Working Papers

FEDERAL RESERVE BANK OF BOSTON

No. 08-7

The Responsiveness of Married Women's Labor Force Participation to Income and Wages: Recent Changes and Possible Explanations

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Abstract:

One contributor to the twentieth century rise in married women's labor force participation was declining responsiveness to husbands' wages and other family income. Now that the rapid rise in married women's participation has slowed and even begun to reverse, this paper asks whether married women's cross-wage elasticities have continued to fall. Using the outgoing rotation group of the monthly Current Population Survey (CPS) and estimating coefficients separately for each year from 1994 through 2006, we find that the decline in responsiveness to husbands' wages has come to an end—at least for the time being—and even find evidence of rising responsiveness to husbands' wages. This increase in the cross-wage elasticity of participation occurs largely between 1997 and 2002 and is concentrated among younger women and women with children.

We also explore a number of possible explanations for this development. We conclude that declining divorce rates, rising child care costs, and the increasing prevalence of high work hours for high pay—all of which were more pronounced at the high end of the income distribution—along with rising income inequality may have played a role. Also possible is that some of the decline is an artifact of changes in the tax system and the way income is measured. In addition, we observe some backsliding in attitudes supportive of gender equality in the market and at home, and perhaps a change in lifecycle timing among Generation X women.

JEL Classification: J22, D13

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This paper, which may be revised, is available on the web site of the Federal Reserve Bank of Boston at http://www.bos.frb.org/economic/wp/index.htm.

The authors are grateful to Chris Foote, Yolanda Kodrzycki, Jane Little, Bob Triest, and Julie Hotchkiss for helpful comments on earlier drafts and to Jessamyn Fleming, Charu Gupta, Ashley Hartman, Brad Hershbein, and Carl Nadler for excellent research assistance. Notwithstanding all this help, the authors alone are responsible for errors.

This version: November 25, 2008

Investigating the determinants of the twentieth century rise in U.S. married women's involvement in the paid labor force has been a cottage industry in labor economics for more than four decades. Numerous authors have attempted to establish the contribution of "economic" variables to women's labor supply—in particular, how much of observed changes in participation and hours of work could be explained by increases in women's own wages (hypothesized to raise participation, ceteris paribus) and by increases in husbands' wages or other family income (hypothesized to reduce it). The estimates of married women's own- and cross-wage elasticities vary fairly widely and for the most part are larger (in absolute value) than those of married men, who generally exhibit little responsiveness either to their own or their wives' wages or to other family income.

Prior to Goldin (1990), however, researchers did not explicitly ask whether married women's own-wage and income elasticities might be changing over time. Goldin, in her analysis of the changing economic role of American women, collects and tabulates a number of estimates of labor supply elasticities over the twentieth century and concludes that they were unlikely to have been produced by a stable labor supply curve. She argues that women's income elasticity appears to have decreased (in absolute value) over the century, while their own-wage elasticity first rose and then fell. Since then, a few studies—most notably Blau and Kahn (2007), but also Juhn and Murphy (1997) and Heim (2007)—estimate the elasticities in more recent years and find continued declines.

Now the half-century-long increase in married women's labor force participation has shown some reversal. Loosely following Blau and Kahn (2007), we examine the labor force participation of prime-age married women (and men) in recent years and investigate whether the wage elasticities have continued to decline. Using the outgoing rotation group of the *Current Population Survey* (CPS) and estimating coefficients separately for each year from 1994 through 2006, we obtain relatively stable own-wage elasticities for married women over the period. However, in marked contrast to earlier studies, we find that the decline in responsiveness to husband's wages has come to an end—at least for the time being—and even find evidence of *rising* responsiveness to husbands' wages. This increase in the cross-wage elasticity of participation occurs largely between 1997 and 2002 and is concentrated among

younger women and women with children. While married men's participation continued its gradual decline over the same period, we find no evidence that their wage elasticities are increasing.

We also explore a number of possible explanations for this development. Candidates include stabilized or falling divorce rates, declines in the intermittency penalty, increased child care costs, increased association between high-wage jobs and long work hours that make it difficult to combine paid work with household activities, increased progressivity of the tax system, and a reversal in the long-run trend of declining male-female differences in attitudes and gender roles.

The changes we identify may also result from the interaction of multiple factors. For example, rising income inequality may be partly driving changing social norms which together contribute to high-end couples deciding to "purchase" the wife's time for non-labor market activities. Or highly educated younger women married to high-earning husbands may feel secure enough either in their marriages or in their ability to command a suitable future wage (when they decide to return to paid work) that they do not perceive a high cost to nonparticipation now.

I. Previous estimates

Economists' early work on married women's labor supply was motivated, in part, by an attempt to explain an apparent puzzle: Given steady increases in men's real earnings and then-current estimates of women's labor supply parameters—relatively low positive own-wage elasticity and large negative other-income elasticity—many economists expected married women to reduce their participation in paid work, but instead their participation was steadily increasing.[1] Mincer (1962) attempted to resolve the puzzle by using aggregated data on a cross section of cities (in order to reduce the transitory component of income) and found a wage effect

[1] Goldin (1990) notes that prior to modern economists' focus on wage and income variables, the conventional wisdom attributed changes to a more complex set of factors including "changes in social norms, declining barriers to their paid work, increasing work flexibility, smaller numbers of children, and the diffusion of labor saving devices in the home … " (p. 126)

that exceeded the income effect by an amount large enough for observed increases in women's wages to explain much of the increase in married women's participation.

After Mincer, other studies based on city aggregates or using micro-data on participation or hours of work obtained estimates of wage and income effects in the cross section and used them to predict changes in participation or hours over time and to apportion the relative contribution of labor demand and supply to those changes. Like Mincer, these studies generally find that estimated responses to wage and income changes could explain a substantial fraction of the observed increases in participation or hours.[2]

Goldin (1990) appears to be the first study to consider explicitly whether married women's wage and income elasticities had changed over time. She notes that the role of supply and demand factors in explaining the rise of married women's labor force participation depends not only on shifts in demand, but also on shifts in supply and on changes in the labor supply wage elasticities. She also collects and compares a number of estimates of own-wage elasticities, own-substitution effects, and other-income effects over the century—mostly from cross-city studies—and concludes that neither the income nor the wage elasticity was stable over time.[3] Based on these collected estimates, she concludes that the wage elasticity was small at the turn of the century, rose until about 1940, and then fell. In a similar manner, she concludes that the income elasticity was large and negative at the turn of the century, fell somewhat (in absolute value) by 1940, and continued to shrink thereafter.

Some additional evidence is provided by Juhn and Murphy (1997), who focus on the extent to which the rise in married women's employment and earnings and the poor wage growth of married men—especially at the bottom of the wage distribution—were linked during the period 1959 to 1989. In comparing cross-section regression results for three sub-periods, they find that the positive relationship between a wife's employment and her own wages appears to have become stronger, while the negative relationship between her employment and her husband's earnings appears to have grown weaker. They find larger increases in

[2] There were also some time series studies, notably Smith and Ward (1984) that analyzed hours of work during the period 1950–80.

[3] She also argues that if labor supply were stable over time, then married women's market work should have increased in the 19th century when it did not.

employment among wives of low-wage men in the 1960s and among wives of middle- and high-wage men in the 1970s and 1980s, the opposite of what observed patterns of men's wage changes would predict.

Blau and Kahn (2007) examine trends in married women's own- and cross-wage elasticities. Using *March Supplement* CPS data, they estimate equations for annual hours of work and participation for three-year periods centered around 1980, 1990, and 2000. They find that married women's own- and cross-wage elasticities declined during both decades, although the decline was larger in the first decade than in the second; over the entire period, married women's own-wage elasticity fell by about one-half and their responsiveness to husbands' wages declined by about 40 percent. Heim (2007) also examines married women's labor supply elasticities from 1979 to 2002. He finds that married women's wage and income elasticities for both participation and hours decreased dramatically in absolute value over the period. However, his estimates also suggest that toward the end of the 1990s, income elasticities begin to flatten out and even turn up slightly.

II. Household decisionmaking, labor supply, and participation elasticities

A full model of labor supply for married individuals involves describing an interrelated set of decisions that determine how family members (1) allocate their time between market work and home production, (2) combine or reconcile their possibly diverging interests and preferences in both time allocation and consumption opportunities, and (3) are affected by the possibility that behavior in one period affects opportunities and constraints in the future. Changes in any factors entering into this web of decisions might change married women's behavioral supply response to their own wages, spouses' wages, or other family income. This section of the paper considers these three aspects of labor supply decisions and focuses on identifying factors that might contribute to married women's responsiveness to their husbands' wages or other family income and what might cause changes in that responsiveness.

A. Individual allocation of time between market goods and nonmarket activities

In a simple, single-period model of household production and labor supply, an individual's participation decision comes from comparing the value of her time at home with her market wage, given other income or available resources.[4] In a standard diagram (see Figure 1), with nonmarket time measured on the horizontal axis and market goods on the vertical axis, the value of her time at home is indicated by the slope of the indirect utility function showing the tradeoff between her nonmarket time and market goods; her market wage determines the slope of the budget constraint; and family income other than her earnings determines the height of the budget constraint at zero work hours.[5] She participates (spends at least some time in paid work) if her market wage exceeds the value of her nonmarket time; otherwise she spends all her time—specializes completely—in home production and does not participate in the labor force.

Differences in available resources, such as labor income from other family members or unearned income, shift her budget constraint up or down without changing its slope. Her participation response is determined by where this new budget constraint is tangent to a new indifference curve relative to the participation boundary. The standard negative estimates of the income elasticity of participation indicate that these indifference curves are typically steeper at higher levels of other income; put another way, her reservation wage rises as nonlabor income increases. Moreover, anything that affects the slopes of her indifference curves, which reflect the possibilities of substituting market-goods-intensive for nonmarket-time-intensive choices in both consumption and production of commodities (holding utility constant) at the zero work-hours boundary, might affect her income elasticity.

On the consumption side, commodities or activities—for example, activities related to the presence of young children or older parents in the home—that increase the extent to which the value of nonmarket time increases (decreases) when other income rises (falls) will increase

[4] We are focusing on women, but the model could apply to married men.

[5] See Blau, Ferber, and Winkler (2002) for a presentation of such a model. Their discussion follows the original formulation in Becker (1965) in which utility is defined over "commodities" (such as meals, vacations, and children) that can be produced with various combinations of market goods and nonmarket time.

the responsiveness to changes in that income. For women with young children, the price of market-provided child care may also be a factor, as the higher the price of child care, the more costly it is to substitute market goods for nonmarket time in caring for children and hence the steeper a parent's indifference curves. In addition, attitudes or preferences, for example, that market-purchased care is not a good substitute for care by a parent, will also produce steeper indifference curves as other income rises, as will social norms or gender roles that encourage or reinforce such beliefs.[6]

The presence of children is not the only potentially important factor that makes for steeper indifference curves; anything that causes nonmarket time to have a high value, such as strong preferences for time-intensive hobbies or other activities, may also raise responsiveness. On the production side, the availability of market goods (such as prepared foods, restaurant meals, microwave ovens, and vacuum cleaners) that allow easier or cheaper substitution of market goods for nonmarket time in home production reduces the value of nonmarket time as other income increases and thereby decreases responsiveness.

The progressivity of the U.S. income tax system may also affect the response to changes in other income (where wages are measured on a pretax basis). Under a progressive tax system, for example, the tax rates on labor income of married women with high-wage working husbands are higher relative to the tax rates on labor income of married women with low-wage husbands than is the case under a less progressive tax system. This tends to reduce the participation of women married to high-wage husbands (even controlling for own wages) and thus tends to raise measured responsiveness.

