FEDERAL RESERVE BANK *of* ATLANTA WORKING PAPER SERIES

# A Tale of Two Decades: Relative Intra-family Earning Capacity and Changes in Family Welfare over Time

Julie L. Hotchkiss, Robert E. Moore,
Fernando Rios-Avila, and Melissa R. Trussell

Working Paper 2014-26a
Revised November 2015

**Abstract:** The share of married families in which the wife earns more than her husband has grown significantly during the past few decades. In spite of the higher total earnings these types of families typically experience, the inversion of traditional earnings superiority apparently produces considerable angst for the families. This paper examines how the total welfare of families of different relative earnings structures has fared during two very different decades and finds that families in which the wife is the higher wage earner experienced at least as much welfare gain as families with a different relative earnings structure. The implication is that even if total welfare isn't as high in families with higher earning wives, as recent literature suggests, the welfare of those families is closing in on families of different earnings structures, as their *gains* in welfare have either surpassed or kept up with welfare gains of other family types during the past three decades.

JEL classification: I30, J22, D19

Key words: joint labor supply, family utility, micro-simulation

---

This working paper was formerly titled "Changes in Family Welfare from 1994 to 2012: A Tale of Two Decades." The authors thank Anne E. Winkler, Phanindra Wunnava, and participants of the Federal Reserve System Applied Micro meetings for helpful comments. The views expressed here are the authors' and not necessarily those of the Federal Reserve Bank of Atlanta or the Federal Reserve System. Any remaining errors are the authors' responsibility.

Please address questions regarding content to Julie L. Hotchkiss (corresponding author), Federal Reserve Bank of Atlanta and Georgia State University, 1000 Peachtree St. NE, Atlanta, GA 30309, julie.l.hotchkiss@atl.frb.org, 404-498-8198; Robert E. Moore, Georgia State University, P.O. Box 3992, Atlanta, GA 30302-3992, rmoore@gsu.edu, 404-413-0056; Fernando Rios-Avila, Levy Economics Institute of Bard College, Annandale-on-Hudson, NY 12504-5000, friosavi@levy.org, 845-758-7711; or Melissa R. Trussell, Georgia Perimeter College, melissa@trussell.biz.

# A TALE OF TWO DECADES: RELATIVE INTRA-FAMILY EARNING CAPACITY AND CHANGES IN FAMILY WELFARE OVER TIME

## I. Introduction and Background

Various sources have documented the fairly dramatic rise in the share of families in which wives earn more than husbands. Wang, Parker, and Taylor (2013) report that the share of married mothers that out-earn their husbands rose from four percent in 1960 to 15 percent in 2011. Winkler (1998) calculates that married families in which wives (not necessarily just mothers) earn more than husbands rose from 16 percent in 1981 to 23 percent in 1996. While the incidence of higher earning wives is overall lower for families with children (as women in these families, ceteris paribus, are less likely to participate in the labor market in the first place), the growth over time is clear.

In considering the potential sources of the rise in higher earning wives, Winkler (1998) points out that positive assortative mating, along with the rise in education among women, likely plays a role. Positive assortative mating is the phenomenon where men and women of similar educational backgrounds are found to be more likely to marry than men and women of different educational levels--partners do not pair up randomly. As the education of and opportunities for women grow, earnings among women, generally, will rise. Then, at any educational level, the likelihood of a woman earning more than her husband will also increase, ceteris paribus.

Wang et al. (2013) also found, consistent with our data, that total family income among families in which the wife earns more than her husband is higher, on average, than among families in which the husband earns more than the wife. In spite of this, there is a great deal of evidence that both men and women, on average, are uncomfortable with this relative earnings arrangement. Some of the anxiety stems from situations where the partners have not chosen for the wife to be the higher earner (Griswold 2014; Bourgeois 2014). For example, if the husband in a traditional family has lost his job, neither he nor his wife is likely to be happy about her being the breadwinner. One might imagine, however, that the angst in this circumstance stems more from the lost job than the relative earnings per se. The media abounds, however, with anecdotes of higher earning wives resulting in stressful marriages (Stewart 2014). There are exceptions, nonetheless, where couples have made the arrangement work for them (Scarantino 2013).

Beyond the anecdotes, however, there is concrete evidence that families in which the wife earns more than her husband are more fragile. Bertrand, Kamenica, and Pan (Forthcoming) find that couples where the wife earns more are less satisfied with their marriages and are more likely to divorce. They also find that if a wife's *potential* income exceeds that of her husband's, she is less likely to participate in the labor force. This is counter-intuitive from an economic perspective, as the standard labor supply model tells us that the higher is a woman's (potential) market wage (relative to her reservation wage), the more likely she is to supply her labor. The Bertrand et al. results seem to be suggesting that it is not just the woman's market wage that matters, but how that market wage compares to her husband's--or that the lower her husband's wage, the higher is her reservation wage. These factors haven't made it into the typical labor supply equation. Bertrand et al. also find that a woman who earns more than her husband also performs a greater share of non-market work than her lower-earning counterpart. They pose the question of whether this could mean that the higher earning women are trying to "compensate" for emasculating their husbands on the earnings front by stepping up the traditional domestic duties.

So, in spite of the fact that families in which the wife is the higher earner enjoy, on average, greater total income, few (neither men nor women) seem to be particularly happy about it. This, of course, is perfectly feasible from a family/joint utility maximizing framework in which the family values not only total income, but also the non-market time of each family member. And, the value (to the family) of one member's time may differ from the value of another member's time. In this paper, we model the joint labor supply decision of a husband and wife under different relative earnings scenarios to determine which family types have fared better over time under varying economic conditions. We find that over two very different decades, families in which the wife is the higher wage earner increased their total welfare by as much during the 1990s and by more during the 2000s than families in which the husband earned the higher wage. These two family types dominated (in terms of welfare gains) families in which both spouses earned similar wages.

## II. METHODOLOGY

The basic research question is this: Given the changes in wages and non-labor income over two different periods of time, how has welfare changed in families where the husband and wife have different relative earnings potential? To answer this question, we estimate utility function parameters that allow us to calculate the dollar equivalent change in utility between two time periods for families in which the husband earns the higher wage, in which the wife earns the higher wage, and in which the husband and wife earn similar wages. The parameters are estimated in the context of a joint labor supply model that recognizes the importance of labor supply decisions of each family member being made in the context of market opportunities of the other member. We model family utility in a neoclassical joint utility framework, which can be thought of as a reduced-form specification of family decision-making. This has the advantage of giving us a clear-cut expression of family welfare that allows for cross wage effects on each member's labor supply decisions, hence capturing some of the relativity in market wages that seem to be driving preferences.

Because we are interested in the change in utility for different family types (based on relative wages) and because preferences may vary by family type, we estimate a different set of parameters for each family type. In addition, we consider that preferences (even within family type) are likely to have changed over time, so we estimate utility function parameters at two different time periods (for each family type) -- in 2012 in order to evaluate change in utility during the 2000s, and in 2003 to evaluate change in utility during the 1990s (roughly speaking).

*II.A. The Family Utility Framework*

The assumption of joint family utility (or, "collective" utility) is often rejected in favor of a bargaining structure to household decision making (for example, see McElroy 1990 and Apps and Rees 2009). However, there is evidence that the choice of structure for household decision making has very little implication for conclusions in micro simulation exercises (see Bargain and Moreau 2003). In addition, Blundell et al. (2007) find that both collective and bargaining models are consistent with their household labor supply model estimated in the U.K. Also, using U.S. data, Winkler (1997) finds that income pooling (implied by the collective utility model) is not rejected when cohabitors are in a long-term relationship, especially when children are present. The joint utility framework is used here in order to evaluate welfare changes of the family (as opposed to independent welfare changes of the individual family members).

Within the framework of the neoclassical family labor supply model, a family maximizes a utility function that represents the household welfare. Assuming, for simplicity, that there are only two members of the household (husband and wife), the family chooses levels of leisure for each member and a joint consumption level in order to solve the following problem:

(1) $\max_{(L_1, L_2, C)} U = U(L_1, L_2, C)$

$$subject\ to\ C = w_1 h_1 + w_2 h_2 + Y\ .$$

Define T as total time available for an individual; $L_1 = T - h_1$ will be referred to as the husband's leisure, and $L_2 = T - h_2$ will be referred to as the wife's leisure; $h_1$ is the labor supply of the husband; $h_2$ is the labor supply of the wife; *C* is total money income (or consumption with price equal to one); $w_1$ is the husband's after-tax market wage; $w_2$ is the wife's after-tax market wage; and *Y* is after-tax non-labor income.[1] Although we refer to $L_1$ and $L_2$ as the "leisure" of the husband and wife, respectively, they actually correspond to all uses of non-market time, including home production activities.[2]

The solution to the maximization problem in equation (1) can be expressed in terms of the indirect utility function, which is solely a function of the wages of the husband and wife and non-labor income of the family:

(2) $$V(w_1, w_2, Y) = U\{[T - h_1^*(w_1, w_2, Y)], [T - h_2^*(w_1, w_2, Y)], [w_1 h_1^*(w_1, w_2, Y) + w_2 h_2^*(w_1, w_2, Y) + Y]\}\ ,$$

where $h_1^*(w_1, w_2, Y)$ and $h_2^*(w_1, w_2, Y)$ correspond to the optimal labor supply equations (desired hours) for the husband and wife, respectively. By totally differentiating the indirect utility

---

1 Net of taxes, wages and non-labor income are computed using a publicly available tax calculator developed by the National Bureau of Economic Analysis called TAXSIM (http://users.nber.org/~taxsim/).

