mounting evidence that employers are very often willing to pay for skills that can be easily transferred to other firms, which contradicts the predictions of standard human capital theory (see Becker 1993[1964]). New training models explain this finding by arguing that the wage returns for workers of training in transferable skills may be less than the productivity returns for employers when markets are imperfect (see, e.g. Acemoglu and Pischke 1999).

² Training does not need to be explicit but take the form of learning-by-doing on the job.

³ Note that even if nominal earnings are higher in H at all levels of tenure, the ratio wages/effort will be higher in the early stages of L-type jobs because skill-investments require effort. Note also that if it is further assumed that women “use up” more effort than men in housework activities and hence dispose of less effort to put forth, the pay-offs of L-type jobs at early stages will be even greater for women. Introducing effort clarifies the incentive properties of the different jobs and facilitates the connection between housework and labor market allocation choices.

Fig. 1 Compensation profiles per effort over tenure for high-specialization (*H*) and low-specialization (*L*) jobs



required but, in turn, they offer lower returns over time. Lack of job-specific requirements will allow workers to move from different L-type jobs at virtually no costs (apart from those involved in job-seeking) and employers to substitute incumbents without losing job-specific training investments. Job separations will therefore be more frequent in L-type jobs than in H-type ones, as they are less costly for both employers and employees. This distinction between high and low skill-specificity jobs is crucial for explaining sex-differences in allocation choices both at the demand and the supply sides.

2.1 Micro-level Implications

In a context of imperfect information, employers can discriminate against women for H-type jobs if they consider the risk of job-disruption to be higher for women than for men of the same characteristics. That women are considered as having higher *average* risks of job-disruption is a statistically informed perception based on the existing distribution of family responsibilities and household tasks between the sexes in all advanced societies. Taking such distribution as the basis for calculating sex-specific disruption risks is a form of what could be termed *distributional inference* (see Polavieja 2008b).

Women are likely to consider the same distributional facts with respect to household and family tasks as an element informing their own job-allocation choices. Domestic workload is expected to constrain women's investment choices in at least two crucial ways: first, by reducing the amount of effort at their disposal—as household tasks should lead to energy depletion making job-specific investments a more costly option for women⁴ (see, e.g. Hersch and Stratton 1997; Stratton 2001); and, secondly, by increasing the risks of an eventual job disruption due to family demands. Any rational actor anticipating job separations will be less inclined to incur job-investment costs that can only be recouped in the future as long as the employment relationship is maintained. Similarly, any rational actor putting (or expecting to put) forth high levels of effort in household tasks, will take such effort-allocation fact (or expectation) into consideration when making her job-investment choices. Hence the risks associated with women choosing job H over job L are expected to be perceived as higher, not only by employers, but crucially by women themselves.

⁴ This follows from Becker's theory of the allocation of effort, which states that effort is in limited supply and positively correlated with productivity in the job. Hence housework supply reduces the available "stock" of effort which will lead to lower productivity and lower earnings (see Becker 1985).

2.2 Feed-back Effects

Sex-differences in labor-market returns can themselves be taken as relevant information by rational actors in imperfectly informative contexts. Under this light, the under-representation of women in high-paying jobs matters because it sends signals to other women that such job-allocation option might be risky—even if such distribution conveys no real information about each individual's actual probability of success. By sending different signals to men and women, an unequal distribution of labor-market rewards across the sexes can lead to the reinforcement of traditional strategies of sphere specialization.

2.3 Institutions

Welfare institutions can, however, reduce the risks for women to invest in highly specific jobs, as well as the risks for their potential employers to employ them. Extensive public childcare provision is particularly important as it reduces time-off work for women, which increases their opportunities for job-specific investments, whilst reducing employers' retraining costs (see Estevez-Abe 2005). Public childcare provision has been typically considered an indicator of the degree of *defamilialization* in a given society—i.e. the extent to which women are freed from the burden of family obligations (see, e.g. Esping-Andersen 1999; Lister 1994; Lewis 1992; O'connor 1993; Orloff 1993). Yet it should be equally noted that high levels of *decommodification*—i.e. public services and transfers that protect individuals from the risks associated with labor market failure—will also benefit women's investments in jobs by providing a generous safety net in the event of job disruption—i.e. by reducing the costs of failure.

The institutional configurations that promote women's position in the labor market can also have important consequences within households. If the position of women in the labor market is strengthened, their intra-household bargaining power should increase accordingly and this, in turn, should lead to a more equal distribution of domestic tasks (see, e.g. Bittman et al. 2003; Ermisch 2003: ch. 2; Evertsson and Neramo 2004). This expectation follows from both sociological and economic bargaining models, which see the unequal distribution of domestic work as the result of spouses' relative access to resources. Welfare policies could also increase women's bargaining power directly by increasing their chances of living independently, hence making their threat of marital/partnership dissolution more credible.