Thus far, we have implicitly assumed that individuals value work only for the earnings

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[6] For example, Ackerlof and Kranton (2000) propose a model in which identity is associated with a specific social category (such as gender) that is in turn linked to ideal physical attributes and proscribed behavior for anyone assigned to that category. People who behave in line with those proscriptions affirm their self image as a woman or man and do not risk a negative response by others. Those who violate the proscriptions may experience an internal conflict or sense of discomfort and may provoke discomfort in others—who may respond by taking actions that also impose additional costs. Thus, the introduction of gender identity creates externalities and changes the payoffs to certain actions.

it produces (the market goods to which it gives access).[7] But married women may also value work because it provides other rewards, such as a sense of identity, personal challenge, social interaction with co-workers, the satisfaction of making a contribution to the community, social status, and increased power within the family; the perceived value of these rewards may also be affected by gender roles, social norms, and other cultural influences. Such aspects of work can be seen as helping to determine the shape of married women's indifference curves and may affect responsiveness to changes in other income.

B. Combining and reconciling the productivities, preferences, and interests of family members

In the model just described, the husband's behavior affects the wife's labor supply decisions only through exogenous "other income"; that is, the wife is a secondary worker, of sorts, whose participation decision is based on having access to family income that comes from her husband's earnings or other sources, as well as her indifference curves and her wage rate.[8] Within a married couple, however, it is useful to think about a woman's decisions regarding labor supply and household production as being made jointly with the labor supply and household production decisions of her husband (and even other family members).

In joint family decisions, a wife's labor supply is endogenous to her husband's labor supply and vice versa. The choice between market goods and wife's nonmarket hours will depend not only on her own indifference curves and market opportunities but also on the indifference curves and market opportunities of her husband. A change in the relative productivity of husband and wife (compared with each other's) in market work and home production may affect the wife's response to her husband's wage. In particular, a rise in the

[7] The simple model also assumes that preferences are individual and do not take the preferences of one's spouse or children into account.

[8] In many early models, complete gender specialization was the efficient outcome of intrinsic differences in the relative productivities of men and women; and gains from specialization were hypothesized to be the source of much of the economic advantage to marriage. Becker (1991) argues that complete specialization can result from even small intrinsic biological differences along with differences in human capital accumulation, which are amplified by social norms and market discrimination. Lundberg and Pollak (2007) point out that if household production involves a variety of activities requiring different skills or if mothers and fathers make distinct contributions, for example, to raising children, then the efficiency rationale for specialization "becomes less compelling." (p. 12)

husband's wage raises the relative value of his market time, and may cause the couple to reallocate their time, so that he shifts more towards market work and she shifts towards home production.[9] An implication is that an increase in income that comes from a higher husband's wage may elicit a larger wife's labor supply response than an equal increase in nonlabor income, at least in part because of feedback through a reduction in his nonmarket hours.[10] The effect may be even more pronounced if high-wage jobs are contingent on high weekly work hours, as that contingency could increase the association between his higher wage, a reduction in his nonmarket hours, and his wife's shift towards nonmarket time.

In addition, once labor supply and household production decisions are embedded in a family context, the manner in which married partners make these joint decisions may also affect participation elasticities. In common preference or unitary models, family members are assumed to act as if they were maximizing a single utility function and any increase in income (such as husband's wage) is pooled and distributed independently of who earns or controls the income. However, accumulating empirical evidence against unitary models has led economists to develop and test bargaining models of family decisionmaking. In cooperative bargaining models, the threat point is (1) divorce, and each spouse's bargaining power is a function of wellbeing in the event of divorce, or (2) an inefficient outcome internal to the marriage, and power depends in part on the resources controlled by each spouse while still married. Noncooperative bargaining models are similar but are based on repeated noncooperative games, which may yield multiple possible equilibria.[11] (See Lundberg and Pollak 1996). Thus, in family bargaining models, labor market "muscle," whether measured by one's potential wage (for example, Pollak 2005) or earnings (for example, Lundberg 2002) or by something else,

[9] We say "may" because under some circumstances it could result in the increased use of market goods in place of nonmarket time.

[10] A higher wife's wage would potentially have an analogous impact on her husband.

[11] Noncooperative bargaining models do not require enforceable binding agreements; furthermore, equilibria may not be Pareto-optimal.

is an important determinant of decisionmaking power,[12] and there is some empirical evidence to support these claims (Friedberg and Webb 2006; Lührmann and Maurer 2007).

This means that a woman's labor supply response to changes in her husband's wage in a family where decisions are characterized by bargaining may also include a component that results from a wage-induced shift in her husband's bargaining power, although the direction of the response to a change in this component is unclear.[13] A husband who enjoys nonmarket activities that require a significant input of time—activities such as reading, playing catch with his child, preparing a gourmet meal, or going on a long vacation—might use the additional power conferred by a higher wage to bargain for more nonmarket time, thereby achieving an outcome in which his wife spends more time in paid work and less time in nonmarket activities as compared with the outcome of a family that does not engage in bargaining.[14] A husband who derives consumption value from working—by gaining a sense of identity, accomplishment, or increased social status—might use a higher wage to bargain for more time in paid work and less in household production, achieving an outcome in which his wife spends more time in household production and less time in market work—an effect that may be amplified if a wife's household activities also raise her husband's productivity in the market.[15] Note that a wife's increased bargaining power that comes from her higher wage will be part of her own-wage response.

C. Dynamic aspects of married women's labor supply decisions

Among other things, marriages are multi-year legal and emotional commitments with endogenous start and end points. Married partners recognize that the decisions they make

[12] In addition to each individual spouse's (potential) earnings or wages, power would depend on institutional arrangements such as property and child-support laws and public transfer policy (inside or outside marriage) that determine how each spouse fares under the "threat" outcome. The equilibrium outcome of noncooperative bargaining may depend on social norms and gender roles (Lundberg and Pollak 1996).

[13] Note that in unitary models, since distribution is unaffected by who earns or controls income, one would not interpret a wife's responsiveness to a higher husband's wage as including an effect of the change in her husband's relative power.

[14] And vice versa for a higher wives' wage.

[15] See Gray (1997) for evidence that white married men with wives who do not work outside the home receive a wage premium over married men with working wives and otherwise similar unmarried men, because their wives provide market productivity-enhancing support.

today—among them labor supply decisions—can affect both themselves and their families well into the future. Behavior in the labor market today can shape future opportunities and mitigate or enhance future circumstances, and consideration of these future effects may alter current behavior and affect married women's responsiveness to their husbands' wages.[16]

The prospect that marriage may end through death or divorce provides a woman an incentive to limit her reliance on her husband's human capital and future earnings for security and to depend more on her own earning power. Goldin (1990) argues that the rise in divorce rates in the middle part of the twentieth century was part of the explanation for declines in married women's responsiveness to husbands' wages and increases in responsiveness to their own.

Decisions about market work and home production also contribute to the future accumulation of both market-related and home-based human capital, with implications for future productivity and the long-run tradeoff of market pay and nonmarket time. Engaging in paid work frequently increases potential future earnings; many jobs confer experience and skills that add to human capital. In addition, past work may also signal seriousness or commitment that employers value.[17] Thus, factors that augment these gains, such as high returns to experience or a substantial wage penalty for intermittency, may blunt married women's responsiveness to their husbands' wages. Moreover, to the extent that bargaining power within the family is dependent on wages or earnings, women who forgo this investment will also forgo additional bargaining power in the future.

III. Data and estimation

In order to assess elasticities empirically, we estimate a labor force participation

[16] Legal contracts between married partners that would seek to proscribe or restrict marital behavior are often unenforceable in court; one way to mitigate undesired outcomes is to use one's own actions—for example, by investing in education or participating in paid work—as a form of insurance.

[17] Conversely, not working means giving up these gains, which potentially puts homemakers at a disadvantage both in marital bargaining and in the event of divorce or death of their spouse. A partner who specializes in household production is investing in marriage-specific human capital that has less value outside the marriage; thus she/he is assuming more risk than the partner who specializes in paid work. Furthermore, the value of that human capital may depreciate over time even if the marriage survives, for example, when the children grow up and leave home.

equation of the following type:

Equation (1) $LFP = a_0 + a_1 \ln W_o + a_2 \ln W_s + B'Z + \varepsilon,$

where labor force participation (LFP) for each person is a function of his or her own potential wage rate, W_o; his or her spouse's potential wage rate, W_s; a vector of demographic characteristics and control variables affecting the relative value of time in and out of the labor force and labor demand conditions, Z; plus a disturbance term, ε.[18]

We combine 12 months of data from the monthly CPS outgoing rotation group (ORG) for each of the years 1994 through 2006 and estimate the equation separately for women and men each year.[19] Observations are members of married couples in which both spouses are ages 25 to 54. We employ the standard Bureau of Labor Statistics (BLS) monthly measure of participation—in or out of the civilian labor force during the survey week.

The equation is estimated using instrumental variables probit; to allow for joint decision-making, both own and spouse wage rates are endogenous variables. Because decisions about children may be made simultaneously with labor supply decisions, we estimate two versions of each year's participation equation, one that includes the number of children under 18 by their age group and one that does not.[20] Alternatively, children could be treated as an endogenous variable in the participation equation, but the data do not provide any plausible instruments. The other control variables (vector Z) include own and spouse age and age-squared, own and spouse race and ethnicity, state unemployment rate, month, division, and state cost of living index (Appendix A provides more detail).

To calculate hourly wage rates, usual weekly wages (including usual overtime, tips, and

[18] This specification does not include other family income because the monthly CPS reports only categorical information on family income. Earlier research (for example, Blau and Kahn 2007) shows very low labor supply elasticities with respect to family income other than spouse's wages.

[19] We begin in 1994 to avoid a break in the data on the participation measure for women. See Appendix A for details.

[20] If decisions about children and work are made simultaneously, higher wages may provide an incentive to work more and have fewer children. Alternatively, women who prefer small families may invest in more market-related human capital and supply more labor than women who prefer large families. Thus, not controlling for the number of children may overestimate the relationship between own wage and labor supply, while controlling for children could underestimate it. Similarly, women who prefer larger families may put extra effort into seeking husbands with higher wages, so excluding children may overestimate women's labor supply responsiveness to husband's wages. Or couples in which the husbands earn high wages may feel they can "afford" more children as well as less market work by the wife, so controlling for children may understate the cross-wage elasticity.

commissions) on a person's main job are divided by usual weekly hours on that job. For those who report that their usual weekly hours vary, hours worked last week (if available), or contract hours are used. We adjust topcoded earnings values to approximate the mean earnings of all topcoded individuals.[21] All dollar variables are deflated to 2000 dollars using the PCE deflator. To reduce measurement error, the individual's wage decile is included as an instrument in the participation equations.

We assign individuals for whom the CPS does not provide valid hourly wage rates the wages of others in the sample with the same observed characteristics. Those who lack valid wages include the unemployed, those who are out of the labor force, and the self-employed, as well as others for whom weekly wages or hours are not available or for whom computed hourly wages do not fall within a reasonable range (see Appendix A). To perform the wage imputation, we estimate wage regressions, separately by gender and year, using data on all married civilians who have "valid" wages. We include the inverse of the Mills ratio derived from a Heckman (1979) selection correction procedure in the wage equation; these coefficient estimates are used to impute wages. The wage and participation equations are identified by exclusion restrictions, based on the notion that wages are determined in the labor market while participation decisions reflect family conditions and individual characteristics. Thus, individual and area labor market characteristics (own education, foreign-born status, and metro status and size) influence wages but do not influence participation, while spouse characteristics (age, age-squared, race, and ethnicity)—and sometimes number of children by age—affect participation but not wages.

IV. Elasticity estimates for all married women

We begin by estimating Equation (1) above for women and for men. Based on these estimates, we calculate the elasticity for each individual observation evaluated at that observation's values of the explanatory variables and take the weighted mean over all

[21] See Appendix A for a description of topcoding adjustment.

observations, using CPS ORG weights. For a more continuous measure and a check on Equation (1), we also estimate an equation in which the dependent variable is usual weekly hours and includes zeroes for nonparticipants.