2 Apps and Rees (2009) are highly critical of family utility models that do not include measures of household production, but even they acknowledge that not much can be done without the availability of richer data (p. 108). Since the focus of the analysis in this paper is utility at the household level, the absence of home production activities is not crucial. It has been suggested that the BLS Time Use Survey would be useful here, but that survey has one respondent per household so data necessary for modeling joint decisions is not available in that survey.

function, we can simulate the change in welfare that results from changes in optimal hours of work and consumption in response to changes in wages and non-labor income (also see Apps and Rees 2009, 263):

(3) $dV = -U_1 dh_1^* - U_2 dh_2^* + U_3 dC^*$ ,

where $U_1$ is the family's marginal utility of the husband's leisure, $U_2$ is the family's marginal utility of the wife's leisure, and $U_3$ is the family's marginal utility of consumption. Equation (3) makes it clear that the change in welfare not only depends on the individual labor supply responses, but also on the family's marginal evaluation of a change in leisure and non-labor income.

Expressed in terms of changes in wages and non-labor income, and re-arranging terms to illuminate the contribution of those changes to family welfare through their impact on husband's labor supply, wife's labor supply, and total family income, the total derivative in equation (3) becomes:

(4) $$dV = -U_1\left(\frac{\partial h_1}{\partial w_1}dw_1 + \frac{\partial h_1}{\partial w_2}dw_2 + \frac{\partial h_1}{\partial Y}dY\right)$$
$$-U_2\left(\frac{\partial h_2}{\partial w_1}dw_1 + \frac{\partial h_2}{\partial w_2}dw_2 + \frac{\partial h_2}{\partial Y}dY\right)$$
$$+U_3\left[\left(w_1\frac{\partial h_1}{\partial w_1} + h_1 + w_2\frac{\partial h_2}{\partial w_1}\right)dw_1 + \left(w_1\frac{\partial h_1}{\partial w_2} + h_2 + w_2\frac{\partial h_2}{\partial w_2}\right)dw_2\right.$$
$$\left. + \left(w_1\frac{\partial h_1}{\partial Y} + 1 + w_2\frac{\partial h_2}{\partial Y}\right)dY\right].$$

The multiple steps involved in calculating this change in family welfare are described below along with a discussion of the estimation issues faced when undertaking this sort of simulation exercise.

*II.B. Estimation Issues*

The direction (sign) and magnitude of the change in utility that result from changes in the husband's and wife's wages and family non-labor income cannot always be determined analytically; they depend on the direction of the wage changes and the size of the labor supply responses of the husband and wife to own and to spouse wage changes, as well as the relative size of the additional utility the family attains from the leisure enjoyed by the husband and wife and from changes in non-labor income.

There are many divergent empirical issues raised in the literature in relation to estimating labor supply responses to wage changes, i.e., estimates of labor supply elasticities. The goal here is to produce reasonable labor supply elasticities that are consistent with the literature. Toward that end, the methodology adopted takes the simplest approach possible while maintaining basic theoretical and empirical integrity.[3]

Functional Form. In order to obtain estimates of the pieces of the change in utility in equation (4) a specific functional form of utility must be specified. Following others (e.g., Ransom 1987; Hotchkiss, Kassis, and Moore 1997; Heim 2009; Hotchkiss, Moore, and Rios-Avila 2012), we estimate a quadratic form of the utility function:[4]

(5) $U(Z) = \alpha(Z) - (1/2)Z'\mathrm{B}Z$ ,

where $Z$ is a vector with elements $Z_1 = T - h_1$, $Z_2 = T - h_2$, and $Z_3 = w_1 h_1 + w_2 h_2 + Y$; $\alpha$ is a vector of parameters and B is a symmetric matrix of parameters. This functional form has the advantage of belonging to the class of flexible functional forms in the sense that it can be thought of as a second order approximation to an arbitrary utility function, (when the second order conditions with respect to leisure comply with $U_{11} < 0, U_{22} < 0$ & $U_{11} * U_{22} > U_{12}^2$). In addition, it is possible to produce analytical closed-form solutions for both the husband's and

---

[3] Many of the caveats, warnings, solutions, and implications related to this specific model were first detailed in Hotchkiss et al (2012).
[4] Further details of this particular model are found in Appendix A.

wife's labor supply functions. Obtaining the first order conditions of this unconstrained maximization problem results in a system of equations linear in $h$:

(6) $\frac{\partial U}{\partial h_1} = \Omega_1 h_1 + \Omega_2 h_2 + \Omega_3 = 0$

(7) $\frac{\partial U}{\partial h_2} = \Omega_2 h_1 + \Omega_4 h_2 + \Omega_5 = 0$.[5]

This system can be solved simultaneously, and the desired hours become $h_1^* = f(w_1, w_2, Y)$ and $h_2^* = g(w_1, w_2, Y)$, which represent the number of hours the members of a household would like to work, given the parameters that define their household utility function, given after-tax wages and non-labor income.

Observed hours ($\tilde{h}$), however, might differ from the optimum hours due to stochastic errors, such that:

(8) $\tilde{h}_1 = \begin{cases} h_1^* + e_1 & if\ h_1^* + e_1 > 0 \\ 0 & otherwise \end{cases}$

$\tilde{h}_2 = \begin{cases} h_2^* + e_2 & if\ h_2^* + e_2 > 0 \\ 0 & otherwise \end{cases}$

where we assume that $(e_1, e_2)$ follows a bivariate Normal distribution with mean 0 and covariance matrix $\sum$ .

Empirical Specification. Estimation of this model can be thought of as a simultaneous Tobit model, where we have four kinds of families: those where both spouses work, those where only one of the spouses works (2 cases), and those where neither of them work. Allowing for hours adjustments along the extensive margin for the wife when assessing labor supply responses to wage changes has been found to make a significant difference when assessing total labor supply response (for example, see Eissa, Kleven, and Kreiner 2008 and Heim 2009); however, extensive margin hours adjustments appear to be unimportant for men (for example, see Blundell

[5] Expressions for $\Omega_i$ ($i$=1-5) are given in Appendix A.

et al. 1988 and Heim 2009). However, we opt for the most flexible specification, which allows for extensive margin hours adjustments for both the husband and wife (as in Hotchkiss, Moore, and Rios-Avila 2012).

The presence of non-working wives and husbands raises one empirical issue identified by Keane (2011) that must be addressed: market wages are not observed for family members who do not work. To obtain estimates of those wages, we take the standard approach in the literature of estimating a selectivity-corrected wage equation (Heckman 1974) on the sample of working men and women, using regressors observable for both working and nonworking individuals.[6] The resulting parameter estimates are then used to predict wages for nonworking men and women based on their observable characteristics.

The maximum likelihood function corresponding to the joint labor supply optimization problem can be written as follows:

$$(9)\ L = \prod_{i=1}^{N} \left[\left(\frac{1}{\sigma_1\sigma_2}\right)\psi\left(\frac{\tilde{h}_1-h_1^*}{\sigma_1}, \frac{\tilde{h}_2-h_2^*}{\sigma_2}, \rho\right)\right]^{(H=1,W=1)}$$

$$* \left[\frac{1}{\sigma_1}\varphi\left(\frac{\tilde{h}_1-h_1^*}{\sigma_1}\right)\left\{1-\Phi\left(\frac{\sigma_1 h_2^*-\rho\sigma_2(\tilde{h}_1-h_1^*)}{\sigma_2\sigma_1\sqrt{1-\rho^2}}\right)\right\}\right]^{(H=1,W=0)}$$

$$* \left[\frac{1}{\sigma_2}\varphi\left(\frac{\tilde{h}_2-h_2^*}{\sigma_2}\right)\left\{1-\Phi\left(\frac{\sigma_2 h_1^*-\rho\sigma_1(\tilde{h}_2-h_2^*)}{\sigma_2\sigma_1\sqrt{1-\rho^2}}\right)\right\}\right]^{(H=0,W=1)}$$

$$* \Psi\left(\frac{-h_1^*}{\sigma_1}, \frac{-h_2^*}{\sigma_2}, \rho\right)^{(H=0,W=0)}$$

Where $\varphi$ and $\Phi$ correspond to the probability density and cumulative distribution functions of a univariate normal, and $\psi$ and $\Psi$ represent the probability density and cumulative distribution functions of the bivariate normal. Also, H=1 if the husband is working and W=1 if the wife is

[6] For purposes of identification, the Heckman selection equation uses non-labor income, number of children in the household, and spouse education as exclusion restriction variables.

working (0 otherwise), $\sigma_i$ ($i$=1,2) represents the standard deviations of $(e_1, e_2)$ and $\rho$ is the correlation between the stochastic errors.

The stochastic errors accounted for in equation (8) represent errors in optimization -- observed hours do not exactly reflect desired hours. Keane (2011) points out that there may exist measurement error in observed wages and non-labor income. This classical measurement error may bias elasticity estimates toward zero. Heim (2009), using a methodology most similar to the one used here, presents results showing that accounting for measurement error produces elasticities practically identical to when it is not accounted for. A typical strategy to mitigate the introduction of measurement error on wages per hour has been to restrict the sample to hourly paid workers. Unfortunately, the estimation strategy detailed here requires a lot of the data and is not estimable with the restricted sample size of hourly workers only. Instead, if the person is not paid by the hour, we use information available about usual weekly earnings and usual hours worked per week. This means our wage estimate might suffer from what Keane refers to as "denominator bias," which will have the tendency of biasing labor supply elasticities downward.