A more equal distribution of housework should change, in turn, the informational structure and reduce the perceived risks of investing in job-specific skills for both women and for their employers. It thus follows that defamilialization and decommodification institutions can reduce the pay-offs of a traditional division of labor within couples and promote greater levels of both housework and labor market equality between the sexes. Under particular institutional conditions, the traditional work-family nexus could thus be progressively replaced by more pro-egalitarian dynamics.

2.4 Welfare Types

Institutional conditions particularly conducive to the erosion of the traditional sex-specialization model could be found in Scandinavian societies. The *social-democratic* welfare state prevailing in these societies is known to provide the highest levels of both defamilialization and decommodification in the world. This is a welfare state fully committed to the promotion of women's economic independence from the family. This goal has been

pursued over time via the provision of universal benefits and services, which are independent from household resources, and which encourage women's full participation in the labor market. A particularly important welfare service to this end is the very generous network of public childcare provision available in these societies.⁵

Communist regimes were also characterized by a strong commitment to the full integration of women in the economic sphere as well as by providing generous public childcare facilities to this end. Although many of these institutional features collapsed after regime change (see Hantrais 2004), the defamilialization legacy of past communist rule could still be visible today in the post-communist societies of Eastern and Central Europe, as almost two-thirds of the workforces of these societies surveyed in 2004 had entered employment prior to 1989 (see Polavieja 2007).

In contrast to the social-democratic model and to the defamilializing elements of the communist regimes, both the *conservative* and the *liberal* welfare states have shown little commitment to women's independence from the family. In the conservative model the family, and not the individual, is considered the main locus of solidarity and welfare provision is organized accordingly. This obviously reinforces the traditional family model leading to sphere-specialization by sex. The liberal model has, for its part, a much more subsidiary take on welfare intervention, which is largely restricted to cases of market failure and demonstrable need. This also leaves little room for concerns about defamilialization, which has never been a goal of liberal regimes. As a result, the liberal model, with its *laissez-faire* approach, exerts little institutional impact on the incentive structures leading to sex-differences in allocation and rewards.

2.5 Hypotheses

The model outlined above allows us to formulate the following hypotheses regarding sex-differences in allocation and pay:

H1 If different job-investment risks are behind the observed differences in job-allocation by sex, and if such differences are key to understanding differences in pay, then the introduction of indicators of job-specialization in the wage equations should absorb a substantial part of the effect of occupational sex-composition on earnings.

H2 The greater the supply of housework of a given individual, the lower his/her earnings should be. This is expected because: (1) domestic workload increases the costs of job-specialization via energy depletion and higher (actual or perceived) disruption risks and (2) because greater domestic effort implies lower performance (via energy depletion) in all jobs.

H3 Yet a high-paying job should also increase intra-household bargaining power and allow individuals to negotiate lower levels of domestic input at their homes, from which a negative correlation between housework and earnings should also follow.

Note that H2 and H3 cannot be differentiated empirically in a cross-sectional framework, as it is not possible to separate out the earning consequences of domestic work (H2)

⁵ Scandinavian countries also provide long and generous parental leave. Parental leave policies might deter employers' investments in job-specific skills and hence hinder women's career progression (see, e.g. Rønsen and Sundström 2002), from which earning consequences should follow (Mandel and Semyonov 2005). Yet when assessing the overall welfare effect of the Scandinavian model, one should consider not only the direct defamilializing impact of public childcare but also the indirect defamilializing effects of decommodification. Both effects combined are expected to offset the possibly negative consequences of generous parental leave.

from the bargaining effects of high earnings (H3) if time is fixed. All we can expect to observe is a negative and significant association between housework and earnings. This expectation can be tested using the ESS. We can refer to it as the *housework association hypothesis* (H2/3).

H4 If sex-specific incentive structures exist independently of attitudinal heterogeneity, the expected statistical associations between the variables in focus (job-specialization, housework and earnings) should remain significant even after controlling for possible sex-differences in preferences, attitudes and tastes.

H5 Welfare regimes providing high levels of defamilialization and decommodification should reduce the pay-offs of sphere specialization by sex, thus making women's returns less dependent on their own domestic supply. This is because defamilialization and decommodification should lower the costs of job-allocation *at every level of domestic supply*. On the other hand, welfare institutions can also increase women's intra-household bargaining power *at every level of earnings* by increasing their options outside partnership (i.e. their "threat points"). Note finally that women's greater bargaining power should translate into a more egalitarian and hence more compressed distribution of housework amongst spouses in generous welfare states.⁶ A more compressed distribution can also reduce by itself the statistical association between housework and earnings. So each and all of these effects should lead to a weaker statistical association between housework and earnings in social-democratic and (possibly also in post-communist) regimes.