A. Estimates of participation elasticities

Table 1 reports own- and cross-wage elasticity estimates for selected years between 1994 and 2006; Figure 2 displays the elasticities for every year. (See Appendix Table A1 for summary statistics of selected variables and Table A2 for all elasticity estimates.) The own- and cross-wage elasticity estimates for women have the usual signs and magnitudes.[22] Married women are more likely to participate when their market wage is higher and less likely to participate when their husband's market wage is higher. The women's own-wage elasticity ranges from 0.18 to 0.25 over the period. This is somewhat smaller than Blau and Kahn's (2007) estimate of married women's "employment participation" response (from an equation estimating the determinants of positive hours), which was 0.27 to 0.30 in 2000. We find the elasticity with respect to husband's wage ranges from -0.09 to -0.17, depending on year and the inclusion of controls for children. These estimates span the estimates of the cross-wage elasticity of employment participation in 2000 obtained by Blau and Kahn (2007), which range from -0.11 to -0.13.

The figure and table show small differences in the estimated elasticities between the equations with and without children; excluding children makes the estimated own-wage elasticity slightly smaller and the cross-wage elasticity slightly larger in absolute value. In both cases, the estimates with and without controls for children do not differ by a statistically significant amount.[23]

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[22] Estimated coefficients on the other included variables are also generally in accord with expectations (results not shown).

[23] As noted in footnote 21, one would expect the opposite own-wage effect if women who prefer fewer children were also likely to have higher labor supply, invest in more market-related human capital, and thus have higher market wages. Hence, what is expected to be an overestimate of the own-wage response—not controlling for children—is slightly lower than what is expected to be an underestimate—including children. By contrast, the cross-wage elasticities differ in the expected direction; that is, excluding children leads to a more negative estimate than controlling for them in the participation equation; hence, the two estimates may be interpreted as upper and lower bounds.

The figure (and Appendix Table A2) also displays estimates for married men. The own-wage elasticity for men is positive but so is the cross-wage elasticity; men married to women with high wages are more, rather than less, likely to work, other things being equal. Consistent with other research, estimated elasticities for men with respect to both own and wife's wages are very small—around 0.05 for own wage and 0.02 for wife's wage, although they are statistically different from zero.

Over the 1994–2006 period, married women's responsiveness to their own wages (upper lines in Figure 2) declines slightly, but mostly between 1994 and 1997, after which it remains in a fairly narrow band. In contrast with previous studies covering (mostly) earlier years, married women's responsiveness to husbands' wages does not continue to decline and even increases in absolute value during the period, and especially between 1997 and 2002, when the elasticity rises from -0.10 to -0.15 or -0.11 to -0.17, depending on controls for children.[24] To avoid exaggerating the cross-wage responsiveness, we focus on the results that control for children, although both versions are reported in the Appendix tables.

To test for significance, we pool data from 1997 and later years (one year at a time) and estimate the instrumental variables probit with the same variables plus a full set of year interactions for the later year. Table 2 reports results for selected years. The cross-wage coefficient increases by a statistically significant amount between 1997 and 1999 and is significantly different from the 1997 coefficient in all later years. Figure 3 displays the estimated elasticities and 95 percent error bands.[25] The upper error band of the later years' estimates falls below the lower error band of the 1997 estimate, another indication that the change is statistically significant.

How economically significant are these changes? Evaluated at mean participation (75 percent), the difference in wife's participation associated with the difference between a husband's wage in the second decile ($11.40 per hour in 2000 dollars) and in the ninth decile ($27.30) was 6 percentage points in 1997 and 10 percentage points in 2002. Thus, the higher

[24] The estimated coefficients and elasticities change fairly continuously and smoothly over time, suggesting that 12 months of combined ORG data provide an adequate sample.

[25] The error bands show the weighted mean individual elasticities computed with the estimated coefficient, plus or minus twice the coefficient's standard error; see Appendix A.

responsiveness subtracted an additional 4 percentage points from the participation rate of women married to husbands with high wages relative to those whose husbands have low wages.

B. Estimates of usual weekly hours elasticities

Much of the research on participation has used the *March Supplement* to the CPS and measured participation by annual work hours. To provide a comparison and as a check on the estimates above, we estimate another version of participation using "usual weekly hours in the primary job" as the dependent variable.[26] In this version, the unemployed are dropped to reduce potential influence on supply from demand-side factors.[27] Non-participants are included at zero hours. Seeking to estimate the responsiveness at both the intensive and extensive margins combined, we use a linear (instrumental variables) formulation, rather than tobit, for these equations.[28]

Figure 4 displays the estimates of married women's elasticities of weekly hours with respect to wages, which are larger than the zero-one participation measure but similar in trend.[29] (Appendix Table A2 reports results, Table A1 provides descriptive statistics, and Appendix A explains how hours elasticities are calculated.). Over the period, the own-wage hours elasticity rises in 1995 and 1996 and then holds fairly steady; the cross-wage hours

[26] We concentrate on the primary job, since wage rate data are collected only for the first job. Estimates from usual weekly hours on all jobs are virtually identical to those on the first job.

[27] By definition, the unemployed are not *choosing* to supply zero hours. Workers with missing hours data are also dropped.

[28] We prefer the linear version because it tells us about the responsiveness of actual hours of work for workers and nonworkers, whereas the tobit coefficient tells us about the responsiveness of a latent variable—in this case, desired hours of work. See Cameron and Trivedi (2005, p. 542). The time pattern of estimated elasticities is similar for the two methods.

[29] The elasticity of hours with respect to own wages *conditional* on participation is expected to be smaller than the elasticity of participation with respect to own wages, because there is no negative income effect of own-wage increases at the participation margin, so the participation elasticity reflects the positive substitution effect alone, while the hours elasticity includes the income effect offset. But the hours measure used here combines the participation and hours decisions by including zeroes for nonparticipants and hence obtains higher elasticities than for zero-one participation.

elasticity falls somewhat more steeply than the zero-one measure, from -0.13 to -0.21,[30] but moves more or less in parallel after 1996. The cross-wage elasticity is statistically significantly larger in the years 1999 through 2006 than in 1997 (see the lower panel of Table 2).

To reconcile our estimates with the findings of Blau and Kahn (2007), we estimate their annual hours equations using their data source (CPS *March Supplement*) but for the periods 1995–96–97 and 2002–03–04—that is, choosing three-year periods centered on the years corresponding to our estimate of smallest and largest cross-wage elasticity.[31] In line with our results, we find a more negative married women's cross-wage elasticity in 2003 than in 1996 and the difference in estimated coefficients between the two periods is statistically significant. This suggests that the difference in the time trend stems from the difference in time period and bolsters our claim that the long-run decreased responsiveness documented by earlier researchers ends by the mid-1990s.[32]

V. Why might elasticities change over time?

What might account for the halt in the decades-long decline in the sensitivity of married women's labor force participation to their husbands' wages? In this section, we build on Goldin and on our discussion of labor supply and household decisionmaking in Section II to develop some possible explanations.

In her analysis, Goldin (1990) emphasizes several important factors. She argues that the changing mix of jobs in the economy, declining institutional barriers to married women's employment, and women's rising educational attainment contributed to a decrease in the negative signal value of a wife's working (as a signal regarding her husband's adequacy as the family's provider), since a woman's employment might reflect the high value of her own

[30] Our estimates are somewhat smaller than Blau and Kahn's (2007) estimate of the elasticity of annual hours with respect to own wages (0.36 to 0.41 in 2000) and similar to their estimate of annual hours with respect to husband's wages (-0.19 to -0.23 in 2000). One might expect annual hours to be more responsive to wages than weekly hours, since annual hours reflect an individual's decision about how many weeks to work as well as how many hours to work in any particular week; also any specific week's hours (and their sum over the year) may be more variable than "usual" weekly hours.

[31] See Appendix B for details.

[32] We also perform a robustness check on our topcoding assumptions. See Appendix B for details.

market time rather than a low value of her husband's income. Goldin also cites the increased availability of and falling prices of market goods that can substitute for a wife's home production, rising divorce rates, and the evolution of women's own views of the intrinsic merits of work and career, partly filtered through lags attributable to cohort aging.

More generally, recall from Section II that any factor causing indifference curves to be steeper at the zero work-hours boundary as income increases may affect the income elasticity. In particular, any market or nonmarket factor that increases the slopes of the indifference curves—the cost of substituting market-goods-intensive choices for nonmarket-time-intensive choices in both consumption and production of commodities (holding utility constant)—may increase responsiveness over time. Relevant market factors may include changes in job characteristics or work-family policies that make it more difficult to combine paid work and nonmarket activities, declines or perceived declines in the cost of job intermittency for women, increases in the costs of child care, and increased progressivity of the tax system. Relevant nonmarket factors may include a leveling or decline in divorce rates, changes in sources of personal identity and social status, or shifts in attitudes and social norms—for example, a shift toward more traditional roles and attitudes about childcare.

To explore these factors, in Section A we investigate the degree to which the levels or time trends in participation responsiveness to spouse (and own) wages differ among subgroups of married women. If levels of responsiveness differ among subgroups and the mix of subgroups shifts over time, these shifts could help to explain changes in the (overall) elasticity of women's labor force participation over the period. If increasing responsiveness to husband's wage is more pronounced among specific subgroups—for example, among younger women and women with children—this might point to a specific potential explanation. In Section B we collect and discuss evidence on a number of these explanations from other studies and data sources. In Section C we present additional stories or hypotheses that bring together factors and evidence from Sections A and B.

A. Evidence from estimates of participation elasticities by subgroup

To investigate the degree to which trends in participation responsiveness differ among

married women by birth cohort and presence of children, we estimate the basic participation equations with a full set of interaction variables for each of these subgroups, one at a time. This approach allows the coefficients on all the variables to vary across the two subgroups. (The bottom panel of Appendix Table A1 summarizes the fraction in each subgroup; Table A3 reports the estimated cross-wage and own-wage elasticities.)

Birth-year cohort

Figure 5 displays cross-wage elasticities estimated separately by birth-year cohort. We define two birth-year cohorts: the Baby Boom generation, born in 1960 or earlier, and Generation X, born after 1960. Note a marked generational shift during our sample period as older Boomers moved past age 54: the fraction in Gen X rose steeply, from 30 percent in 1994 to 72 percent in 2006.

The results for the Baby Boom generation suggest a continuation through 2006 of the trends identified by earlier research: The cross-wage elasticity of Baby Boom wives declined slightly, as did the own-wage elasticity. By contrast, Gen X wives displayed increasing responsiveness to their husbands' wages; the estimated spouse-wage coefficients for the two cohorts differ significantly after 1999.[33]

Thus, Gen X wives became much more responsive to their husbands' wages after 1999 while Baby Boom wives did not.[34] These generational differences are consistent with a number of explanations, such as changes in attitudes or norms, declines in the perceived probability of divorce, a decrease (or perceived decrease) in the intermittency penalty, or other reasons for changes in the inter-temporal allocation of work over women's lifetimes.

Presence of children

About two-thirds of married couples in the sample have children under the age of 18 living at home. Estimating participation equations separately, we find that married women with

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[33] The cross-wage interaction variable for Gen X wives exhibits a coefficient significantly different from zero in 1998 and in all the years 2000 through 2006.