Endogeneity. Keane (2011) also identifies two potential sources of endogeneity. First, it is reasonable to expect that observed wages and non-labor income are correlated with a person's taste for work (reflected through hours of work). Both fixed effects and instrumental variables have been used to resolve this issue but are simply not possible in this case since we do not have panel data and because of the non-linear nature of the labor supply functions to be estimated. In addition to the inclusion of variables expected to affect the taste for work (e.g., children), we expect that the inclusion of spousal variables (through the estimation of joint labor supply) will help to remove additional sources of correlation from the error term (i.e., because of positive assortative mating, people with similar taste for work will be married to each other; see Lam

1988 and Herrnstein and Murray 1994).

Second, in light of the kinked budget constraint created by the progressivity of the tax system, the after-tax wage rate and after tax non-labor income depend on which tax bracket the worker falls, which depends on the number of hours worked. The simplest approach to addressing this issue was first proposed by Hall (1973) and basically "linearizes" the budget constraint segment on which each person is observed by simply recalculating unearned income to find its "virtual" intercept as if it were extended beyond the specific segment. This strategy amounts to assuming that preferences are strictly convex, which means that family members would make the same hours choice facing this linearized budget constraint that they would have made facing the non-linear budget constraint.[7] If this assumption is binding, Keane points out that labor supply elasticities will be biased in a negative direction. Also, this assumption will only have implications for those few families for which the changes mean a movement across tax brackets, and we are focusing on the impact of relatively small changes in real wages and real non-labor income.

An additional concern Keane (2011) identifies in the literature is making sure the hours/wage combinations observed in the data are coming off workers' labor supply curve, rather than off employers' labor demand curve. Identification of the labor supply relationship boils down to including regressors (determinants of hours) that reflect the demand for a person's skills (thus determine the observed wage) that are not reflective of that person's taste for work. Toward

[7] This assumption of strictly convex preferences can be tested by analyzing the second order conditions of the maximization problem, which are akin to the internal consistency conditions established by (Amemiya 1974, 1006). Using the nomenclature presented in equations 6 and 7, the conditions imply that $\Omega_1 < 0$; $\Omega_4 < 0$ and $\Omega_1\Omega_4 > \Omega_2 * \Omega_2$, which are found to be true for all the models estimated here.

that end, we include an indicator for race that could affect observed wage through employer discrimination, but, *ceteris paribus* should not affect taste for work.

Further, we only marginally control for the presence of fixed costs of working raised by Apps and Rees (2009) by including the presence of children in the determination of hours. However, Heim (2009) presents results showing that once demographics are controlled for, additional consideration of fixed costs only very slightly impacts estimates of the parameters of the utility function (Heim 2009, Table 3).

## III. DATA

The Current Population Survey (CPS) is administered by the U.S. Bureau of Labor Statistics each month to roughly 60,000 households. The survey has a limited longitudinal aspect in that households are interviewed for four consecutive months, not interviewed for eight months, then interviewed again for four months. Households, families, and individuals can be matched across these survey months if they remain in the same physical location. In survey months four and eight, the household is said to be in the "outgoing rotation" group and members of the household are asked more detailed questions about their labor market experience, such as wages and hours of work.

We make use of the CPS outgoing rotation groups in March, April, May, and June from 2012 and 2003 in order to construct the samples for which the family labor supply model is estimated at each time period's end point. Detailed non-labor income is obtained by matching each family to the March supplement, which is the month in which this information is collected. Multiple months of outgoing rotation groups are used in order to expand the sample size.

We restrict the samples in the following ways:

*structural restrictions*
- include only households with husband and wife present and between18-64 years of age
- exclude households with unmarried same- or opposite sex adults/partners or children older then 18 years old
- exclude households in which the main activity of either spouse is self-employment[8]

*homogeneity restrictions*
- exclude households with non-positive total household income, negative nonlabor income, after-tax hourly wages greater than $250 or less than $0.50, or after-tax weekly total income greater than $10,000
- exclude households for which the calculated marginal tax rate is 75 percent or higher

Less than one percent of our sample is lost due to homogeneity restrictions.

Information on the detailed sources of family income, number of children, and earnings available from the CPS is used to calculate the marginal tax rate on earnings (wages) and the total tax liability (in any year of interest) using the National Bureau of Economic Research (NBER) TAXSIM tax calculator (http:// www.nber.org/~ taxsim/; see also Feenberg and Coutts 1993).[9] The calculator is more complete than we have information for from the CPS, so we made assumptions for the missing values as recommended by the managers of the tax calculator. For example, there is no information in the CPS that would allow one to calculate itemized deductions (mortgage payments, charitable contributions, etc.), so values of zero are entered for the missing information. Although this means we do not have as accurate a calculation of the family's actual tax liability as we would like, it is important to remember that the assumptions for each family do not change across years of comparison.

---

[8] It is difficult to estimate market hourly earnings (wage) for someone who is self-employed. Given the nature of their activities, in a short period of time, reported earnings can be negative, even if, in the long term, the market value of a self-employed worker's time would be positive. The welfare gains of the self-employed are left for future work.

[9] In addition to the detained income source information from the CPS data, we also include information on property tax, CPS imputed capital gains and capital losses. All households are classified as if they were declaring taxes jointly and the main earner is identified as that with the highest total earned income. The tax simulation was implemented using the Stata taxsim interface. Data was prepared based on the recommendations found at http://users.nber.org/~taxsim/to-taxsim/cps/.

*III.A. Family Classification*

Based on husbands' and wives' after-tax hourly wages, both effective and predicted hourly wages, families are placed in one of three groups: (1) husband and wife have similar wages (within 0.2 log points, or 20 percent, of one another), (2) the husband's wage is greater (0.2 log points higher) than his wife's wages, and (3) the wife's wage is greater (0.2 log points higher) than her husband's wage.[10] Creating a band for "similar" wages and making only three classifications (as opposed to more) are done for two primary reasons. First, the band of similarity is to allow for measurement error in the reporting and calculating of hourly wages (also see Winkler 1998, who describes the implausible number of families with members who earn exactly the same amount). And, two, the 20 percent band accommodates family members who switch high-wage status from time to time. In other words, we want to be sure that the relative wage classification that we observe at one point in time is reflective of this family's typical relative wage situation. Winkler et al. (2005) find that the relative *earnings* position over a three-year period of time switched for up to 40 percent of married couples. This is also one reason we use relative *wages* to classify families, rather then relative earnings. We expect wages to reflect a more consistent valuation of relative earning potential within the family than earnings at any point in time, which is also dependent on hours worked. We expect much greater variation in a person's hours than in their earning potential. In addition, the exercise to obtain utility function parameters is the estimation of optimal labor supply (hours), which figures into the construction of earnings -- in other words, we don't want to use our ex post outcome to classify families ex ante.

[10] Using wage differentials between husband and wife of 0.15 and 0.25 log points produced similar results and the same conclusions.

Separate utility function parameters are estimated for families in each of these groups since we would expect, based on the literature cited earlier, that preferences differ depending on which family member is observed earning a higher wage. For those cases in which the husband or wife is not working, their imputed after-tax wages are used to classify them with respect to the three family types. After-tax wages and non-labor income are in real values, reflecting the end-point of each decade.

Even though we classify families based on their relative after-tax wages, rather than on their relative earnings/income (as was done by Bertrand, Kamenica, and Pan, Forthcoming; and Winkler, McBride, and Courtney Andrews, 2005; among others), the trends seen in shares of families in which the wife earns more than the husband is also reflected in the trend of relative wages. The share of families in which the wife earns a higher wage than her husband increases from 16 to 18 to 21 percent from 1994 to 2003 to 2012, respectively. Figure 1 reproduces, using our data, the charts used by Bertrand et al. to illustrate the distribution of families based on the wife's relative contribution to family income. Rather than plot the distribution by the relative contribution to total income (which would include hours of work), Figure 1 plots the distribution of families based on the wife's contribution of relative hourly earning potential (wife's wage divided by the sum of wife's and husband's wage) for three years, 1994, 2003, and 2012. The data in Figure 1 reflect the "cliff" at 50 percent illustrated in Bertrand et al.'s data. They point to this distinct break as evidence that families find being in the right tail (where the wife earns more than her husband) distasteful.

[Figure 1 about here]

*III.B. Sample Means*

The first half of Table 1 contains selected sample averages across family types for the two years used for estimation. As expected, labor supply is lower for both husbands and wives across all family types in 2012 than in 2003.[11] Families in which the wife earns the higher wage have the fewest young children; the highest non-labor income; and the highest education, wages, and age among wives. Generally, after-tax real wages and non-labor income were rising in the 1990s and increasing less in the 2000s.

[Table 1 about here]

The periods of time used for analysis were chosen for a number of reasons. Earlier work (Hotchkiss, Kassis, and Moore 1997; Hotchkiss and Moore 2002) analyzed welfare changes among two-earner couples during the 1980s, so this analysis can be seen roughly as an extension of that work, with a different focus.[12] In addition, there was a major redesign of the CPS in 1994, so that year provides an obvious starting point. Also, both time periods are the same length; contain a recession, albeit the 2007-8 recession was considerably deeper; and end at least two years after the end of a recession.

*III.C. Simulating Changes in Wages and Non-labor Income*

An important component of simulating the change in family welfare (detailed in equation 4) is to obtain an appropriate counterfactual of the average wage and non-labor income, in both cases after taxes, that households in, say, 2012, would have faced in 2003. Since we don't have access to a panel data set (i.e., we can't see the actual wages families in 2012 earned in 2003), we

[11] See Hotchkiss and Rios-Avila (2013) for an analysis of the decline in labor force participation over this time period.