3 Data, Variables and Methodology

I use the second round of the ESS, (2004) to fit different earning functions to a sub-sample of married and cohabiting employees. An important methodological caveat of the ESS is that country samples are small for the purposes of earnings research. Moreover, response rates to the earnings questions are below the 50% threshold in several countries. Such countries have been excluded from the analysis. The final working sample includes all married or cohabiting employed wage-earners (reporting wages) older than 24 and country nationals from Belgium, the Czech Republic, Denmark, Finland, Germany, Luxemburg, Norway, Poland, Spain, Sweden, Switzerland and the UK ($N = 5,794$). Small sample-size forces us to pool men and women together and to test institutional effects via welfare typology interactions. These are all methodological limitations that stem from the structure of the data.

The dependent variable of our analyses is the logarithm of gross hourly wages in Euros before deduction for tax and/or insurance. According to the ESS, the overall mean gross-pay for the selected sample is 17€/h. There are obvious differences by country.

Occupational sex-composition is calculated as the fraction of employees that are women in respondents' occupation at respondents' country. Sex-composition is measured using the unrestricted national samples of our selected ESS countries, each containing an average of 1,600 observations. In order to increase the number of observations per occupational cell, and hence to obtain more reliable sex-concentration estimates, 4-digit occupational codes

⁶ The existing comparative evidence shows indeed that Scandinavian societies display the most egalitarian distribution of housework amongst spouses (see e.g. Batalova and Cohen 2002; Evertsson and Neremo 2004; Fuwa 2004; Geist 2005).

have been clustered into 3-digits. This procedure reduces estimation bias due to small sample size but at the expense of losing some detail in the occupational indicator.

Job-specialization is measured using respondents' own assessments of job-learning time. The ESS asks every worker to evaluate the time that it would be required for "someone" with the right qualification to learn to do respondent's job well. As it was discussed in greater detail in Polavieja (2008a: 203), this wording has two advantages over competing indicators of job-specialization: first, it refers directly to respondent's job net of general human capital requirements, and, secondly, it avoids self-assessment, which reduces any possible subjectivity bias due to sex-differences in self-esteem (see Polavieja 2008a: 203). Respondents' assessments of job-learning time are measured at the ESS using an interval scale that ranges from 1 (*less than a week*) to 8 (*more than 2 years*).⁷

Housework supply is measured using two rather distinct, although evidently correlated, indicators: (1) individual's total supply of housework and (2) individual's supply relative to that of his/her partner. Individual supply is measured using information on the total amount of housework time supplied at respondents' homes, as well as on respondents' own contribution to this total. The ESS defines total housework as the number of hours devoted in a typical weekday by all members of the household to various domestic tasks, not including childcare nor leisure activities. Respondent's own share of this total has been computed on the basis of their responses to the ESS question "*about how much of this (total household) time do you spend yourself?*" assuming the following equivalences (imputed values in parenthesis): 1. *None or almost none* (0); 2. *Up to a quarter of the time* (0.2); 3. *More than a quarter, up to a half of the time* (0.4); 4. *More than a half, up to three quarters of the time* (0.6); 5. *More than three quarters, less than all of the time* (0.8); and 6. *All or nearly all of the time* (1). Total individual housework is calculated as total household time multiplied by respondent's share (using the imputed equivalences).

The relative contribution of respondents' "vis-à-vis" their partners is calculated as the difference between respondents' own share of housework and their partner's share, where both shares are calculated using the same equivalences as above. The resulting indicator thus ranges from -1 (i.e. the respondent does not contribute to housework and his/her partner does all of it) to 1 (i.e. the respondent does all the housework and his/her partner does none). These two housework indicators show a correlation of 0.6 in the ESS, which means that the higher the amount of domestic supply provided by respondents, the higher is their relative contribution to the total housework "vis-à-vis" their partners. This unsurprising finding implies that these indicators cannot be estimated jointly but must be used as alternative measures of housework supply.

Institutional interactions are tested using an expanded version of Esping-Andersen's original welfare state typology (Esping-Andersen 1990) including a fourth category that comprises the former communist societies of East Central Europe. The analyzed countries are therefore clustered in the following four regime types: *Conservative* (including respondents from Belgium, Luxemburg, Switzerland, Spain and former West Germany); *Social-democratic* (comprising respondents from Denmark, Sweden, Norway and Finland); *Liberal* (UK) and *Post-communist* (Czech Republic, Poland and former East Germany).

⁷ The ESS includes two other indicators that could, in principle, be relevant to job-specialization: (1) self-assessed difficulty of getting a similar or better job with another employer, and (2) difficulty to employer of replacing the respondent (as assessed by the latter). Yet these two indicators correlate very poorly with each other, as well as with job-learning time, and they show an equally poor performance in wage equations. This raises serious doubts as to their actual validity as indicators of job-specialization. Given these problems, I use only job-learning time as a measure of job-specialization. This approach is in accordance with the literature (see Tam 1997).