[34] Since the time period we analyze is relatively short, it is virtually impossible to distinguish birth-year cohorts from age groups. The fraction of the sample under age 40 declined somewhat during the period, from 57 percent in 1994 to 49 percent in 2006, as the youngest members of the Baby Boom generation moved into their 40s. When we estimate separate equations for women under 40 years of age and those 40 years and older, we obtain similar results.

children are much more responsive to their husbands' wages than are women with no children at home and that responsiveness increased over the period (Figure 6). The rise was concentrated between 1997 and 2002, when the cross-wage elasticity climbed from -0.12 or -0.13 to -0.21 or -0.22, while the elasticity for women without children at home remained fairly steady (and quite small—in the vicinity of -0.05). The elasticity of participation with respect to own wage is similar for married women with and without children (Table A3).[35]

The full regression estimates (not shown) indicate that married women did not become more responsive to the presence of children per se; the participation coefficients on number of children under age 3, ages 3–5, 6–11, and 12–17 did not change appreciably over the 1994–2006 period. Nonetheless, it appears that husband's wages became increasingly important in the labor-supply decisions of mothers with children. Blau and Kahn (2007) also find a higher cross-wage elasticity for mothers of young children—0.35 to 0.4 as compared with 0.2 for all women—and unlike their other estimates, the cross-wage elasticity for mothers of young children actually rose slightly between 1990 and 2000.[36]

The finding that rising responsiveness to husbands' wages is concentrated among mothers points toward explanations such as changes in total family size or mother's age at first birth, increased costs (or decreased availability) of purchased child care, changes in attitudes and social norms about market-provided care as compared with mother's care, and an increase in the extent to which high-wage jobs require long hours, encouraging increased specialization within marriage.

B. Exploring other evidence

In this section, we bring together other evidence that might explain the rising responsiveness of married women to their husbands' wages, particularly among younger women and women with children.

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[35]The estimated own-wage elasticities appear to be slightly lower for women with children than for those without during the 1997 to 2000 period. Blau and Kahn (2007) find a higher own-wage elasticity (of annual hours) for women with children under six years old than for all women (about 0.5 for mothers of young children compared with 0.4 for all women).

[36] They define young children as under age six; we include mothers who have any children under age 18 at home.

Divorce rates

One of the explanations offered for the long-run trend of declining responsiveness of wives to their husbands' earnings is the steady rise in the U.S. divorce rate, which reduced the extent to which married women could rely on their husbands' earnings for future security (Goldin 1990; Heim 2007).[37] This explanation could similarly account for women's *increased* responsiveness to husbands' wages when the probability of divorce and/or the length of time spent outside of marriage (after first marriage) *decreases*, reducing the riskiness of depending on husbands' income.

U.S. divorce rates declined steadily after 1980,[38] when many of the younger women in our sample were in childhood and forming expectations about marriage and work.[39] In adulthood, women also may have observed and reacted to a change amongst their peers: the fraction of 25-to-54-year-old women who were divorced or separated declined between 1994 and 2006; the divorced and separated share of ever-married women—a relevant indicator when the share of married women is declining—held steady for women ages 25–54 but declined for women under age 40.[40]

The trend among the college educated is even more pronounced. In our period from 1994 to 2006, ever-married women with graduate degrees experienced declining prevalence of divorce or separation while less-educated women (high school grads and some college) saw the prevalence of divorce and separation rise (CPS tabulations). Providing a longer view, a detailed study by Martin (2006) indicates 10-year dissolution rates for all education categories rose from the cohort of women who married between 1960 and 1964 through the 1975–79 cohort.[41] By

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[37] One might also expect any trends in the probability and amount of alimony awarded and paid in the event of divorce to have an impact; however, we could not locate data on alimony that were consistent over time.

[38] The U.S. divorce rate rose from 2 per 1,000 population in 1940 to 5.3 per 1,000 in 1979 and 1981, but then declined to 3.6 by 2006. National Center for Health Statistics, *Monthly Vital Statistics Report*, Vol. 43, No. 8, "Table 1. Divorces and annulments and rates: United States, 1940-90," and subsequent annual data from monthly vital statistics reports.

[39] The youngest women in the sample in 1994 (age 25) would have finished high school around 1987; the youngest in 2006 would have finished high school around 1999; and even 40-year-olds in 2006 would have finished by the mid 1980s.

[40] Authors' tabulations of monthly *Current Population Survey*.

[41] He analyzes the incidence of marital dissolution within the first 10 years of marriage for first marriages of U.S.-born women that began between 1960 and 1994. He controls for age at first marriage, incidence of premarital first birth, and other demographic characteristics.

contrast, from the 1975–79 through 1990–94 cohort, dissolution rates fell by almost half for college-educated women while holding steady for women with a high school diploma (including some college) and continuing to rise for women with less than a high school diploma.

This decline in the probability of divorce and/or the length of time spent out of marriage (once married), especially for younger and more-educated women, may have reduced the perceived and actual risk of depending on husbands' earnings for security and thereby raised responsiveness to husbands' wages.

Intermittency penalty

Another possible factor is the perceived or actual loss in earning power when a woman has breaks in her work history. Researchers have documented the existence of an intermittency penalty,[42] but there is little research measuring changes in the penalty over time. One exception is Hotchkiss and Pitts (2007), who find that the penalty was substantial in 1992, shrank steadily to almost zero in 2000, and then rose to nearly its 1992 level in 2002 and 2004.[43] While earlier research by Hotchkiss and Pitts (2005) indicates that women are not very responsive to the size of the wage penalty in making a decision to take a break from work, if one assumes a several-year response lag, their estimated time pattern of the size of the penalty is consistent with our pattern of rising cross-wage responsiveness.

There are a number of possible explanations for a decline in the intermittency penalty, including an increase in women's attachment to and investment in work before taking a break, a change in the nature of jobs such that human capital depreciates less quickly when a worker is out of the work force, or increased experience with returning workers that may have taught employers that returning employees' productivity is less impaired than they had previously believed. Hotchkiss and Pitts attribute their estimates to demand-side factors that allow employers to penalize workers for earlier intermittency during weak phases of the business

[42] See, for example, Jacobsen and Levin (1995) and Hotchkiss and Pitts (2003, 2005).

[43] Their data are available every other year. They construct an index of intermittency for each woman, reflecting the number of periods outside the work force after first entrance, the average duration, and the number of years of continuous work since returning, and they include the index as an endogenous variable in a wage regression.

cycle.[44] In our context, however, it seems unlikely that women would consider a cyclically influenced penalty in making a decision about taking a break from work—a break that might not end until the economy had moved into the recovery phase of the cycle.

Nonetheless, if the intermittency penalty has declined in recent years—or if young women believe it has—they would find it less costly in terms of forgone future earnings to leave the labor market temporarily in response to a high husband's wage. A decline in the intermittency penalty also means that women who take time out of the paid labor force would be less disadvantaged in the event of marital dissolution and thus may have greater bargaining power within marriage. Research to determine whether and why the intermittency penalty is changing would be useful in pinning down its contribution, if any, to changes in married women's cross-wage responsiveness.

Costs of (nonparental) child care

Considerable research has investigated the responsiveness of married women's labor force participation to child care costs, finding that higher costs of market care have a negative effect on participation and work hours.[45] In addition to this direct effect, rising child care costs indicate that market substitutes for parental care are becoming more expensive (a mother's indifference curves become steeper), so the responsiveness of her labor supply to her husband's income increases. Moreover, increases in the price of child care favored by high-wage families relative to the price of care used by low-wage families could further raise measured responsiveness to husbands' wage.

Rosenbaum and Ruhm (2007) report that parents of high socioeconomic status use larger amounts and more expensive modes of child care for young children, such as day care centers, preschools, and family day care; parents of lower socioeconomic status generally rely more on care by relatives. The CPI for child care (which reflects the price of purchased care) rose about twice as fast as the all-items CPI over the 1994–2006 period, and almost twice as fast as a rough estimate of the opportunity cost of the time of informal caretakers, measured by the market

[44] They attribute the decreasing penalty up to 2000 to economic expansion and the jump between 2000 and 2002 to the 2001 recession.

[45] See, for example, Kimmel (1998) and Powell (2002).

wages of high school graduates.[46] Thus, relative price changes for child care may well have contributed to the rising responsiveness of wives to their husbands' wages. However, it is impossible to know whether this represents a change from the previous decade because the child care CPI began in 1991.

Real or perceived effects of maternal employment on child outcomes[47] may also be increasing married women's responsiveness to husbands' wages. Until recently, research was mixed and found small negative effects from maternal employment or from nonparental childcare (which were often conflated), or positive or no significant effects. (See, for example, Belsky and Eggebeen (1991) and Baum (2003) for discussion of the literature.) However, many of these studies were flawed by small, unrepresentative data samples or by lack of controls for unobserved heterogeneity. Later studies that try to control more explicitly for covariates (such as family background) or for quality of care are more consistent in finding small negative effects of nonparental care on all or some subgroups (classified by age, race, and/or socioeconomic status) of children. For example, Ruhm (2004) investigates the relationship between maternal employment and child outcomes such as cognitive development, obesity, and risky behaviors (for example, smoking or drinking) of 10- and 11-year-olds and finds that the consequences of maternal employment are negative but small for the average child.[48] In addition, he finds these small average effects mask sharp disparities between the effects on "advantaged" and "disadvantaged" adolescents, with substantial negative impacts found for advantaged youths

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[46] The child care and nursery school CPI focuses on care of pre-school children, including pre-kindergarten educational programs, individuals whose occupation is to regulate care for children (such as one-person firms), and short-term care, such as babysitting and extended day programs at elementary schools (Bureau of Labor Statistics, e-mail communication, July, 10, 2008). The child care and nursery school CPI rose 72 percent between 1994 and 2006, while the CPI rose 36 percent, and core CPI increased 32 percent (Bureau of Labor Statistics, Databases & Tables, CPI—All Urban Consumers, Child care and nursery school http://www.bls.gov/data/). Median full-time full-year earnings of women with a high school diploma and no college rose 37 percent (U.S. Census Bureau, *Current Population Survey, Annual Social and Economic Supplement*, Table P-20, Educational Attainment—Workers 25 Years Old and Over by Median Earnings and Sex: 1991 to 2006 http://www.census.gov/hhes/www/income/histinc/p20.html and Table P-24 Educational Attainment—Full-Time, Year-Round Workers 25 Years Old and Over by Median Earnings and Sex: 1991 to 2006 http://www.census.gov/hhes/www/income/histinc/p24.html).

[47] Almost all studies focus on maternal employment; few focus on father's impact, perhaps an indirect reflection of attitudes or social norms.

[48] He also finds that less intensive employment is often associated with favorable outcomes and that maternal labor supply after age three typically has little effect.

compared with neutral or favorable consequences for the less advantaged.[49]

Thus, parents today, and especially highly educated, higher-income parents, may feel more strongly than parents twenty years ago that nonparental care would have negative developmental effects on their children. This greater certainty about nonmonetary costs of child care is another possible source of wives' increased responsiveness to husbands' wages.

High wages, long hours

If jobs increasingly have long weekly hours or other characteristics that make it difficult for workers to combine market work and household production, one would expect a rise in the share of households in which one spouse specializes in paid work and the other in home production. If high-wage jobs, in particular, are increasingly associated with long hours or these other characteristics, it might lead to an increase in the cross-wage participation elasticity when estimated in the cross-section.

Kuhn and Lozano (2008) provide some evidence of such an association between high wages and long hours. They find that the share of employed American men regularly working long weekly hours began to increase around 1970, reversing a well-documented, century-long trend of declining weekly hours. Moreover, the change is most pronounced among high-wage, highly educated, salaried, and older men. The fraction of men working 50 hours or more in the top quintile of average hourly earnings rose 8.9 percentage points during the 1980s and another 5.5 percentage points in the 1990s; the share in the middle quintile rose 5.9 and 1.5 percentage points; and the share of those in the bottom quintile fell 2.1 and 4.6 percentage points, respectively. This is a reversal of the pre-1983 pattern, when the lowest-paid quintiles were more likely than the top quintile to put in long hours.

The authors attribute this change to an increase in the marginal incentive to work more

[49] Ruhm uses several alternative definitions of "advantaged" vs. "disadvantaged"—race/ethnicity, mother's college attendance, presence of spouse or partner in child's birth year, and a multivariate index of socioeconomic status based on predicted family income—with similar results.

than 40 hours per week for skilled, salaried employees.[50] More specifically, they argue that their data are consistent with a rise in tournament-style promotion and pay practices.[51] Since the rewards in tournament-style pay regimes are received in the future, (current) long hours and (future) high wages are yoked in ways that may not be easily disentangled or negotiated away and may amplify the tendency for high-earning married partners to specialize.