[12] These earlier analyses only included families in which both spouses were working, whereas here we allow for non-participation of both members, and the focus of the earlier work was on the role of the shrinking male/female wage gap and on documenting welfare gains across the income distribution.

opt to use an inverse probability weighting methodology, akin to the one used in Dinardo et al. (1996), in order to create a counterfactual distribution of 2003 wages with the household characteristics observed in 2012.

This amounts to estimating the probability of an observation (in the combined 2003 and 2012 samples) being observed in year 2012 using as explanatory variables age of the husband, age of the wife, their squares and cross multiples, education of husband and wife, interaction between education and age, race of husband and wife, and the number of children of different ages:

(10) $P(year = 2012|X) = \Lambda(X'b)$ .

The parameter estimates from this logit model are then used to construct the inverse probability ratio, $\frac{\Lambda(X'\hat{b})}{1-\Lambda(X'\hat{b})}$, for each household in 2003. This is used as a weight for calculating what the average husband and wife wages (and household non-labor income) would be for the 2012 families, based on the 2003 wage (and non-labor income) distribution:

(11) $\widetilde{w}_{t=2003}^{cf} = \frac{\Lambda(X'\hat{b})}{1-\Lambda(X'\hat{b})} * w_{2003}$ .

These 2003 counterfactual wages are then averaged within family type (i.e., husband/wife earns more or the same) in order to compare with observed wages in 2012 for the same family type. The expected wage change of, for example, the husband between 2003 and 2012 ($dw_1$ in equation 4) for family type $k$ is then given by:

(12) $dw_1 = \left[\frac{1}{N_k^{2012}} \sum_{i \epsilon k}^{N_k^{2012}} w_{1,t=2012}\right] - \left[\frac{1}{T_k} \sum_{i \epsilon k}^{N_k^{2003}} \widetilde{w}_{1,t=2003}^{cf}\right]$,

where $T_k = \sum_{i \epsilon k}^{N_k^{2003}} \left[\frac{\Lambda(X'\hat{b})}{1-\Lambda(X'\hat{b})}\right]$. This calculation is analogously performed for $dw_2$ and $dY$in equation (4).

## IV. RESULTS

*IV.A. Estimated Labor Supply Elasticities*

The maximum likelihood labor supply estimates are reported in Appendix B and are as expected, for the most part. For example, across all family types, hours increase at a decreasing rate with age (the exception being for women in families in which the wife earns the higher wage and in which the husband and wife earn a similar wage); the presence of children has a mixed impact on the labor supply of both husbands and wives across different family types; black (Hispanic) husbands and wives work fewer (more) hours than their white counter-parts; and husbands with higher levels of education work more hours than those with less than high school, whereas only wives with a high school degree work more hours than their less-than-high-school educated counter-parts.

The estimated marginal utilities and labor supply elasticities of interest are shown in the bottom half of Table 1. As expected, income elasticities on the intensive (hours) margin and extensive (participation) margin are negative for both husbands and wives; and both intensive and extensive cross-wage elasticities (when non-zero) are negative, except when husband and wife earn similar wages. We also observe, as expected, that wives' hours and participation decisions are more sensitive to wages than their husbands'.

The estimated own wage hours elasticities for husbands are consistent with estimates reported by Kaiser et al (1992) for Germany; and Ransom (1987), Pencavel (2002), and Heim (2009) using U.S. data.[13] In addition, the estimates for wives' labor supply elasticities are on the low side, but within the ballpark of those reported in the literature using U.S. data. For example,

[13] Similar to Ransom (1987), while the uncompensated wage elasticity can be negative, the corresponding compensated own wage elasticity for husbands is always positive.

the range of estimates found in Cogan (1981), Hausman (1981), Triest (1990), Ransom (1987), Hotchkiss et al. (1997), Blau and Kahn (2005), and Heim (2009) is 0.12 to 0.97.[14] Furthermore, the estimated negative cross-wage elasticities (except where the wife and husband earn similar wages) indicate that husbands and wives view their leisure time as substitutes; this is consistent with cross-elasticities estimated in Hotchkiss et al. (2014), Hotchkiss et al. (2012), Heim (2009), Ransom (1987). The bottom line here is that the estimated labor supply elasticities (both extensive and intensive) are reasonable.

*IV.B. Changes in Family Welfare*

Figure 2 illustrates the estimated dollar equivalent utility change for the average family in each relative wage classification.[15] Considering the changes in both real after-tax wages and non-labor family income across two decades, and potential changes in preferences, families in all relative wage categories experienced much larger welfare gains during the 1990s than in the 2000s (the decade of the Great Recession). The average 1990s family in which the husband earned a higher wage experienced a marginally bigger (although not statistically significantly larger) gain in welfare across the decade than the average 1990s family in which the wife was the higher wage earner ($91.19 per week vs. $84.54 per week, respectively). Both of those family types gained more welfare than the average family in which the spouses earned about the same wage; at $40.96/week, this average family gained only half as much welfare as the other types of families.

[Figure 2 about here]

---

[14] Also see Killingsworth (1983, 107).

[15] We present results for the average family in each relative wage classification as opposed to the average welfare change within each classification because it is at the average values of the variables used to generate the parameter coefficients that we can be sure the first order conditions for the utility maximization problem are satisfied.

The story is different in the 2000s. During the decade of the Great Recession, families in which the wife was the higher wage earner gained the greatest amount of welfare -- an average of $21.50/week -- higher (but not statistically) than the marginally lower gain of $20.49/week for the average family in which the husband and wife earned similar wages and statistically significantly more than the $3.87/week gain for the average family in which the husband was the higher wage earner. This is not too surprising as the 2007-2009 recession was known for it's disproportionate impact on industries in which men are over-represented -- a fact that led to the dubbing by some of the recession as a "man-cession" (see, for example Rampell 2009). Consequently, a smaller welfare gain among families in which the husband is the higher wage earner (or, rather, higher potential wage earner) could derive from him not actually realizing that potential in the labor market or from suffering larger declines in wages than his wife.

Referring back to Table 1, we can see one contributor for these different welfare change outcomes across the decades.[16] In the 2000s, in families in which she was the higher wage earner, the wife experienced an average real after-tax wage gain of $0.38 but only $0.33 in families in which the husband earned the higher wage. At the same time, husbands experienced only a $0.09 average real after-tax wage increase in families in which the wife earned the higher wage and actually faced an average wage *decline* of $0.03 if he earned the higher wage. In addition, virtual non-labor income rose more -- by an average $5.09/week -- in families in which the wife earned the higher wage, whereas families in which the husband earned the higher wage experienced an average loss in weekly virtual income of $1.75. In other words, in the 2000s, wage gains by both the husband and wife, as well as gains in non-labor income were smaller among families in which the husband was the high wage earner.

[16] Another potential source, of course, is a change in preferences, which would be reflected through differences in estimated utility function parameters found in Appendix B.

During the 1990s, wages rose for both the husband and wife in all types, although by different relative amounts depending on who was the higher wage earner. This suggests why the welfare gains comparing families in which the wife or husband earned the higher wage were not statistically different from one another in the 1990s. By contrast, wage gains were smaller for both the husband and wife in families in which they earned about the same, and virtual non-labor income declined in these families -- making the welfare gains for this average family in the 1990s significantly less than the other family types.

## V. Conclusions

The share of families in which the wife earns a higher wage than her husband has been growing over the past several decades, causing some discontent among those families with inverted traditional earnings structure (e.g., see Bertrand, Kamenica, and Pan, Forthcoming). This paper has found that in spite of this angst, total welfare of families in which the wife earns a higher wage than her husband rose just as much (on average) during the prosperous 1990s as it did in families in which the husband was the high wage earner. In addition, the highest welfare gains in the dismal 2000s were among families in which the wife was the high wage earner (although the welfare gains were only marginally better than for families in which the spouses earned about the same wage). For all families, of course, the decade of the Great Recession meant smaller welfare gains all around than were experienced by families in the 1990s.

Earlier work by Hotchkiss, Kassis, and Moore (1997) found that families in which the wife was in a higher earning category than her husband had greater increases in material well-being across the decade from 1983 to 1993.[17] This means that over three decades of analysis, families in which the wife is the higher wage earner or is in a higher earnings category than her husband experienced at least as much welfare gain as families with a different relative earnings structure. This doesn't necessarily mean, however, that families in which the wife is the higher wage earner are happier (i.e., have higher utility *levels*) -- in fact, Bertrand, Kamenica, and Pan (Forthcoming) would suggest otherwise. However, the results in this paper suggest that even if welfare isn't as high in families with higher earning wives, the welfare of those families is closing in on families of different earnings structures, as their *gains* in welfare have either surpassed or kept up with welfare gains of other family types over the past three decades.

[17] The analysis by Hotchkiss et al. (1997) differed from the one in this paper primarily by using a sample of dual earner families only, not allowing for non-workers.