Differences in attitudes, preferences and orientations between men and women are expected to have a biasing impact on earnings' estimations. The wealth of attitudinal indicators present at the ESS allows us to identify these attitudinal differences by sex and hence to control for a source of individual heterogeneity that is usually unobservable. Drawing on several attitudinal questions, two different scales have been constructed.

The first scale measures gender attitudes and has already been used in Polavieja (2008a). The scale computes respondents' degree of agreement with the following five Likert-type items: (1) whether *women should be prepared to cut down on their wages for the sake of their families*, (2) whether *men should have equal domestic responsibilities as women*, (3) whether *men should have preference over scarce jobs*, (4) whether *parents should stick together for children even if they do not get along*, and (5) whether *a person's family should be his/her priority*. The scale shows a Cronbach's alpha of 0.6, it is normally distributed and ranges from 0 to 20, the latter value implying the highest score in "traditional" gender attitudes.

The second attitudinal control seeks to address differences in what could be termed degree of "social ambition". The indicator used to this end is the result of applying factor analysis to a set of attitudinal questions from the so-called *Human Value* module of the ESS. In this module, respondents are presented with several descriptions of fictitious individuals and are asked to evaluate how much alike they consider themselves to be in relation to the examples described (examples are chosen so as to have the same sex as respondents). Factor analysis showed that responses to the following descriptions did actually formed part of a single factor (results available on request): (1) *Being very successful is important to her/him. She/he hopes people will recognize her/his achievements*; (2) *It is important to her/him to show her/his abilities. She/he wants people to admire what she/he does*; and (3) *It is important to her/him to get respect from others. She/he wants people to do what she/he says*. Responses to these three descriptions were added up in a 6-interval scale ranging from -3 to 2. The scale showed a Cronbach's alpha of 0.7. Introducing individual scores along this attitudinal dimension in the earnings models is an unusual opportunity to control for individual characteristics possibly linked to returns and very unlikely to be observed elsewhere. Attitudinal controls will allow us to interpret our findings in terms of incentive structures, which is absolutely crucial for the validation of the proposed model.

A final control introduced in the earnings function captures the degree of wage compression in respondents' industry, measured as the industry-country standard deviation from mean hourly wages. This is an important control as we know that Scandinavian societies show greater levels of wage compression than other "regimes". In order to test for the welfare-state effect discussed above (H5), it is therefore important to net out our regime-type interactions from the possible statistical effects of different wage distributions⁸ (see Mandel and Semyonov 2005; Table 1).

⁸ Mandel and Semyonov (2005) argue that the lower earning differentials between men and women found in highly developed welfare states are actually attributable to the more egalitarian wage structures that characterizes these countries rather than to their family policies. Controlling for wage compression will therefore tend to isolate the defamilialization and decommodification mechanisms discussed above from the possible effects of wage equalization. Yet it must be recognized that wage compression could itself be interpreted as another welfare effect that further equalizes intra-household bargaining-power. Under this latter light, controls for wage compression could be interpreted as unnecessary.

Table 1 Description of key variables

Variable	Description	<i>N</i>	Mean or %	Standard deviation
<i>y</i>	Is the log of the ratio of gross weekly earnings and usually weekly hours in € ^a	6,090	2.36	1.0
Schooling	Years of schooling completed	16,143	12.08	3.87
Experience	Total number of years in paid work	15,265	23.8	13.26
<i>S</i>	Proportion of female in respondent's occupation (3-digit ISCO codes) and respondent's country	15,827	0.52	0.27
<i>f</i>	Sex of employed respondents			
	Male	7,917	48.75%	
	Female	8,324	51.25%	
JSK	Time that would be required for people with the right qualification to learn to do R's jobs well, measured using an interval scale ranging from 1 = less than a week, to 8 = more than 2 years	16,255	4.39	1.25
Absolute housework	<i>N</i> of hours of housework provided by R on a typical weekday, measured as total number of hours of household housework divided by respondents' share	16,255	2.3	3.54
Relative housework	(Proportion of housework typically provided by R on a typical weekday)–(proportion of housework typically provided by R's partner on a typical weekday). It ranges from –1 = R's partner does all the housework to 1 = the R does all the housework	15,892	0.08	0.61
Sex-role attitudes	Index of (traditional) gender role attitudes. 21-Interval scale ranging from 0 = less traditional to 20 = more traditional	16,255	9.45	3.06
Personality traits	Index of social ambition. It is a 6-interval scale ranging from –3 = less to 3 = more ambitious	16,255	–0.41	0.84
Welfare typology	Grouping of countries according to Esping-Andersen (1990) welfare regimes plus post-communist Europe			
	Conservative (BE, LU, CH, ES and former West DE)	6,990	43.0%	
	Social democratic (DK, SE, NO, FI)	3,993	24.6%	
	Liberal (UK)	829	5.1%	
	Post-communist (CZ, PL, and former East DE)	4,443	27.3%	