Another possible reason for an increase in the association of long hours and high wages is raised by Cutler and Madrian (1998). They point out that an increase in the fixed costs of employment such as a rise in employee benefits (even if offset by a wage reduction) will lead firms to substitute increased hours of work per employee for adding more employees. According to the BLS Employment Cost Index, private sector benefits rose markedly faster than wages and salaries in most years since the late 1980s (the notable exceptions being the boom years, 1995–2000). This relative increase was even more pronounced for health benefits, which are disproportionately offered to high-wage workers, and thus may contribute to increased cross-wage responsiveness.[52]

Note that an increase in workplace policies that make it easier to combine market work (including jobs that require long hours) and household production, such as the ability to work from home, the provision of onsite child care, concierge services, or other worker assistance, could counteract these trends and reduce responsiveness.

Increases in the top marginal U.S. personal income tax rates

Previous research has recognized that using pre-tax wages tends to result in biased

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[50] They conclude that the increases were not offset by decreases in other dimensions of labor supply (such as increased multiple job holding, alternating periods of intense paid work with periods of lower activity or inactivity, increased part-time work, and longer annual vacations). Nor were they the result of the business cycle, changing demographics, or mix of jobs by detailed occupation and industry.

[51] Analyzing both the long-hours premium (the weekly earnings differential for subgroups that usually work long hours compared with those that usually work a standard week) *and* wage dispersion within detailed industry and occupation categories, they examine the covariation between real wage changes and hours changes across subgroups of men during the period. The largest increases in work hours occurred during the 1980s, when overall real wage growth was negative; thus, they conclude that more than a simple wage model is needed to explain the data.

[52] Cutler and Madrian (1998) estimate an increase of about 1.5 percent to 3 percent in weekly hours for those with health insurance compared with those without health insurance from 1980 to 1993, whereas Kuhn and Lozano (2008) say that higher hours are unlikely to be explained by increased fixed costs of employment: "If anything, changes in fixed costs should have a higher impact on the hours of low-wage workers than high-wage workers" (footnote p. 30).

elasticity estimates (for example, Blau and Kahn 2007; Heim 2007). If marginal income tax rates are changing over time, the size of the bias will change each time rates change. This can produce a "trend" that is an artifact of using pre-tax wages, rather than a true change in married women's responsiveness to their husbands' post-tax wages. In particular, decreases (increases) in U.S. top marginal tax rates could bias downward (upward) estimated trends in the responsiveness of women's labor force participation to their husbands' wages.

Overall, marginal tax rates on labor income rose and became more progressive in 1993. In 1992, the highest marginal rate was 31 percent; in 1993, two higher brackets (36 percent and 39.6 percent) were added, and these rates were in effect through 2000. Furthermore, the fraction of married couple returns in those two top brackets increased every year from 1994 to 2000.[53] Feenberg and Poterba (2004) calculate the weighted average marginal tax rate (including the AMT) on labor income—a measure that summarizes both rates and shares—and show an increase from 22.55 percent in 1992 to 25.07 percent in 1999.[54] However, a number of states reduced income tax rates or top income tax rates between 1994 and 2001 (Johnson and Tenny 2002) which may have offset the change in federal rates in those states. In addition, beginning in 2001, and again in 2002 and 2003, marginal rates were reduced in many of the existing brackets: in 2002, an additional 10-percent bracket was added at the bottom; by 2003, the top marginal rates had fallen to 33 percent and 35 percent.

If there are lags in families' awareness of changes in the tax laws, the pattern of increased tax rates on higher-income families from 1993 through 2000 suggests that the increased responsiveness we estimate between 1997 and 2002 may be, in part or in full, an artifact of using pre-tax rather than post-tax wages. Similarly, declines in tax rates that occurred after 2000 may have contributed to the decline in our estimated elasticity after 2004.

Identity, expectations, and attitudes

Goldin (2005, 2006) claims that American women took part in a "quiet revolution" that

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[53] Internal Revenue Service, *Statistics of Income Bulletin*, Publication 1136, various issues 1997–2008, Table 1. 1994 is the earliest year these data are available.

[54] For all taxpayers, not just married couples.

began in the late 1960s and early 1970s.[55]

> The revolution was characterized by the transformation of women's economic and social position, from static decision making with limited or intermittent time horizons, to dynamic decision making, with long-term horizons. . . . from agents who work because they and their families "need the money" to those who are employed, at least in part, because occupation and employment define one's fundamental identity and societal worth. . . .[and from having] "jobs" to "careers," where the distinction between those two concepts concerns both time horizon and human capital. (2006; p. 2)

This change in perspective and stance—from seeing employment in terms of "jobs" to seeing it in terms of "careers"—along with associated changes in the sources of women's identity points to reduced responsiveness to husbands' wages. Moreover, Goldin argues that pinpointing and understanding the revolution requires looking beyond conventional measures of participation and hours to indicators associated with women's time horizon, identity, and investment in human capital.

Goldin examines a number of indicators, including young women's increasing expectations of future employment, the changing determinants of their life satisfaction, their increased educational attainment and changing fields of study, and their increasing age at first marriage. She finds that these series (and others) show sharp breaks in the late 1960s and early 1970s, with rates of change that slow or end by the mid to late 1980s.[56] Similarly, Goldin and Shim (2004) use several different data sources to look at college-graduate women's surname retention upon marriage[57] and conclude that the fraction of women keeping their maiden name appears to have risen sharply in the 1970s and 1980s, but declined slightly in the 1990s.

In addressing the slowdown, Goldin (2006) provides evidence on participation by age that does not support the hypothesis that female labor involvement has reached some "natural rate" and evidence on spells out of work that does not support the hypothesis that highly-

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[55] Goldin argues that the revolution was preceded by three evolutionary phases: 1900 to 1930, 1930 to 1950, and 1950 to 1970.

[56] Although this period saw changes across all cohorts, the young women at the forefront of change were born during the mid 1940s to the late 1950s.

[57] Surname retention may be an indication of the extent to which a woman who marries with her career already established expects to continue working in the same field. It may also be a statement about feminist values and identity.

educated women are "opting out." She also notes that a definitive conclusion requires data on how these women behave over their entire working lives.

To pursue these questions, we extend several of her indicators and examine other evidence just prior to and during the period of the slowdown.

Indicators of expectations regarding future market work

Women continue to advance in terms of overall investment in education: the share of women age 25 to 34 with four years of college or more has continued to rise from 12.0 percent (1970) to 20.9 percent (1980) to 23.5 percent (1990) to 29.9 percent in (2000) to 34.1 percent (2007).[58] Cotter, Hermsen, and Vanneman (2004) note that since the early 1980s, young women have been awarded more than half of all master's degrees; and their share of professional degrees and doctorates has continued to rise and almost reached parity with men's.[59] However, they also note that while young men and women have considerably narrowed the difference in college majors, the pace of increased gender integration of college majors slowed after 1985. According to the U.S. Department of Education, women's share of awarded bachelor's degrees in engineering and engineering technologies, at just under 18 percent, was about the same in 2006 as in 1999, and up only 3 percentage points from 1994; women's share of bachelor's degrees awarded in computers and information sciences actually declined, from about 35 percent in 1987 to 21 percent in 2006.[60] Cotter et al. find a slowdown in the rate of decline of the occupational dissimilarity index, which dropped by an average of about 4.5 percentage points during each of the three decades from 1960 though 1990, but by only 1.8 points in the 1990s. Moreover, they calculate that the decrease in the 1990s can be attributed to the growth of integrated occupations; that is, without the expansion of employment in those occupations, occupational segregation would have *increased* in the 1990s.

Other indicators of women's expectations about future labor market attachment also

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[58] U.S. Census Bureau. 2007. "Years of school completed by people 25 years and over, by age and sex: Selected years 1940-2007." Educational Attainment Historical Table A-1. http://www.census.gov/population/www/socdemo/educ-attn.html.

[59] Professional degrees include M.D., D.D.S., L.B., and J.D.; doctoral degrees include Ph.D. and Ed.D.

[60] U.S. Department of Education, National Center for Education Statistics, 2007 *Digest of Education Statistics*, Tables 292 and 294, http://nces.ed.gov/programs/digest/2007menu_tables.asp.

give a mixed picture. The estimated median age at first marriage for women continued to rise between 1990 and 2006 (from 23.9 years to 25.5 years), although the pace slowed somewhat from the previous two decades, when it rose from 20.8 years to 23.9 years.[61] Similarly, women continued to delay having their first child. Between 1990 and 2005, the share of women having their first child after the age of 30 increased for all education levels, but for women with a bachelor's degree or more, the share rose even more sharply, from just under 27 percent to slightly below 36 percent.[62] However, using data from the *June Supplement* to the CPS, Vere (2007) finds that total intended fertility (live births plus intended future births) has been rising steadily for college-educated women. Those born in 1974–75 intend to have about 0.5 more children, on average, than those born in 1956–57; there is no corresponding increase among women without college degrees. In our CPS sample, the number of children under the age of 18 among married couples is fairly level between 1994 and 2006, but the number among college-educated couples rises slightly.[63] Hoffnung (2006) studied married women's choice of surname during the time period 1987 to 2002. In line with Goldin and Shim, she finds no significant change in the share of educated women taking a nontraditional name.[64]

Direct measures of attitudes and norms

The shift towards gender equality and a narrowing of differences between the sexes in attitudes and behaviors of young adults appears to have slowed in recent years and, in some cases, reversed.

Thornton and Young-DeMarco (2001) examine trends in attitudes using several large data sets and find that the dramatic increases in egalitarian attitudes and beliefs that began in

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[61] U.S. Census Bureau. 2007. "Estimated median age at first marriage, by sex: 1890 to the present." Marital Status Historical Table MS-2. Data from *Current Population Survey*, March and Annual Social and Economic Supplements, 2006 and earlier. http://www.census.gov/population/www/socdemo/hh-fam.html#history.

[62] Centers for Disease Control and Prevention, National Center for Health Statistics, VitalStats, Birth Data Files, http://www.cdc.gov/nchs/vitalstats.htm.

[63] The mean number is 1.33 among all married couples; the mean number in couples with college-educated husbands or wives rises by about 0.07 over the period.

[64] Taking a nontraditional surname tends to indicate career commitment; Hoffnung finds that educated women are more likely to take a nontraditional name (maiden name, hyphenated name, etc.), and women who choose nontraditional names score higher on a test of occupational role commitment, attend higher status colleges, and marry later. Hoffnung also notes that keeping one's name may not carry the same "feminist" meaning today that it did in earlier years.

the 1960s and continued into the early 1990s, may have begun to level out by the late 1990s.[65] In the *General Social Survey* (GSS), for example, although two items continued the move toward greater egalitarianism[66] in the late 1990s, one moved in the opposite direction,[67] and others showed no change. Among high school seniors participating in Monitoring for the Future, there was only one item that continued to move in an egalitarian direction (and only among young women),[68] while three measures for women[69] and one for men[70] displayed statistically significant changes in the opposite direction. Still, the modest size of the changes (3 to 4 percent) and the mixed pattern of the results suggest it may be premature to conclude that attitudes are reversing; furthermore, this leveling occurred when measures of egalitarian attitudes were high by historical standards.