# APPENDIX A

## FIRST ORDER CONDITIONS OF UTILITY MAXIMIZATION PROBLEM, LABOR SUPPLY EQUATIONS, AND LIKELIHOOD FUNCTION ESTIMATED

(to be made available online)

The quadratic functional form as presented in equation (5) in the text can also be written in the following form:

$$U(Z) = a_1(L_1) + a_2(L_2) + a_3(C) - \frac{1}{2}b_{11}(L_1)^2 - \frac{1}{2}b_{22}(L_2)^2 - \frac{1}{2}b_{33}(C)^2 - b_{12}L_1L_2 - b_{13}L_1C - b_{23}L_2C \qquad \text{(A1)}$$

Where $L_1 = T - h_1; L_2 = T - h_2; and, C = w_1h_1 + w_2h_2 + Y$

This becomes an unconstrained utility maximization problem which depends on the working hours $h_1$ and $h_2$, assuming that $Y$ (non-labor income) is exogenous. The corresponding first order conditions become:

$$\frac{\partial u}{\partial h_1} = a_1^* + a_3^*w_1 - b_{11}h_1 - b_{33}w_1(w_1h_1 + w_2h_2 + Y) - b_{12}h_2 + b_{13}(2w_1h_1 + w_2h_2 + Y) + b_{23}w_1h_2 = 0 \qquad \text{(A2)}$$

$$\frac{\partial u}{\partial h_2} = a_2^* + a_3^*w_2 - b_{22}h_2 - b_{33}w_2(w_1h_1 + w_2h_2 + Y) - b_{12}h_1 + b_{23}(w_1h_1 + 2w_2h_2 + Y) + b_{13}w_2h_1 = 0 \qquad \text{(A3)}$$

There is no need to specify a time endowment (T) in order to estimate the labor supply functions because $a_1^*$, $a_2^*$, and $a_3^*$ are re-parameterized functions of T and *Y*. This re-parameterization is necessary for identification of the labor supply equations. It is through these starred parameters that differences in tastes across families are allowed to enter. Specifically,

$a_1^* = X_1\Gamma_1$ and $a_2^* = X_2\Gamma_2$

where $X_1$ and $X_2$ are vectors of individual and family characteristics and $\Gamma_1$ and $\Gamma_2$ are parameters to be estimated.

Using equations (A2) and (A3), we can solve the system obtaining the values of $h_1$ and $h_2$ that maximize the utility function, in the following way:

$$\Omega_1h_1^* + \Omega_2h_2^* + \Omega_3 = 0 \qquad \text{(A4)}$$

$$\Omega_2h_1^* + \Omega_4h_2^* + \Omega_5 = 0 \qquad \text{(A5)}$$

Where:

$$\Omega_1 = 2b_{13}w_1 - b_{11} - b_{33}w_1^2; \tag{A6}$$

$$\Omega_2 = b_{23}w_1 + b_{33}w_1w_2 - b_{12} + b_{13}w_2; \tag{A7}$$

$$\Omega_3 = a^*{}_1 + a^*{}_3w_1 + (b_{33}w_1 + b_{13})Y; \tag{A8}$$

$$\Omega_4 = 2b_{23}w_2 - b_{22} - b_{33}w_2^2;\text{ and} \tag{A9}$$

$$\Omega_5 = a^*{}_2 + a^*{}_3w_2 + (b_{33}w_2 + b_{23})Y. \tag{A10}$$

From equations (A4) and (A5), the solutions for $h_1^*$ and $h_2^*$ become:

$$h_1^* = \frac{\Omega_3\Omega_4 - \Omega_2\Omega_5}{\Omega_2^2 - \Omega_1\Omega_4} \tag{A11}$$

$$h_2^* = \frac{\Omega_1\Omega_5 - \Omega_2\Omega_3}{\Omega_2^2 - \Omega_1\Omega_4} \tag{A12}$$

Observed hours ($\tilde{h}$), however, can differ from optimum hours due to stochastic errors, such that:

$$\tilde{h}_1 = \begin{cases} h_1^* + e_1 & if\ h_1^* + e_1 > 0 \\ 0 & otherwise \end{cases} \tag{A13}$$

$$\tilde{h}_2 = \begin{cases} h_2^* + e_2 & if\ h_2^* + e_2 > 0 \\ 0 & otherwise \end{cases}, \tag{A14}$$

where we assume that $(e_1, e_2)$ follows a bivariate normal distribution with mean 0 and covariance Σ. This model can be considered a simultaneous Tobit model, where both variables are censored from below.

In order to estimate predicted changes in labor supply, participation, and hours of work, we need to calculate the partial derivatives of the labor supply equations with respect to $w_1$, $w_2$, and $Y$ (equations A11 and A12). These derivatives are obtained with the help of Mathematica® (*Mathematica* (version 8) 2010). Since we specify a censored error distribution through estimation of a bivariate Tobit, the derivatives and hour predictions are adjusted following Muthen (1990), and then evaluated for each family. Only the averaged elasticity values are presented.

APPENDIX B
MAXIMUM LIKELIHOOD UTILITY PARAMETER ESTIMATES
(to be made available online)

| | 2003 | | | | 2012 | | | |
|---|---|---|---|---|---|---|---|---|
| | Full Sample | Husband wage > Wife wage | Wife wage > Husband wage | Similar wages | Full Sample | Husband wage > Wife wage | Wife wage > Husband wage | Similar wages |
| a1: Husband | | | | | | | | |
| Age | 2.447*** | 1.743*** | 3.423*** | 2.350* | 2.462*** | 0.580** | 4.329*** | 0.553** |
| | (0.126) | (0.207) | (0.282) | (1.136) | (0.170) | (0.200) | (0.340) | (0.213) |
| Age^2 | -0.032*** | -0.023*** | -0.045*** | -0.031* | -0.032*** | -0.008*** | -0.055*** | -0.007** |
| | (0.001) | (0.003) | (0.003) | (0.015) | (0.002) | (0.002) | (0.004) | (0.003) |
| Black | -1.732*** | -2.503*** | -2.547** | -0.125 | -2.369*** | -1.993*** | -2.801** | -0.440 |
| | (0.387) | (0.559) | (0.890) | (1.121) | (0.493) | (0.538) | (1.013) | (0.286) |
| Hispanic | 4.156*** | 3.563*** | 6.540*** | 2.190 | 3.319*** | 2.846** | 6.257** | 0.253 |
| | (0.543) | (0.771) | (1.338) | (1.555) | (0.797) | (0.905) | (2.007) | (0.265) |
| Other | 5.887*** | 5.371*** | 7.534*** | 3.614 | 5.963*** | 4.573*** | 9.585*** | 0.492 |
| | (0.571) | (0.843) | (1.379) | (2.356) | (0.828) | (0.986) | (2.027) | (0.320) |
| High School | 9.873*** | 8.506*** | 12.620*** | 7.199 | 11.327*** | 6.667*** | 16.811*** | 1.384* |
| | (0.620) | (0.979) | (1.469) | (4.585) | (0.904) | (1.094) | (2.118) | (0.584) |
| Some College | 1.210*** | 2.419*** | 0.840 | 2.018 | 1.765*** | 2.325*** | 0.307 | 4.619*** |
| | (0.330) | (0.660) | (0.647) | (1.097) | (0.413) | (0.504) | (0.766) | (0.843) |
| College | 0.510* | 0.897* | -0.026 | 2.394** | 1.668*** | 1.968*** | 0.740 | 3.536*** |
| | (0.252) | (0.419) | (0.554) | (0.868) | (0.346) | (0.384) | (0.699) | (0.828) |
| Grad | 0.679* | 1.059** | 0.945 | 0.404 | 1.563*** | 0.885* | 1.785* | 2.033* |
| | (0.271) | (0.369) | (0.678) | (0.657) | (0.369) | (0.375) | (0.798) | (0.948) |
| nkids 0-5 | -11.835*** | 1.404 | -27.913*** | -27.010* | -17.142*** | 19.912*** | -49.657*** | -4.558 |
| | (2.540) | (3.681) | (5.957) | (12.416) | (3.492) | (3.944) | (7.525) | (3.422) |
| nkids 6-12 | 2.447*** | 1.743*** | 3.423*** | 2.350* | 2.462*** | 0.580** | 4.329*** | 0.553** |