Source European Social Survey, married and cohabiting employed respondents from selected countries (2004)

^a Values > 6.39 (i.e. 600 €/h) have been recoded as missing

3.1 Methodology

Hypotheses are tested using a simple two-level linear framework that addresses the nested structure of the ESS data. This framework accounts for the existence of residual components at both the individual and the country level by splitting the regression intercept (β_{0j}) into two separate components: the mean of the country intercepts (γ_{00}) and a between-country residual variance parameter (u_{0j}). This latter parameter is assumed to have a random distribution $u_{0j} \sim N(0, \sigma_u^2)$ and can be estimated either as a fixed or as a random

coefficient (for a technical discussion, see Halaby 2004). In our selected sample we have 13 countries containing an average of 363 married or cohabiting wage earners each. These sample sizes seem to favor random-intercept models over fixed-effects (see Snijders and Bosker 1999) and hence random-intercept regressions are presented below. Yet it must be noted that all substantive findings are robust to using fixed-effect estimates instead (results available on request). The parameters of the random-intercept models fitted to the ESS selected sample have been estimated by maximum likelihood method. Hypotheses are tested using nested equations within a model-building framework as in Tam (1997) and Polavieja (2008a).

4 Findings

Table 2 shows the results of fitting maximum-likelihood random-intercept regressions to our ESS selected sub-sample of married and cohabiting respondents. Model 1 is a standard Mincerian equation that yields a wage difference of 22% between men and women. Model 2 adds occupational sex composition and this takes up some of the sex-difference estimated in model 1—although not a very substantial part of it. The unstandardized beta coefficient for occupational sex-composition estimated in model 2 is -0.078 . Since y_i is logged hourly wages, this amounts to a 8% wage difference per hour between individuals employed in fully male occupations and those employed in fully female-ones, and this net of experience and education. Model 3 adds job-specialization, measured as time required to learn respondent's job, and this absorbs a very substantial part of the effect of occupational sex-composition on earnings.⁹ The sex-composition coefficient drops from -0.08 to -0.04 and becomes non-significant ($P > |z| = 0.15$). Note that job-specialization also reduces the sex-intercept coefficient, as well as the labor market experience and schooling coefficients. This finding is consistent with hypothesis 1 as it suggests that the observed sex-differences in job-allocation leading to sex-differences in pay reflect to a large extent differences in job-specific skill investments, which seems in line with previous results reported in the literature (see Tam 1997; Polavieja 2005, 2007, 2008a).

Models 4a and b add our alternative housework supply measures to the earnings function. As expected, both absolute and relative measures of housework supply are negatively associated with hourly earnings and this net of human capital variables and job-specialization. Possible interactions between each of these indicators and respondents' sex have been tested and rejected (results available on request). Note that accounting for housework also reduces the sex-intercept coefficient, thus indicating that some of the sex-differences in pay not explained by the previous equations could actually be due to sex-differences in domestic supply, a finding which seems also in line with previous research on the earning consequences of housework (see, e.g. Hersch and Stratton 1997; Stratton 2001). In sum, these findings seem to suggest that housework supply is linked to both sex-differences in job-allocation, from which earning consequences could follow, and more directly to earnings, which is also consistent with the housework association hypothesis (H2/3).

⁹ Tests not reported in Table 3 show that, although attitudinal controls and housework indicators also produce a notable reduction in the sex-composition coefficient, job-specialization is the only variable that can absorb all its statistical impact on earnings.

Table 2 Random-intercept regressions on the log of gross hourly wages, ESS (2004)