Cotter, Hermsen, and Vanneman (2004) use seven questions from the GSS to construct an indicator of the public's attitudes about women's roles in politics, the household, and the workplace. They find a substantial shift towards egalitarian attitudes from the late 1970s to the mid 1990s (consistent with Goldin's revolution), with the peak reached in 1994, after which public opinion showed no trend through 2002 (the final year in their analysis). Much of the increase was driven by younger, more liberal cohorts replacing older, more conservative ones, but the trend towards more liberal cohorts ended with the Baby Boom cohort. In addition, a conservative "period effect" since the mid 1990s is evident for each of the cohorts born after

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[65] The five data sets are: (1) Monitoring for the Future, (2) the General Social Survey, (3) the Intergenerational Panel Study of Parents and Children, (4) the National Survey of Families and Households, and (5) the American component of the International Social Science Project. Participants in these surveys were asked the extent to which they agree or disagree with statements about gender role equality as it relates to role specialization and decisionmaking within the family. The authors compiled the percentage of men and women giving egalitarian responses (that is, supporting egalitarian decisionmaking, desiring less segregation of female and male roles, and viewing maternal employment as benign for children) to each of the statements in each year the questions were asked.

[66] (1) "It is more important for a wife to help her husband's career than to have one herself" (for women and men). (2) "Do you approve of a married woman earning money in a business or industry if she has a husband capable of supporting her?" (for men).

[67] "It is much better for everyone involved if the man is the achiever outside the home and the woman takes care of the home and family."

[68] "A preschool child is likely to suffer if the mother works."

[69] (1) "If a wife works, her husband should take a greater part in housework and child care." (2) "It is much better for everyone involved if the man is the achiever outside the home and the woman takes care of the home and family." (3) "Having a job gives a wife more of a chance to develop herself as a person."

[70] "Having a job takes away from a woman's relationship with her husband."

1925; that is, once the plateau was reached, the ongoing shift toward more liberal cohorts offset a conservative shift within each cohort and resulted in roughly unchanged attitudes.

Kiecolt (2003) also uses the GSS to create a measure of how satisfied working age men and women are with their jobs relative to their satisfaction with their family lives from 1973 to 1994. She classifies people into four categories: high work-home satisfaction; low work-high home satisfaction (home as haven); high work-low home satisfaction (work as haven); and low work-home satisfaction. Overall (for men and women together), there is a small but noticeable decline in work as haven and an increase in home as haven, particularly beginning in the late 1980s. Looking by gender, Kiecolt finds that the change between 1973 and 1994 is driven by changes in the attitudes of women. Men's relative work-home satisfaction was stable over the period, but women shifted away from seeing work as haven towards seeing home as haven. However, the direction of causality is not obvious. Kiecolt attributes the attitude change to women's increasing concentration in female-dominated occupations, which tend to pay poorly, and to the "role overload" that occurs with women's disproportionate responsibility for domestic labor in many married couples.

Attitudes about divorce seem to have become more accepting between the 1960s and 1980, and then to have remained steady (Thornton and Young-Demarco 2001). However, Martin and Parashar (2006) note an "education crossover" in attitudes of younger women, ages 25 to 39, toward divorce. Between 1974 and 2002, women with bachelor's degrees, who previously had the most permissive attitude toward divorce, adopted a more restrictive attitude towards divorce than women with only some college did, while young women with no high school diploma adopted an increasingly permissive attitude.[71] Less egalitarian attitudes about gender roles and/or increasing prevalence among women of a view of home as a haven would also likely be associated with more conservative attitudes about divorce.

Social norms can have an impact on a person's behavior, independent of the person's own attitudes and values, by rewarding and advantaging those who act in concert with those norms and imposing costs on people who violate them. Thus, changes in individual attitudes

[71] Based on the GSS survey question "Should divorce in this country be easier or more difficult to obtain?"

and values can be amplified through changing social norms. Goldin (1990) argues that around 1900, married men's status was enhanced by the extent to which they had nonworking wives but that this association declined during the twentieth century, while at the same time wives' status was increasingly enhanced by participation in paid work. As noted earlier, Goldin attributes some of the secular decline in women's income (or cross-wage) elasticity to these shifts.

Evidence presented in this section raises the possibility that attitudes and norms have stopped shifting in the direction that favors wives' working. Some of the evidence suggests that this change is occurring to a greater extent among younger cohorts, a finding that would also square with our finding of greater increases in responsiveness for younger women. This evidence contrasts with the findings of most researchers who studied the phenomenon in the 1970s and 1980s, that the attitude shifts were dispersed across cohorts and age groups.

However, it is important to underline that causality and the direction of causation are uncertain. Changing attitudes and norms may cause behavior to change; behavior change may push attitudes and norms to adapt; causation may go in both directions. Or attitudes, norms, and behavior may all be reflecting the influence of some other force(s).[72] Nonetheless, many indicators of attitudes and norms that were previously moving in favor of wives' working show a slowdown and possible reversal, which, if not directly causal, seems to be a real phenomenon possibly associated with increasing cross-wage responsiveness.

C. Stories that integrate several factors

The disaggregated estimates in Section A and other evidence in Section B suggest some possible explanations for the end of the several-decades-long trend of shrinking married women's responsiveness to husband's wages. Here we pull some of these threads together into a set of complementary "stories" that may help us further understand the recent changes in responsiveness.

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[72] For example, Rindfuss, Brewster, and Kavee (1996) conclude that labor market behavior changes in the 1970s *preceded* attitude change.

Compositional changes

Changes in the U.S. population's mix of demographic characteristics may be one reason for the recent changes in women's labor force behavior. If, for example, highly educated women are more responsive to their husband's wages than less-educated women (as in Heim 2007), then rising educational attainment among married women will raise the measured elasticity. Note, however, that educational attainment also rose in the 1970s and 1980s, making it less convincing as a root explanation. Similarly, women with young children are more responsive to their husbands' wages than are wives with no children at home, so rising birth rates and family sizes would raise the measured elasticity. As noted above, there is some evidence that intended and actual family sizes have increased for more-educated women. Along the same lines, Gen X women showed increasing responsiveness to their husbands' wages in the late 1990s and early 2000s and also became the majority cohort by 2000, rising to almost three-quarters of prime-age couples by 2006.[73]

Changes in relative bargaining power within marriage

Bargaining power shifts related to increases in husbands' wages may also be behind the increase in married women's cross-wage elasticity, if husbands use their increased bargaining power to buy nonmarket time for their wives. (Other changes in bargaining power, whether from changes in women's wages or from other determinants of wellbeing at the threat point, may affect wives' participation, but not specifically their responsiveness to husbands' wages.)

Overall, married men's wages have continued to fall relative to their wives'.[74] Blau (1998) finds that the female-male hourly earnings ratio among married couples rose an average of about 1.3 percent per year (21.3 percent total) over the 15-year period from 1979 to 1994; our sample shows an average increase of 0.3 percent per year (3.9 percent total) between 1994 and

[73] Note, however, as Heim (2007) indicates, shifting cohort composition cannot "explain" behavioral changes, since the question remains why one cohort behaves differently from another.

[74] Since we estimate the response to husband's wages, controlling for the woman's own wage (equivalent to estimating the response to own relative to husband's), relative wages are the relevant issue.

2006.[75] This suggests that husbands' bargaining power may have declined after the late 1970s, although the rate of decrease slowed in the 1990s. However, this time pattern varies by educational attainment. Between 1994 and 2006, the ratio holds roughly steady for couples in which the husband has earned a college degree or more, while it rises slightly for less-educated couples. On this basis, one might speculate that highly educated husbands held their own during the 1994–2006 period, while less-educated husbands lost ground in both periods.

Husbands may have used their increased bargaining power to decrease their nonmarket time, and/or the slowdown and reversal in egalitarian gender attitudes and social norms may have increased their preference for stay-at-home wives. This would contribute to married women's estimated responsiveness, particularly among the well educated. More and cleaner evidence on the size and role of changes in bargaining power and preferences would be helpful in gaining greater understanding of these changes.

Growing inequality of family incomes

Another potential explanation for the rising effect of husbands' wages on wives' labor supply is increasing inequality of incomes, either directly or via associated changes in social norms. Although U.S. family and household income inequality has been rising since the mid 1970s, both household and family income inequality increased even more substantially in the early 1990s. Furthermore, recent increases in inequality have resulted largely from the pulling away of the top of the distribution, in contrast with the experience of the 1970s and 1980s when rising inequality stemmed from both income losses at the bottom and income increases at the

[75] Blau's sample in each year includes wives and husbands (married to each other), both of whom are between the ages of 25 and 64 and have worked for at least one week during the year. Our sample includes wives and husbands between the ages of 25 and 54; our hourly wage measure is "potential" and includes imputed wages for those not employed.

top.[76] As the incomes of husbands at the top of the earnings distribution move farther and farther ahead of the income of the median-income husband, the measured cross-wage elasticity increases (especially when topcoded CPS wages fail to capture the degree to which this has occurred). Similarly, since marginal tax rates for couples with the highest incomes rose in the early 1990s (relative to marginal rates on incomes of couples in the middle), wives at the top may have been less likely to participate (even controlling for their own wages) which possibly contributed to increased measured responsiveness.

Furthermore, as higher fractions of families attain levels of income that would have characterized them as wealthy according to prior definitions, and as the richest 1 percent become ever richer, the influence of these families—working through social norms—may shift middle- and upper-income families' consumption demands upward along with them. While such a shift may involve the consumption of high-priced market goods, it may also include the "purchase" of wife's specialization in nonmarket time, a phenomenon that has always been more prevalent among the rich. Put another way, the growing inequality of money incomes may translate into a growing inequality of leisure plus home production plus purchased goods and services, with women who have high-wage husbands buying relatively more leisure and/or home production and couples with lower earning power finding this a less feasible option. Indeed, the spread of Martha Stewart products from their high-end genesis (she initially catered posh book-release parties for New York publishing houses) to K-Mart may represent a similar phenomenon, raising expectations for "individually crafted" homes and lifestyles, which require a significant input of nonmarket time from the wife. Among families with children, those who believe that market substitutes for parental care of children are inferior would likely view full-time maternal care as a luxury good, one which couples having ever-higher-earning

[76] The Gini coefficients for family income and household income rose particularly sharply between 1992 and 1993, reflecting changes in data collection methods and increases in income limits for recording data; they declined slightly for a year or two, and then continued climbing at their pre-1992 pace. (U.S. Census Bureau, *Current Population Survey, Annual Social and Economic Supplements*, http://www.census.gov/hhes/www/income/histinc/histinctb.html.) Several authors have documented the degree to which the incomes of the very rich are outpacing those of the rest of the distribution. Piketty and Saez (2006) report steep increases in the income share of the top decile of income tax filers from 1994 to 2000, with the increase concentrated in the top 1 percent, and even more so in the top 0.1 percent. In addition, they show that most of the income growth of the top 0.01 percent reflects growth in salaries, not business or capital income. See also Dew-Becker and Gordon (2005).

husbands can afford and to which others will aspire.[77] Such influences may have been reinforced among the near-rich, as noted earlier, to the degree that child care costs have risen faster for the types of child care preferred by more-educated parents.

Life cycle and timing changes

The change in married women's responsiveness may also be the first stage in a shift in timing of market work and home production across periods in the lifetimes of currently young women, rather than any long-term change in responsiveness or attachment to the work force. Perhaps Gen X women with high-wage husbands are taking extra time out of the labor force to invest in education or in raising their children, but they still plan to be fully attached to the labor force (with lower responsiveness to husbands' wages) later. As life spans increase and the physical demands on the typical job become less demanding, they may also see themselves retiring at older ages.

Evidence presented on women's increasing educational investments, choice of college majors and professional degrees, and their age at first marriage are in line with such an explanation, as is the concentration of increasing responsiveness to husbands' wages among Gen X women. In addition, the declining prevalence of divorce (especially for more-educated women in recent cohorts) and evidence of a decline in the intermittency penalty could reinforce such an impact. The growth in programs, such as those offered by Harvard Business School, Dartmouth, Stanford, and MIT, that specifically serve to reconnect professional women to the labor force after a family-related break is presumably a response to the demand by firms and/or women wanting to return. Determining the importance of this explanation requires longitudinal data and a sufficient time interval to track responsiveness and total labor market involvement over the currently younger cohort's entire lifespan.