| | 2003 | | | | 2012 | | | |
|---|---|---|---|---|---|---|---|---|
| | Full Sample | Husband wage > Wife wage | Wife wage > Husband wage | Similar wages | Full Sample | Husband wage > Wife wage | Wife wage > Husband wage | Similar wages |
| | (0.126) | (0.207) | (0.282) | (1.136) | (0.170) | (0.200) | (0.340) | (0.213) |
| nkids 13-18 | -0.032*** | -0.023*** | -0.045*** | -0.031* | -0.032*** | -0.008*** | -0.055*** | -0.007** |
| | (0.001) | (0.003) | (0.003) | (0.015) | (0.002) | (0.002) | (0.004) | (0.003) |
| Constant | -1.732*** | -2.503*** | -2.547** | -0.125 | -2.369*** | -1.993*** | -2.801** | -0.440 |
| | (0.387) | (0.559) | (0.890) | (1.121) | (0.493) | (0.538) | (1.013) | (0.286) |
| a2: Wife | | | | | | | | |
| Age | 0.623*** | 1.605*** | -0.007 | -0.166 | 1.405*** | 2.590** | 0.110 | 0.041 |
| | (0.098) | (0.372) | (0.086) | (0.570) | (0.231) | (0.980) | (0.156) | (0.096) |
| Age^2 | -0.010*** | -0.025*** | -0.0002 | 0.0001 | -0.020*** | -0.036** | -0.002 | -0.0004 |
| | (0.001) | (0.005) | (0.001) | (0.009) | (0.003) | (0.013) | (0.002) | (0.001) |
| Black | -0.127 | 0.557 | -0.850** | -1.475 | -1.803*** | -1.414 | -1.686** | -0.193 |
| | (0.239) | (0.599) | (0.309) | (1.008) | (0.530) | (1.044) | (0.549) | (0.325) |
| Hispanic | 3.045*** | 6.244*** | 0.501 | 2.823 | 8.721*** | 15.081** | 1.152 | 0.467 |
| | (0.476) | (1.456) | (0.498) | (2.609) | (1.316) | (5.628) | (1.117) | (0.411) |
| Other | 3.828*** | 8.307*** | 0.242 | 3.017 | 12.402*** | 21.399** | 0.588 | 1.043 |
| | (0.546) | (1.847) | (0.486) | (2.873) | (1.654) | (7.829) | (1.084) | (0.555) |
| High School | 4.476*** | 8.403*** | 0.293 | 5.500 | 16.187*** | 26.035** | 1.620 | 1.910* |
| | (0.631) | (1.981) | (0.496) | (4.854) | (2.071) | (9.457) | (1.158) | (0.814) |
| Some College | -4.218*** | -10.018*** | -0.619** | -4.088*** | -5.995*** | -10.450** | -1.417** | -5.926*** |
| | (0.447) | (1.988) | (0.225) | (1.063) | (0.727) | (3.726) | (0.432) | (1.144) |
| College | -2.185*** | -5.287*** | -0.205 | -3.111** | -3.944*** | -7.085** | -0.469 | -4.357*** |
| | (0.258) | (1.097) | (0.144) | (0.994) | (0.533) | (2.540) | (0.300) | (1.066) |
| Grad | -0.214 | -0.831 | -0.024 | 0.087 | -0.348 | -1.351 | 0.251 | -2.180 |
| | (0.169) | (0.431) | (0.166) | (0.968) | (0.378) | (0.805) | (0.338) | (1.204) |
| nkids 0-5 | -6.490*** | -15.201*** | 3.910 | 11.403 | -21.417*** | -36.506** | 2.639 | -4.292 |

| | 2003 | | | | 2012 | | | |
|---|---|---|---|---|---|---|---|---|
| | Full Sample | Husband wage > Wife wage | Wife wage > Husband wage | Similar wages | Full Sample | Husband wage > Wife wage | Wife wage > Husband wage | Similar wages |
| | (1.565) | (4.507) | (2.073) | (6.850) | (3.886) | (13.051) | (3.324) | (3.368) |
| nkids 6-12 | 0.623*** | 1.605*** | -0.007 | -0.166 | 1.405*** | 2.590** | 0.110 | 0.041 |
| | (0.098) | (0.372) | (0.086) | (0.570) | (0.231) | (0.980) | (0.156) | (0.096) |
| nkids 13-18 | -0.010*** | -0.025*** | -0.0002 | 0.0001 | -0.020*** | -0.036** | -0.002 | -0.0004 |
| | (0.001) | (0.005) | (0.001) | (0.009) | (0.003) | (0.013) | (0.002) | (0.001) |
| Constant | -0.127 | 0.557 | -0.850** | -1.475 | -1.803*** | -1.414 | -1.686** | -0.193 |
| | (0.239) | (0.599) | (0.309) | (1.008) | (0.530) | (1.044) | (0.549) | (0.325) |
| a3 | 1.009*** | 1.109*** | 0.262*** | (1.192) | 1.125*** | 0.310*** | 0.556*** | 0.246** |
| | (0.065) | (0.119) | (0.062) | (0.819) | (0.070) | (0.094) | (0.101) | (0.084) |
| b12 | -0.178*** | -0.225*** | -0.094*** | -0.924** | -0.274*** | -0.190*** | -0.131*** | -1.309*** |
| | (0.026) | (0.049) | (0.022) | (0.289) | (0.037) | (0.046) | (0.030) | (0.089) |
| b13 | -0.008*** | -0.011*** | -0.004*** | -0.016* | -0.009*** | -0.002* | -0.006*** | -0.007*** |
| | (0.000) | (0.001) | (0.001) | (0.007) | (0.001) | (0.001) | (0.001) | (0.001) |
| b22 | 0.424*** | 0.715*** | 0.298*** | 1.515*** | 0.824*** | 1.074** | 0.518*** | 1.824*** |
| | (0.041) | (0.140) | (0.071) | (0.286) | (0.088) | (0.389) | (0.102) | (0.236) |
| b23 | -0.004*** | -0.006*** | 0.002*** | (0.003) | -0.005*** | -0.004** | 0.003*** | 0.005*** |
| | (0.0000) | (0.0010) | (0.0010) | (0.0080) | (0.0010) | (0.0010) | (0.0010) | (0.0010) |
| b33 | 0.00007*** | -0.00001 | 0.00009*** | -0.0002 | 0.00006*** | 0.00003 | 0.00015*** | 0.0000 |
| | (0.00001) | (0.00002) | (0.00002) | (0.00015) | (0.00001) | (0.00002) | (0.00003) | (0.00002) |
| drho | 0.134*** | 0.112*** | (0.056) | 0.288*** | 0.114*** | 0.006 | (0.047) | 0.406*** |
| | (0.014) | (0.019) | (0.033) | (0.030) | (0.015) | (0.021) | (0.034) | (0.034) |
| s1 | 14.657*** | 13.990*** | 16.221*** | 14.491*** | 16.671*** | 15.515*** | 18.296*** | 16.680*** |
| | (0.094) | (0.116) | (0.249) | (0.191) | (0.119) | (0.147) | (0.294) | (0.248) |
| s2 | 21.183*** | 23.632*** | 16.005*** | 18.442*** | 22.403*** | 24.796*** | 17.270*** | 21.042*** |
| | (0.156) | (0.243) | (0.246) | (0.257) | (0.183) | (0.291) | (0.275) | (0.338) |

| | 2003 | | | | 2012 | | | |
|---|---|---|---|---|---|---|---|---|
| | Full Sample | Husband wage > Wife wage | Wife wage > Husband wage | Similar wages | Full Sample | Husband wage > Wife wage | Wife wage > Husband wage | Similar wages |
| N | 14312 | 8286 | 2517 | 3509 | 11916 | 6497 | 2508 | 2911 |
| LL | -107510.8 | -60428.2 | -19670.4 | -26646.5 | -89457.3 | -47737.9 | -19288.9 | -21760.4 |

Notes: P-values below parameter estimate. Husband and wife have similar wages means they are within 0.2 log points of one another; the husband's wage being greater (less than) the wife's wage means that his wage is more (less) than 0.2 log points of his wife's wage.

## REFERENCES

Amemiya, Takeshi. 1974. "Multivariate Regression and Simultaneous Equation Models When the Dependent Variables Are Truncated Normal." *Econometrica* 42 (6): 999–1012. doi:10.2307/1914214.

Apps, Patricia, and Ray Rees. 2009. *Public Economics and the Household*. Cambridge, UK: Cambridge University Press. http://www.cambridge.org/us/academic/subjects/economics/public-economics-and-public-policy/public-economics-and-household?format=PB.

Bargain, Olivier, and Nicolas Moreau. 2003. "Is the Collective Model of Labor Supply Useful for Tax Policy Analysis? A Simulation Exercise." CESifo Working Paper Series 1052. CESifo Group Munich. http://econpapers.repec.org/paper/cesceswps/_5f1052.htm.

Bertrand, Marianne, Emir Kamenica, and Jessica Pan. Forthcoming. "Gender Identity and Relative Income within Households." *The Quarterly Journal of Economics*. doi:10.1093/qje/qjv001.

Blau, Francine D., and Lawrence M. Kahn. 2005. "Changes in the Labor Supply Behavior of Married Women: 1980-2000." Working Paper 11230. National Bureau of Economic Research. http://www.nber.org/papers/w11230.

Blundell, Richard, Pierre-Andre Chiappori, Thierry Magnac, and Costas Meghir. 2007. "Collective Labour Supply: Heterogeneity and Non-Participation." *The Review of Economic Studies*.

Blundell, Richard, Costas Meghir, Elizabeth Symons, and Ian Walker. 1988. "Labour Supply Specification and the Evaluation of Tax Reforms." *Journal of Public Economics* 36 (1): 23.

Bourgeois, Trudy. 2014. "How We Did It, How We Do It: When the Wife Makes More Money Than the Husband." Blog. *The Huffington Post*. September 4. http://www.huffingtonpost.com/trudy-bourgeois/how-we-did-it-how-we-do-i_b_5767546.html.

Cogan, John F. 1981. "Fixed Costs and Labor Supply." *Econometrica*.

DiNardo, John, Nicole M. Fortin, and Thomas Lemieux. 1996. "Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach." *Econometrica*.

Eissa, Nada, Henrik Jacobsen Kleven, and Claus Thustrup Kreiner. 2008. "Evaluation of Four Tax Reforms in the United States: Labor Supply and Welfare Effects for Single Mothers." *Journal of Public Economics* 92 (January): 795–816. doi:10.1016/j.jpubeco.2007.08.005.

Feenberg, Daniel, and Elisabeth Coutts. 1993. "An Introduction to the TAXSIM Model." *Journal of Policy Analysis and Management*.

Griswold, Alison. 2014. "Most Women Who Earn More Than Their Husbands Aren't Happy About It." *Business Insider*. February 12. http://www.businessinsider.com/women-earn-more-than-husbands-and-happiness-2014-2.

Hall, Robert E. 1973. "Wages, Income, and Hours of Work in the U.S. Labor Force." In *Income Maintenance and Labor Supply*, edited by Glen G. Cain and Harold W. Watts, 102–62. Chicago, IL: University of Chicago Press.