Input variables	Model 1		Model 2		Model 3		Model 4a		Model 4b		Model 5a		Model 5b	
	<i>b</i>	Sig.	<i>b</i>	Sig.										
Female	-0.216 (0.014)	****	-0.192 (0.017)	****	-0.172 (0.017)	****	-0.154 (0.018)	****	-0.142 (0.020)	****	(see below)	(see below)	(see below)	
Experience	0.014 (0.002)	****	0.014 (0.002)	****	0.012 (0.002)	****	0.012 (0.002)	****	0.012 (0.002)	****	0.013 (0.002)	****	0.013 (0.002)	****
Experience ²	-0.0002 (0.00005)	****	-0.0002 (0.00005)	****	-0.0002 (0.00005)	***	-0.0002 (0.00005)	***	-0.0002 (0.00005)	***	-0.0002 (0.00005)	****	-0.0002 (0.00005)	***
Years of education	0.050 (0.002)	****	0.050 (0.002)	****	0.045 (0.002)	****	0.045 (0.002)	****	0.045 (0.002)	****	0.043 (0.002)	****	0.044 (0.002)	****
<i>S</i> (<i>P</i> of female in <i>R</i> 's occupation)			-0.078 (0.030)	***	-0.043 (0.030)	NS	-0.036 (0.030)	NS	-0.036 (0.030)	NS	-0.031 (0.030)	NS	-0.031 (0.030)	NS
JSK (<i>T</i> required to learn <i>R</i> 's job)					0.050 (0.005)	****	0.0496 (0.005)	****	0.0495 (0.005)	****	0.0486 (0.005)	****	0.0485 (0.005)	****
Housework (<i>N</i> of hours supplied by <i>R</i>)						****	-0.0198 (0.006)	****		****	-0.0160 (0.006)	***		****
Relative housework (vis-à-vis partner)									-0.046 (0.017)	***			-0.0384 (0.017)	**
Sex-role attitudes(ID) × sex(<i>f</i>)														
Female (ID = 0)													-0.037 (0.043)	NS
ID (for men)													-0.0009 (0.004)	NS
ID × <i>f</i> (ID for women)													-0.0153 (0.005)	***
Social ambition index													0.0176 (0.009)	*
													0.0182 (0.009)	**

Table 2 continued

Input variables	Model 1		Model 2		Model 3		Model 4a		Model 4b		Model 5a		Model 5b	
	<i>b</i>	Sig.												
Constant	1.93	****	1.93	****	1.75	****	1.75	****	1.71	****	1.67	****	1.64	****
<i>N level-1 (N level-2)</i>	4,726 (13)		4,726 (13)		4,726 (13)		4,726 (13)		4,726 (13)		4,726 (13)		4,726 (13)	
<i>sigma_u</i>	0.73****		0.73****		0.72****		0.72****		0.72****		0.71****		0.71****	
<i>sigma_e</i>	0.48****		0.48****		0.48****		0.48****		0.48****		0.48****		0.48****	

Source Calculated by the author from European Social Survey, selected countries (2004)

* Significance ≤0.1; ** significance ≤0.05; *** significance ≤0.01; **** significance ≤0.001

Table 3 Random-intercept regressions on the log of gross hourly wages: Institutional interactions

Input variables	Model 6a		Model 6b	
	<i>b</i>	Sig.	<i>b</i>	Sig.
Experience	0.012 (0.002)	****	0.012 (0.002)	****
Experience ²	−0.0002 (0.00005)	***	−0.0002 (0.00005)	***
Years of education	0.043 (0.002)	****	0.043 (0.002)	****
S (<i>P</i> female in R's occupation)	−0.033 (0.030)	NS	−0.033 (0.030)	NS
JSK (T required to learn R's job)	0.049 (0.005)	****	0.048 (0.005)	****
<i>Societal clusters × housework</i> (absolute and relative measures)				
Societal clusters (ref. → conservative)				
Social democratic	0.075 (0.27)	NS	0.121 (0.27)	NS
Post-communist	−1.29 (0.30)	****	−1.28 (0.30)	****
Liberal	−0.14 (0.45)	NS	−0.13 (0.45)	NS
Personal housework supply (<i>N</i> of hours) effect for conservative countries)	−0.026 (0.009)	***		
Social democratic × personal housework supply	0.027 (0.013)	**		
Post-communist × personal housework supply	0.004 (0.014)	NS		
Liberal × personal housework supply	−0.006 (0.019)	NS		
Relative housework (vis-à-vis spouse) (effect for conservative countries)			−0.0898 (0.024)	****
Social democratic × relative housework			0.082 (0.031)	***
Post-communist × relative housework			0.098 (0.037)	***
Liberal × relative housework			0.026 (0.05)	NS
ID (sex-role attitudes) × <i>f</i> (female)				
<i>f</i>	−0.052 (0.044)	NS	−0.041 (0.045)	NS
ID	−0.002 (0.004)	NS	−0.002 (0.004)	NS
If × ID	−0.013 (0.005)	***	−0.014 (0.005)	***
Index of social ambition	0.019 (0.009)	**	0.020 (0.009)	**
Wage compression at respondents' industry-region	0.002 (0.0004)	****	0.002 (0.0004)	****
Constant	1.94	****	1.89	****
<i>N level-1</i> (<i>N level-2</i>) =	4,726 (13)		4,726 (13)	
<i>sigma_u</i>	0.40****		0.41****	
<i>sigma_e</i>	0.47****		0.47****	

Source Calculated by the author from European Social Survey, selected countries (2004)

* Significance ≤ 0.1 ; ** significance ≤ 0.05 ; *** significance ≤ 0.01 ; **** significance ≤ 0.001

Models 5a and b add our final attitudinal controls. Three main findings are worth reporting. First, we can observe a significant negative association between traditional gender attitudes and earnings for women (yet not for men); secondly, we can also observe a

significant positive association between the social ambition index and earnings (for both sexes¹⁰); and, thirdly, we can observe that, despite these attitudinal controls, both job-specialization and housework measures maintain their significant effects on earnings. This is a very important finding as it suggests that the observed associations between sex, occupational sex-composition, job-specialization and housework-supply occur irrespectively of respondents own sex-role attitudes and personal tastes—as captured by the social ambition index. Hence hypothesis 4 seems also supported by the ESS data.