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[77] Kimmel and Connelly (2007), using data from the 2003 and 2004 *American Time Use Surveys*, report that the number of weekday and weekend minutes women spend on child care (as distinct from other home production) is an increasing function of their husbands' earnings as well as of their own predicted wages, controlling for the price of child care, number of children by age, and a variety of other determinants.

VI. Conclusions

We document rising responsiveness to husbands' wages in married women's labor force participation decisions in the late 1990s and early 2000s. Our findings are in contrast to previous research showing a steady long-run decline in the cross-wage elasticity and suggest a change in married women's labor supply behavior. The change is particularly pronounced for women with children and younger women. While the trend reverses somewhat toward the end of our period, the responsiveness of married women's labor force participation to husbands' wages was still significantly more negative in 2006 than in 1997.

We identify and explore a number of indicators, looking for possible reasons for the change. We conclude that declining divorce rates, rising child care costs, increasing prevalence of high work hours for high pay—all of which were more pronounced at the high end of the income distribution—along with rising income inequality, some apparent backsliding in attitudes supportive of gender equality in the market and at home, and perhaps a change in lifecycle timing among Gen X women may all have played a role.[78] Further research would be useful in establishing more definite links.

In the meantime, with so many potential contributing factors, each with uncertain paths and potential interactions, it is difficult to speculate about whether this change is likely to be sustained. To the degree that rising inequality (focused at the top of the income distribution) is responsible, we expect responsiveness to continue to rise, unless the future brings some compression or redistribution of income. If the patterns reflect changes in the lifecycle *timing* of Gen X women's work rather than changes in lifetime labor market commitment, we may see small variations in overall responsiveness both upward and downward, depending on the cohort and age composition of the population, how women in the ensuing cohorts approach these timing issues, and other factors that affect timing choices. Attitude changes, especially among younger cohorts, suggest continued high responsiveness as this cohort ages, although just as they changed after the 1980s, attitudes could shift again, or differ for subsequent cohorts.

[78] Changes in the progressivity of the tax system may also have contributed to the measured rise in responsiveness.

All told, considering these reasons as well as unknown future changes in family sizes, childcare costs, the intermittency penalty, and divorce rates, it seems unlikely that married women's participation responsiveness to their husband's wages will soon resume its long-term downward trend.

Appendix A. Data and estimation

This appendix provides additional detail on data and estimation issues described in Sections III, IV, and V.A. of the text.

Comparability issue before 1994

We begin the analysis with January 1994, when the BLS implemented a series of changes, some specifically intended to improve accuracy in measuring women's labor market activity. Prior to 1994, it was assumed that an adult woman at home might be a homemaker, and thus she was asked: "What were you doing most of last week—working, keeping house, or something else?" An adult man at home was asked if he was "working, or something else?" This means that women were more likely to be classified as out of the labor force than as unemployed. In the revised, post-1993 survey, all individuals are asked the same questions. Also, the survey has been reworded to distinguish more accurately between hours spent working at home for pay and hours spent in unpaid work around the house (Polivka and Miller 1998). Studies that use the CPS *March Supplement*, and take as the measure of participation annual hours (the product of usual hours worked per work and weeks worked per year) rather than "in or out of the labor force during the survey week," do not face the same comparability issues (but are not using the "official" measure of participation and have a smaller sample size than pooled monthly observations).

Control variables

In estimating Equation (1), the vector of control variables, Z, in the participation equations includes own and spouse's age and age-squared, own and spouse's race and ethnicity (dummy variables for being black non-Hispanic, other non-Hispanic, and Hispanic, with white non-Hispanic as the omitted category), a measure of the cost of living (for each state, we average five years of the cost of living index compiled by Leonard et al. 1995–99), a measure of labor demand conditions (the unemployment rate in the individual's state of residence averaged over three months prior to the observation), the woman's Census division (region), and month dummies. In some versions, Z also includes the number of children by age.

Topcode adjustment

Following the literature, we adjust topcoded earnings values so that they represent the mean earnings of all topcoded individuals. The CPS topcode for "usual weekly earnings" moved up from $1923 in 1997 and before to $2885 in 1998 and thereafter. The BLS does not publish actual mean earnings of individuals above the topcode in the monthly CPS, so we use an adjustment that raises the nominal topcode mean with inflation and is anchored at the multiple 1.5 in 1997 and in 2004. We also perform a robustness check on this topcode adjustment. (See Appendix B.)

Imputing wages

We assign wages to the following list of individuals who lack "valid" wage observations: those who are unemployed, out of the labor force, or self-employed; those whose wages and hours variables have been allocated by CPS data processors; those whose calculated real wages are under $2.00 per hour or more than $200 per hour; and those whose wages or hours are missing for any other reason. We estimate wage equations for each year, separately by sex, using data on all married civilians employed in wage and salary employment who have valid wages (they are not included in the list above of individuals who lack "valid" wage observations). This wage equation includes own age and age-squared, own race and ethnicity, cost of living, state unemployment rate, Census division, and month, plus own education, dummy variables for being foreign born, whether living in a metro area, whether the metro area has a population greater than one million, and the Mills ratio from a Heckman selection procedure (Heckman 1979). In the Heckman procedure, we include any variables in the selection equation that are consistently included in the participation equation.

Elasticity estimates

We obtain elasticity estimates by calculating the elasticity for each observation evaluated at that observation's values of the explanatory variables and taking the mean over all observations. Error bands are computed in a similar manner, evaluating the elasticity for each individual using the wage coefficient plus or minus twice its standard error. Because the equations are probits, we predict the dependent variable and its perturbation with a small

change in the wage, and then convert to the predicted participation probability using the normal distribution. The procedure is simpler for the hours elasticities because the estimating equations are linear. But we constrain the predicted values of hours to be greater than zero and perform the wage-change exercise around that constrained prediction, in order to avoid extremely large elasticities for individuals whose predicted hours are very close to zero. A simple hours elasticity evaluated at the means of all variables is slightly more negative (by 0.01 to 0.02) than what we obtain by computing the mean elasticity across all individuals, and it increases (in absolute value) slightly more (by about 0.005) between 1997 and 2002 than the individual-mean version.

Appendix B. Robustness Checks

Topcoding

To ensure that our findings do not result from either of the key elements of our topcode adjustment—raising the nominal value of the assumed above-topcode mean earnings with inflation and including the 1998 jump in the CPS topcode in our estimates—we reverse both of them in our robustness check. The CPS raised topcode values for weekly earnings from $1,923 in 1997 to $2,885 in 1998, so we re-estimate the equations imposing the 1997 topcode value in years after 1997. We also remove the inflation adjustment throughout the 1994–2006 period. (That is, we use the same 1.5 multiple in all years for all earnings values at or above $1,923.) With these changes, the time pattern of estimated elasticities is virtually identical to those reported in Table A2—the biggest difference (in absolute value) amounts to about 1.5 percent of the elasticity estimates themselves (for example, a difference of 0.002 for a cross-wage elasticity in the vicinity of -0.15).

Data from CPS Annual Supplement

Using the CPS *March Supplement* data on hours and earnings in the preceding calendar year, Blau and Kahn (2007) estimate married women's annual hours elasticities for "1980," "1990," and "2000" (pooled data from 1979–80–81, 1989–90–91, and 1999–00–01). They find substantial declines in married women's cross-wage elasticity at the end as compared with the beginning of each decade, although the decline is smaller between 1990 and 2000 than between 1980 and 1990. While our estimating equations are similar, our wage measures and our participation measures differ: We measure wages as usual weekly earnings divided by usual weekly hours from the monthly CPS, while they use annual earnings divided by annual work hours from the *March Supplement*. Our dependent variable is the standard participation measure (in or out of the labor force) from the monthly CPS; theirs is annual work hours.

These differences and similarities prompted us to ask whether our apparently different finding of increased responsiveness to husbands' wages after 1997 might have resulted from the difference in the time period or from the participation and/or wage measures. To investigate this question, we estimated Blau and Kahn's annual hours equations using CPS *March*

Supplement data for 1995–96–97 and 2002–03–04—that is, we used their equations and data source but chose three-year-period end-points corresponding to our estimates of the smallest and largest cross-wage elasticities. This procedure yields larger estimates of married women's cross-wage elasticity in 2003 than in 1996 and suggests that the difference in findings is the result of the time period considered rather than the data source or estimation method. By choosing decade end-points for analysis, Blau and Kahn apparently miss the elasticity trough and peak, and thus are comparing years between which responsiveness declined.

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Table 1

Married Women's Elasticities of Participation with Respect to Wages, Selected Years

	1994	1997	2000	2003	2006
Cross-wage elasticities					
Controlling for children	-0.092	-0.096	-0.140	-0.134	-0.133
Not controlling for children	-0.103	-0.107	-0.156	-0.153	-0.146
Own-wage elasticities					
Controlling for children	0.247	0.222	0.210	0.201	0.217
Not controlling for children	0.235	0.204	0.192	0.185	0.199

Notes:

Equations that control for children include measures of number of children by age group.

Equations are estimated using instrumental variables probit, treating own and spouse wages as endogenous; elasticities calculated across weighted individual observations

All equations also control for own and spouse age and age-squared, own and spouse race and ethnicity, state unemployment rate, month, division, and state cost of living index.

Table 2

Tests of Change in Wage Coefficients over Time, Selected Years

Estimated coefficients (standard errors in parentheses)

	Base year	Interaction terms for selected later years					
	1997	1999	2000	2002	2003	2004	2006
Participation elasticities							
Controlling for children:							
Own wage	0.5040 ***	0.0132	-0.0316	-0.0187	-0.0688 **	-0.0389	-0.0285
	(0.0230)	(0.0326)	(0.0326)	(0.0316)	(0.0315)	(0.0315)	(0.0319)
Spouse wage	-0.2172 ***	-0.1008 ***	-0.0978 ***	-0.1232 ***	-0.0721 ***	-0.0880 ***	-0.0737 ***
	(0.0183)	(0.0263)	(0.0264)	(0.0254)	(0.0254)	(0.0255)	(0.0256)
Not controlling for children:							
Own wage	0.4651 ***	0.0143	-0.0318	-0.0237	-0.0649 **	-0.0422	-0.0281
	(0.0223)	(0.0315)	(0.0316)	(0.0306)	(0.0305)	(0.0305)	(0.0309)
Spouse wage	-0.2436 ***	-0.1056 ***	-0.1065 ***	-0.1332 ***	-0.0883 ***	-0.1078 ***	-0.0769 ***
	(0.0179)	(0.0258)	(0.0259)	(0.0249)	(0.0249)	(0.0250)	(0.0251)
Hours elasticities							
Controlling for children:							
Own wage	8.321 ***	0.068	-0.369	-0.386	-0.767 **	-0.358	-0.279
	(0.227)	(0.325)	(0.327)	(0.315)	(0.318)	(0.319)	(0.319)
Spouse wage	-4.608 ***	-1.254 ***	-1.228 ***	-1.427 ***	-1.003 ***	-1.309 ***	-1.114 ***
	(0.222)	(0.320)	(0.321)	(0.308)	(0.310)	(0.311)	(0.312)
Not controlling for children:							
Own wage	8.224 ***	0.065	-0.391	-0.511	-0.856 ***	-0.494	-0.403
	(0.233)	(0.333)	(0.336)	(0.323)	(0.326)	(0.327)	(0.327)
Spouse wage	-5.185 ***	-1.422 ***	-1.447 ***	-1.669 ***	-1.318 ***	-1.722 ***	-1.228 ***
	(0.229)	(0.330)	(0.332)	(0.318)	(0.320)	(0.321)	(0.321)

Note: Coefficients are estimated by pooling two years of data and including interaction terms for all variables for later year.
Hence coefficients on interaction terms indicate difference in coefficient in later year as compared to base year.
Furthermore, t-test of interaction-term coefficient indicates whether the later year's coefficient is significantly different from the coefficient in the 1997 base year.
Asterisks indicate coefficient is significantly different from zero at the following confidence level:
***99 percent or greater; ** 95-99 percent; *90-95 percent.