Hausman, Jerry A. 1981. "The Effect of Taxes on Labor Supply." In *How Taxes Affect Economic Behavior*, edited by H. Aaron and J. Pechman. Washington, D.C.: Brookings.

Heckman, James. 1974. "Shadow Prices, Market Wages, and Labor Supply." *Econometrica* 42 (4): 679–94. doi:10.2307/1913937.

Heim, Bradley T. 2009. “Structural Estimation of Family Labor Supply with Taxes: Estimating a Continuous Hours Model Using a Direct Utility Specification.” *Journal of Human Resources* 44 (2): 350–85. doi:10.1353/jhr.2009.0002.

Herrnstein, Richard J., and Charles A. Murray. 1994. *The Bell Curve: Intelligence and Class Structure in American Life*. New York: Free Press.

Hotchkiss, Julie L., Mary Mathewes Kassis, and Robert E. Moore. 1997. “Running Hard and Falling behind: A Welfare Analysis of Two-Earner Families.” *Journal of Population Economics* 10 (3): 237–50.

Hotchkiss, Julie L., and Robert E. Moore. 2002. “Changes in the Welfare of Two-Earner Families across the Income Distribution, 1983-1993.” *Applied Economics Letters* 9 (7): 429–31. doi:http://www.tandfonline.com/loi/rael20.

Hotchkiss, Julie L., Robert E. Moore, and Fernando Rios-Avila. 2012. “Assessing the Welfare Impact of Tax Reform: A Case Study of the 2001 U.s. Tax Cut.” *Review of Income and Wealth* 58 (2): 233–56. doi:10.1111/j.1475-4991.2012.00493.x.

———. 2014. “Family Welfare and the Great Recession.” FRB Atlanta Working Paper No. 2014-10. Federal Reserve Bank of Atlanta. https://ideas.repec.org/p/fip/fedawp/2014-10.html.

Hotchkiss, Julie L, and Fernando Rios-Avila. 2013. “Identifying Factors behind the Decline in the U.S. Labor Force Participation Rate.” *Business and Economic Research* 3 (1). doi:10.5296/ber.v3i1.3370.

Kaiser, Helmut, Ulrich van Essen, and P. Bernd Spahn. 1992. “Income Taxation and the Supply of Labour in West Germany: A Microeconometric Analysis With Special Reference to the West German Income Tax Reforms 1986—1990.” *Jahrbücher Für Nationalökonomie Und Statistik* 209 (1/2): 87–105.

Keane, Michael P. 2011. “Labor Supply and Taxes: A Survey.” *Journal of Economic Literature* 49 (4): 961–1075. doi:10.1257/jel.49.4.961.

Killingsworth, Mark R. 1983. *Labor Supply*. Cambridge Surveys of Economic Literature. Cambridge [Cambridgeshire] ; New York: Cambridge University Press.

Lam, David. 1988. “Marriage Markets and Assortative Mating with Household Public Goods: Theoretical Results and Empirical Implications.” *The Journal of Human Resources* 23 (4): 462–87. doi:10.2307/145809.

*Mathematica* (version 8). 2010. Champaign, IL.

McElroy, Marjorie B. 1990. “The Empirical Content of Nash-Bargained Household Behavior.” *The Journal of Human Resources* 25 (4): 559–83. doi:10.2307/145667.

Muthen, Bengt. 1990. “Moments of the Censored and Truncated Bivariate Normal Distribution.” *British Journal of Mathematical and Statistical Psychology* 43: 131–43.

Pencavel, John. 2002. “A Cohort Analysis of the Association between Work Hours and Wages among Men.” *The Journal of Human Resources* 37 (2): 251–74. doi:10.2307/3069647.

Rampell, Catherine. 2009. “The Mancession.” Blog. *Economix Blog*. August 10. http://economix.blogs.nytimes.com/2009/08/10/the-mancession/.

Ransom, Michael R. 1987. “An Empirical Model of Discrete and Continuous Choice in Family Labor Supply.” *The Review of Economics and Statistics* 69 (3): 465–72. doi:10.2307/1925534.

Scarantino, Drew Anne. 2013. “‘I Make Less Than My Wife’: How 3 Real Men Feel About It.” *LearnVest*. June 24. http://www.learnvest.com/2013/06/i-make-less-than-my-wife-how-3-real-men-feel-about-it/.

Stewart, Sara. 2014. “Are Female Breadwinners a Recipe for Disaster?” *New York Post*, April 30, sec. Living. http://nypost.com/2014/04/30/are-female-breadwinners-a-recipe-for-disaster/.

Triest, Robert K. 1990. “The Effect of Income Taxation on Labor Supply in the United States.” *The Journal of Human Resources* 25 (3): 491–516. doi:10.2307/145991.

Wang, Wendy, Kim Parker, and Paul Taylor. 2013. “Breadwinner Moms.” *Pew Research Center's Social & Demographic Trends Project*. May 29. http://www.pewsocialtrends.org/2013/05/29/breadwinner-moms/.

Winkler, Anne E. 1997. “Economic Decision-Making by Cohabitors: Findings Regarding Income Pooling.” *Applied Economics* 29 (8): 1079–90. doi:10.1080/000368497326471.

———. 1998. “Earnings of Husbands and Wives in Dual-Earner Families.” *Monthly Labor Review* 121 (4): 42.

Winkler, Anne E., Timothy D. McBride, and Courtney Andrews. 2005. “Wives Who Outearn Their Husbands: A Transitory or Persistent Phenomenon for Couples?” *Demography*.

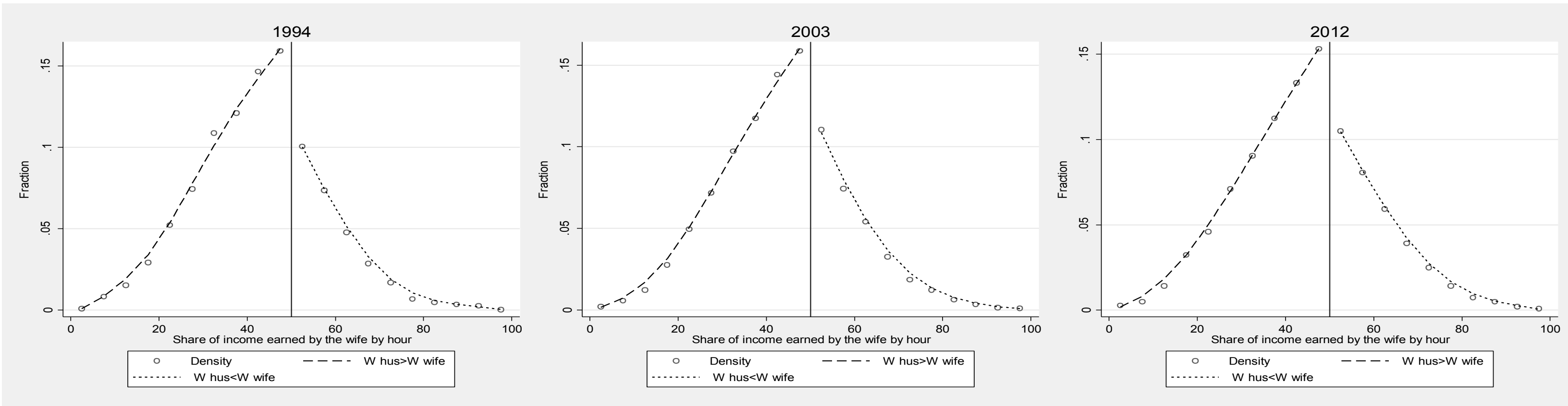
Table 1. Estimated utility function parameters and labor supply elasticities.

| | 2003 | | | | 2012 | | | |
|---|---|---|---|---|---|---|---|---|
| | Full Sample | Husband wage > Wife wage | Wife wage > Husband wage | Similar wages | Full Sample | Husband wage > Wife wage | Wife wage > Husband wage | Similar wages |
| Number of families | 14526 | 8403 | 2570 | 3553 | 12017 | 6632 | 2516 | 2869 |
| *Husband Average Characteristics* | | | | | | | | |
| Husband working = 1 | 0.92 | 0.93 | 0.90 | 0.90 | 0.89 | 0.92 | 0.85 | 0.86 |
| Husband gross wage (w1), incl. imputed | $25.42 | $30.50 | $16.08 | $20.14 | $25.35 | $30.98 | $16.01 | $20.84 |
| Husband after-tax wage | $18.56 | $22.28 | $11.62 | $14.74 | $18.96 | $23.21 | $11.92 | $15.57 |
| Husband hours (h1), if working | 43.02 | 43.26 | 42.49 | 42.82 | 42.84 | 43.25 | 41.74 | 42.77 |
| Husband age | 43.29 | 43.30 | 43.93 | 42.78 | 44.68 | 44.44 | 45.57 | 44.43 |
| Husband black = 1 | 0.20 | 0.18 | 0.21 | 0.22 | 0.23 | 0.23 | 0.23 | 0.23 |
| Husband college graduate = 1 | 0.33 | 0.36 | 0.29 | 0.30 | 0.38 | 0.42 | 0.33 | 0.34 |
| Change in husband's after-tax wage (dw1) | $1.15 | $1.74 | $0.76 | $0.60 | -$0.10 | -$0.03 | $0.09 | $0.34 |
| *Wife Average Characteristics* | | | | | | | | |
| Wife working = 1 | 0.76 | 0.68 | 0.90 | 0.83 | 0.74 | 0.67 | 0.86 | 0.78 |
| Wife wage (w2), incl. imputed | $18.11 | $13.89 | $29.56 | $19.85 | $19.22 | $14.52 | $29.86 | $20.55 |
| Wife after-tax wage | $13.25 | $10.25 | $21.33 | $14.52 | $14.40 | $10.96 | $22.21 | $15.35 |
| Wife hours (h2), if working | 35.88 | 34.39 | 37.21 | 37.71 | 36.33 | 34.88 | 37.64 | 37.89 |
| Wife age | 41.22 | 41.19 | 41.88 | 40.83 | 42.75 | 42.50 | 43.68 | 42.52 |
| Wife black = 1 | 0.20 | 0.19 | 0.21 | 0.22 | 0.23 | 0.24 | 0.23 | 0.24 |
| Wife college graduate = 1 | 0.22 | 0.19 | 0.29 | 0.22 | 0.26 | 0.24 | 0.33 | 0.27 |
| Change in wife's after-tax wage (dw2) | $1.03 | $0.93 | $1.26 | $0.68 | $0.53 | $0.33 | $0.38 | $0.30 |
| *Family Average Characteristics* | | | | | | | | |
| Weekly non-labor (virtual) income (Y) | $318.08 | $310.52 | $356.95 | $308.07 | $344.15 | $332.64 | $384.57 | $335.01 |
| Number of children less than 6 | 0.36 | 0.40 | 0.30 | 0.33 | 0.36 | 0.38 | 0.33 | 0.34 |
| Federal marginal tax rate | 19.80% | 19.62 | 20.75 | 19.52 | 17.91 | 17.83 | 18.59 | 17.51 |
| State marginal tax rate | 4.45% | 4.42 | 4.60 | 4.40 | 4.22 | 4.21 | 4.27 | 4.22 |
| Change in weekly virtual income (dY) | $1.15 | $0.04 | $9.73 | -$2.54 | $1.07 | -$1.75 | $5.09 | $0.54 |