4.1 Welfare Regime Interactions

Empirical findings seem therefore consistent with the idea that there are incentive structures leading to sphere specialization by sex which are independent of differences in preferences and tastes. Such incentive structures are expected to be affected by institutional variation. According to the institutional variation hypothesis (H5), the incentives for sphere specialization by sex, and hence the association between housework supply and earnings, should be less strong in welfare regimes that provide higher levels of defamilialization and decommmodification.

In order to test for institutional variation in the association between housework and earnings (H5), models 6a and b introduce an interaction between the welfare regime typology described above and each of our housework indicators. Since our model specification allows country intercepts to vary randomly, the parameters of these interactions can be interpreted as net of country-specific influences on average earnings. This seems the most sensible way of testing for welfare-state effects given the size of our working sample. The results of these tests are presented in Table 3.

Model 6a fits an interaction between welfare regimes and the total supply of housework provided by married or cohabiting employed respondents, controlling for all the parameters estimated in the previous model (model 5a in Table 2) plus a further control for the level of wage dispersion in respondents' industry at their region of residence. Model 6a shows that there is a significant and negative association between absolute supply of housework and earnings in the conservative welfare cluster (BE, LU, ES, CH and former-West DE), which is the reference category in the regime interaction ($\beta_{ref.} = -0.026$, $P > |z| = 0.009$). This means that in conservative societies 1 h increase of housework supply “reduces” hourly wages by an average of 3% points. This statistical association between individuals' absolute housework supply and their earnings does not appear to be significantly different in either liberal (i.e. UK) or in post-communist societies (PL, CZ and former-East DE), as shown by their respective interacted coefficients. Yet model 6a yields a statistically significant interaction effect for Scandinavian societies (DK, SE, NO and FI) and this even after controlling for wage dispersion at the industry level. The coefficient of this interaction term for social-democratic societies captures how different the association between absolute housework and earnings is for this regime type in comparison to the association found for the conservative cluster. Note that the interacted coefficient estimated by model 6a is $\beta_{int.} = 0.027$, $P > |z| = 0.04$, which means that the absolute association between housework and earnings for this regime type would be $\simeq 0$ and evidently non-significant:

$$\beta_{scandinavia} = \beta_{ref.} - \beta_{int.} = -0.026 + 0.027 = 0.001 \simeq 0, \quad P > |z| = 0.90$$

Model 6b tests for the welfare regime interaction using this time the relative measure of housework and finds that not only the social-democratic but also the post-communist

¹⁰ Interactions between the social ambition index and respondents' sex have been tested and rejected.

regime appear as having a significantly different association between relative housework and earnings—i.e. different from the one observed for conservative societies, which is $\beta_{\text{ref.}} = -0.089$, $P > |z| = 0.000$. The interacted term for the social-democratic regime is now $\beta_{\text{int.}} = 0.082$, $P > |z| = 0.007$ and hence the absolute effect of relative housework would be:

$$\beta_{\text{scandinavia}} = \beta_{\text{ref.}} - \beta_{\text{int.}} = -0.089 + 0.082 = -0.007 \simeq 0, \quad P > |z| = 0.79$$

The interacted term for the post-communist regime is $\beta_{\text{int.}} = 0.098$, $P > |z| = 0.008$ and hence the absolute effect of relative housework supply would be:

$$\beta_{\text{post-comm.}} = \beta_{\text{ref.}} - \beta_{\text{int.}} = -0.089 + 0.098 = 0.009 \simeq 0, \quad P > |z| = 0.78$$

In sum, we find that for individuals living in the Scandinavian cluster, the association between housework supply and earnings seems significantly weaker than the one found in the conservative and the liberal clusters and this regardless of how we measure housework. In fact no statistically significant association between housework and earnings seems to be found in social-democratic welfare regimes. Similar results are found for the post-communist cluster but only when we use the relative housework measure.

The interactions tested seem thus consistent with the idea that high levels of defamilialization and decommodification, as those prevailing in Scandinavian countries, can affect the incentive structures leading to sex-differences in job allocation and pay by reducing the costs of job-specialization for women, by redistributing the risks of job-disruption across the sexes and by enhancing women's bargaining power within their families. All these effects combined could be stronger than the possibly adverse consequences of generous parental leave also typical of Scandinavian societies. Together, they could help to erode the work-family nexus by reducing the pay-offs of a "traditional" division of labor between spouses.

5 Discussion

As in virtually all social research, there is a gap in this paper between the theoretical model proposed and the empirical tests performed. This gap is admittedly considerable because the model proposed is dynamic, as any causal model is, whereas the data used are cross-sectional and consequently preclude any serious analysis of the direction of causality. Yet, to the extent that the model proposed makes explicit recognition of reinforcing effects between housework and labor market returns, resolving the issues regarding the direction of causality might not be so crucial for the validation of its main empirical predictions. What matters rather is identifying the multiple interrelations that might occur between the micro-level variables of interest under different institutional conditions. The linear regression approach used in this paper should not prevent us from interpreting the results in a rather more 'systemic' fashion.

The argument proposed in this paper can therefore be better interpreted as one identifying the conditions for two different scenarios, each of which assumes multidirectional causality. The first scenario is one of "traditional" equilibrium, in which sex-differences in housework supply, job-allocation and pay reinforce each other. The second scenario could be described as the "egalitarian-trend" scenario, where such reinforcement effects are curtailed by governmental action. Both the conservative regime countries of our sample and the UK seem to be closer to the former scenario, whilst Scandinavian countries seem closer to the latter. Central and Eastern European post-communist societies could display

some elements of gender egalitarianism, but most probably as a legacy of the past. There are significant differences in both the degree of defamilialization and in the degree of decommodification across each of these regime types. The model proposed explains why such differences should be linked to these two alternative scenarios.

A very important piece of evidence for the empirical validation of the model proposed is the finding that the effects of job-specialization and housework supply on earnings persist even after controlling for sex-differences in sex-role attitudes and personal tastes (perhaps even personality traits). This finding has been possible thanks to the unusually rich set of attitudinal variables present at the ESS. It has been judged as crucial because it shows that people's (job and housework) allocation choices do not depend solely on their own subjective values and tastes but on the opportunity structure they face. This implies that, without state intervention, the structure of incentives behind sex-differences in job-allocation, housework supply and earnings could persist even in the face of attitudinal change.

The explanation proposed here can therefore do without the assumption that unequal outcomes must necessarily respond to differences in actors' preferences and tastes. More to the point, overt forms of discrimination—what economists call discrimination by *taste*—are not required to explain sex-differences in job-allocation and pay in this model. All that is required is subjectively rational actors operating in a context of uncertainty and imperfect information. In such a context, it has been argued, actors can use what has been termed distributional inference as a means to inform their expectations. Statistical discrimination is a form of distributional inference. Hence with very few assumptions about actors' behavior, this model can offer a sociological explanation of how macro-level structures (as reflected in distributional outcomes) can affect micro-level actions even in the absence of discriminating employers and/or family-oriented women. This explanation can be defined as *structural* precisely because it addresses the inequality component that does not depend on preference heterogeneity.

The statistical models presented rest on a number of assumptions that have been imposed by the very nature of the data and which should be relaxed in future research. Small-N limitations have forced us to pool men and women together and to assume constant effects across the sexes for all explanatory variables with the sole exception of gender-role attitudes. This is a necessary simplification in order to save degrees of freedom. Small sample sizes have also forced us to compute an occupational segregation estimate using 3-digit codes. Given the small sizes of the ESS country samples used, this indicator could still be affected by measurement error. Occupational sex-composition estimates should be improved in future research by drawing on the largest datasets available in each analyzed country.¹¹

The analytical approach adopted in this study has sought to net out institutional effects from country-specific sources of variation by using a two-level regression framework with random-intercept country effects and welfare-regime interactions. Yet it must be noted that the use of welfare-type interactions to test for institutional effects has also been imposed by small sample size and it is admittedly far from ideal. Welfare-regime interactions can capture significant differences across welfare types but they tell us little about which particular institutional characteristic/s might be driving these differences. Controlling for

¹¹ This has not been possible at this stage of research as the statistical offices of several of the countries analyzed in this study only provide occupational information at a very high level of aggregation so that the benefits of using large national samples as the basis for calculation are currently offset by the costs of having very poor occupational information. It is hoped that forthcoming datasets such as the harmonized European Labor Force Survey can overcome this problem.

wage dispersion at the industry level is only a very imperfect step in the direction of isolating institutional mechanisms. The challenge is therefore to design fine-grained empirical strategies that allow us to open up the welfare-state black-box and see what is inside. This paper has offered a list of institutionally driven mechanisms that seem plausible in the light of the evidence presented but which certainly call for further validation in future research.

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