| | 2003 | | | | 2012 | | | |
|---|---|---|---|---|---|---|---|---|
| | Full Sample | Husband wage > Wife wage | Wife wage > Husband wage | Similar wages | Full Sample | Husband wage > Wife wage | Wife wage > Husband wage | Similar wages |
| *Husband Elasticities* | | | | | | | | |
| Husband own wage elasticity | 0.043 | 0.046 | -0.029 | 0.039 | 0.063 | 0.020 | -0.022 | 0.000 |
| Husband cross wage elasticity | -0.048 | -0.029 | -0.058 | -0.038 | -0.062 | -0.010 | -0.108 | 0.000 |
| Husband income elasticity | -0.041 | -0.046 | -0.026 | -0.066 | -0.053 | -0.018 | -0.052 | -0.069 |
| Husband participation own wage elasticity | 0.005 | 0.003 | -0.001 | 0.034 | 0.015 | 0.002 | 0.005 | 0.031 |
| Husband participation cross wage elasticity | -0.003 | -0.001 | -0.007 | 0.011 | -0.009 | 0.000 | -0.028 | 0.042 |
| Husband participation income elasticity | -0.006 | -0.004 | -0.007 | -0.047 | -0.015 | -0.001 | -0.026 | -0.051 |
| *Wife Elasticities* | | | | | | | | |
| Wife own wage elasticity | 0.199 | 0.099 | 0.090 | 0.130 | 0.144 | 0.007 | 0.189 | 0.078 |
| Wife cross wage elasticity | -0.132 | -0.115 | 0.000 | 0.016 | -0.101 | -0.070 | -0.023 | 0.061 |
| Wife income elasticity | -0.052 | -0.036 | 0.000 | -0.035 | -0.044 | -0.024 | -0.025 | -0.035 |
| Wife participation own wage elasticity | 0.104 | 0.087 | 0.015 | 0.041 | 0.087 | 0.014 | 0.040 | 0.033 |
| Wife participation cross wage elasticity | -0.069 | -0.086 | 0.001 | 0.012 | -0.055 | -0.051 | -0.001 | 0.048 |
| Wife participation income elasticity | -0.039 | -0.036 | 0.001 | -0.012 | -0.034 | -0.022 | -0.001 | -0.011 |
| | | | | | | | | |
| *Marginal Utilities* | | | | | | | | |
| MU wrt husband's leisure | 7.70 | 9.83 | 1.23 | 8.03 | 11.10 | 2.49 | 3.83 | 0.49 |
| MU wrt wife's leisure | 6.68 | 8.18 | 0.89 | 9.79 | 11.15 | 7.11 | 4.25 | 4.80 |
| MU wrt income | 0.51 | 0.54 | 0.07 | 0.67 | 0.57 | 0.12 | 0.21 | 0.14 |

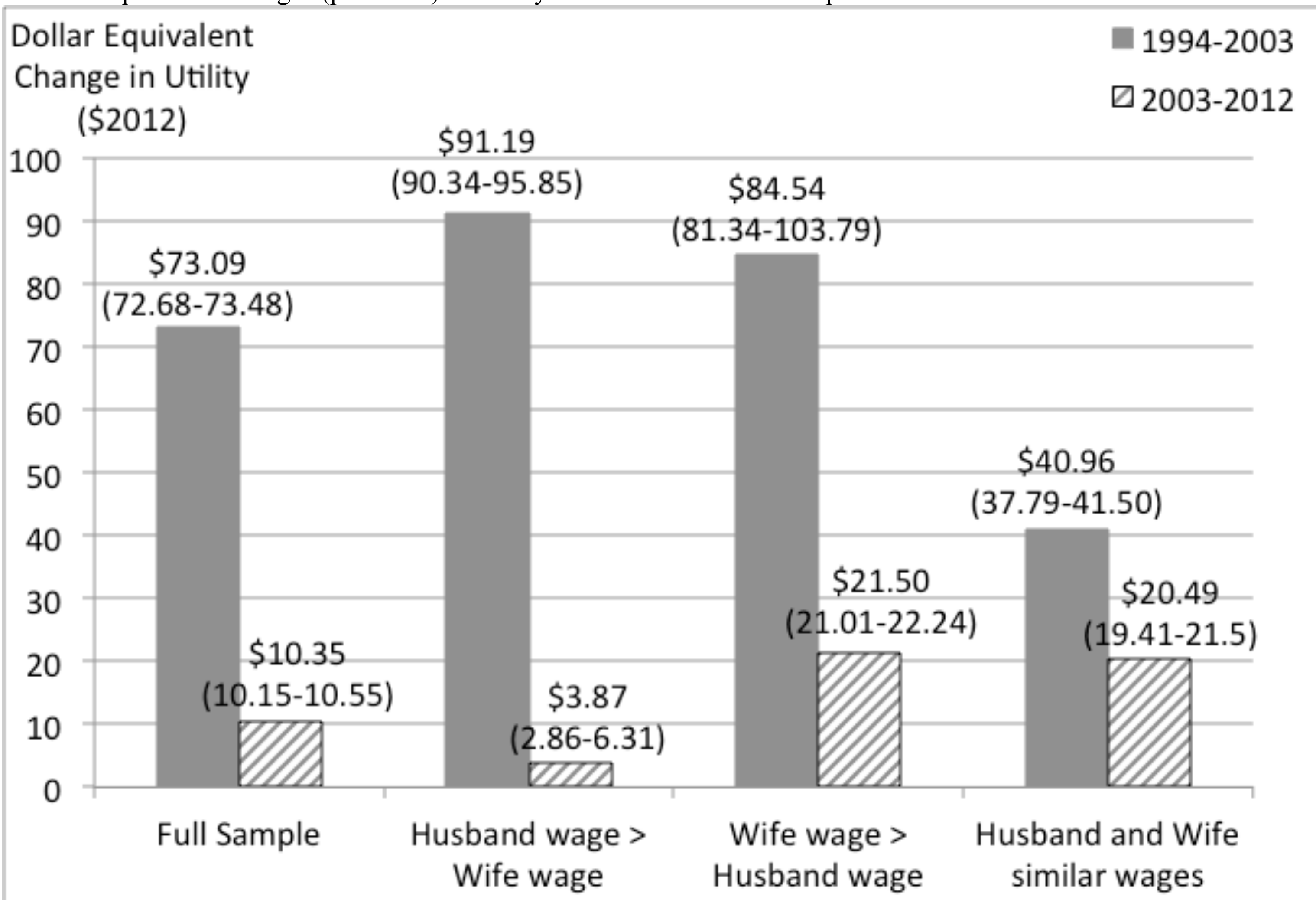
Notes: Dollar values are in real 2012 dollars for comparison. Husband and wife have similar wages means they are within 0.2 log points of one another; the husband's wage being greater (less than) the wife's wage means that his wage is more (less) than 0.2 log points of his wife's wage.

Figure 1. Distribution of families based on the wife's relative hourly earning potential, 1994, 2003, and 2012.




Note: Authors' calculations, U.S. Bureau of Labor Statistics, Current Population Survey (http://www.bls.gov/cps/earnings.htm#demographics). The wife's relative hourly earning potential is calculated as the ratio of the wife's wage divided by the sum of the wife's and husband's wage. Calculated using only families with observed wages for both members. Density points to the left of the 50% demarcation reflect families in which the Husband's wage is greater than the Wife's wage; points to the right are where Wife's wage is greater than the Husband wage.

Figure 2. Dollar equivalent changes (per week) in family welfare across two time periods.




Note: Husband and wife have similar wages means they are within 0.2 log points of one another; the husband's wage being greater (less than) the wife's wage means that his wage is more (less) than 0.2 log points of his wife's wage. Bootstrapped (250 iterations) standard errors in parentheses.