Figure 1

Married women's labor supply

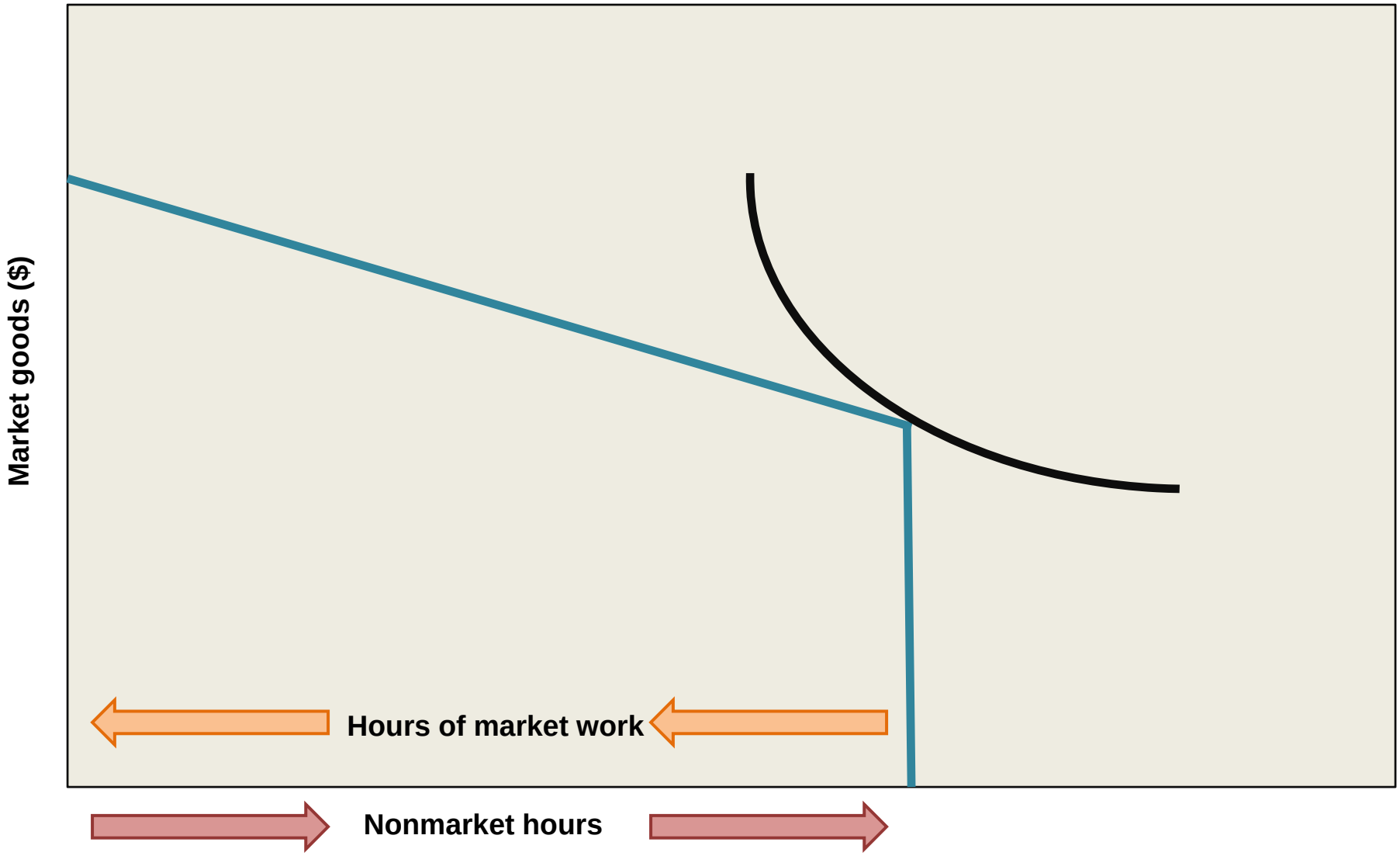

Figure 2

Wage elasticities, married women and men
(weighted elasticities, unweighted regressions)

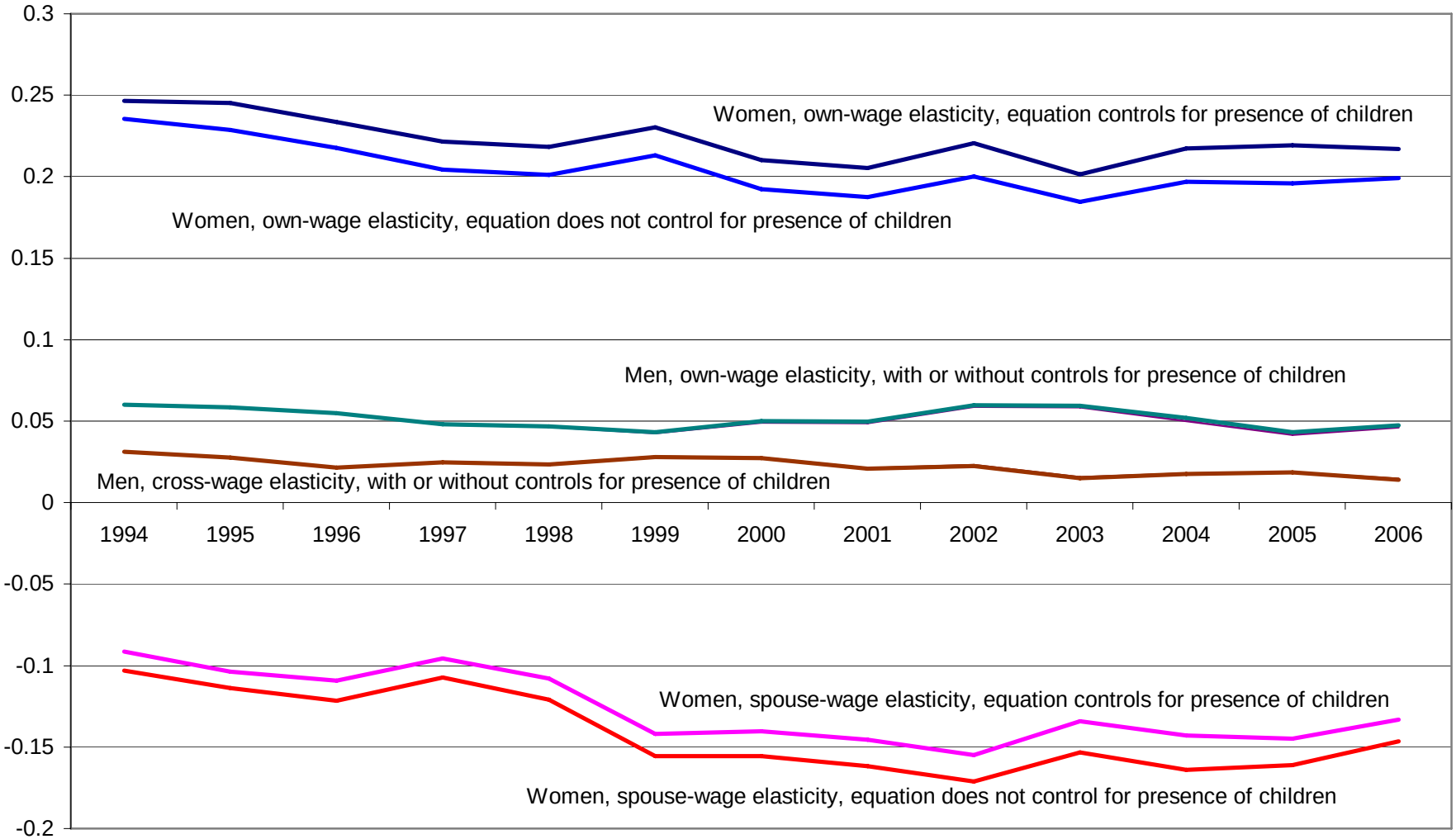

Figure 3

Cross-wage elasticities and error bands
(equations control for children, elasticities are weighted)

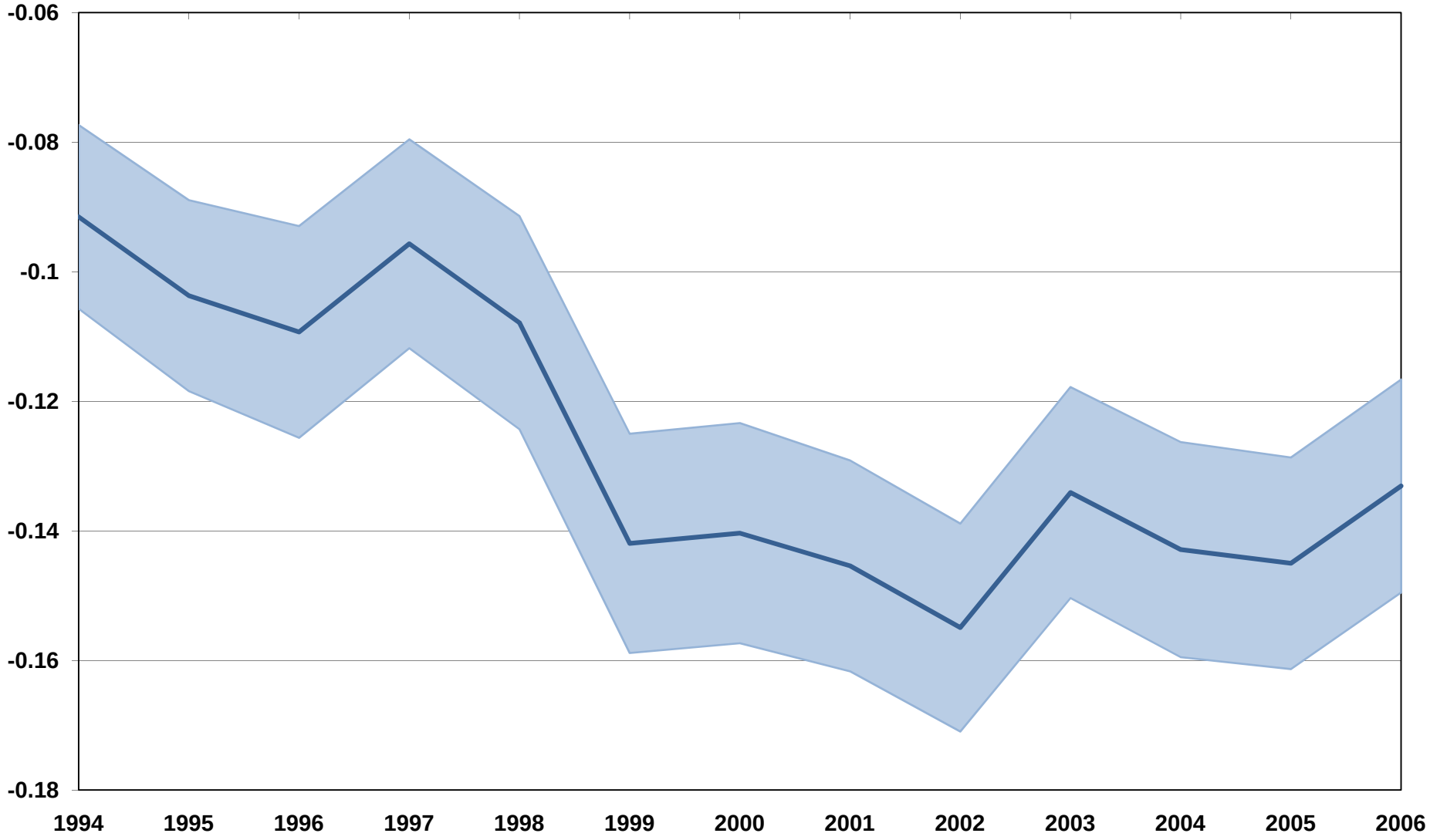

Figure 4

Cross-wage elasticities of participation and weekly hours, with error bands
Equations are unweighted instrumental variables and control for children; elasticities are weighted

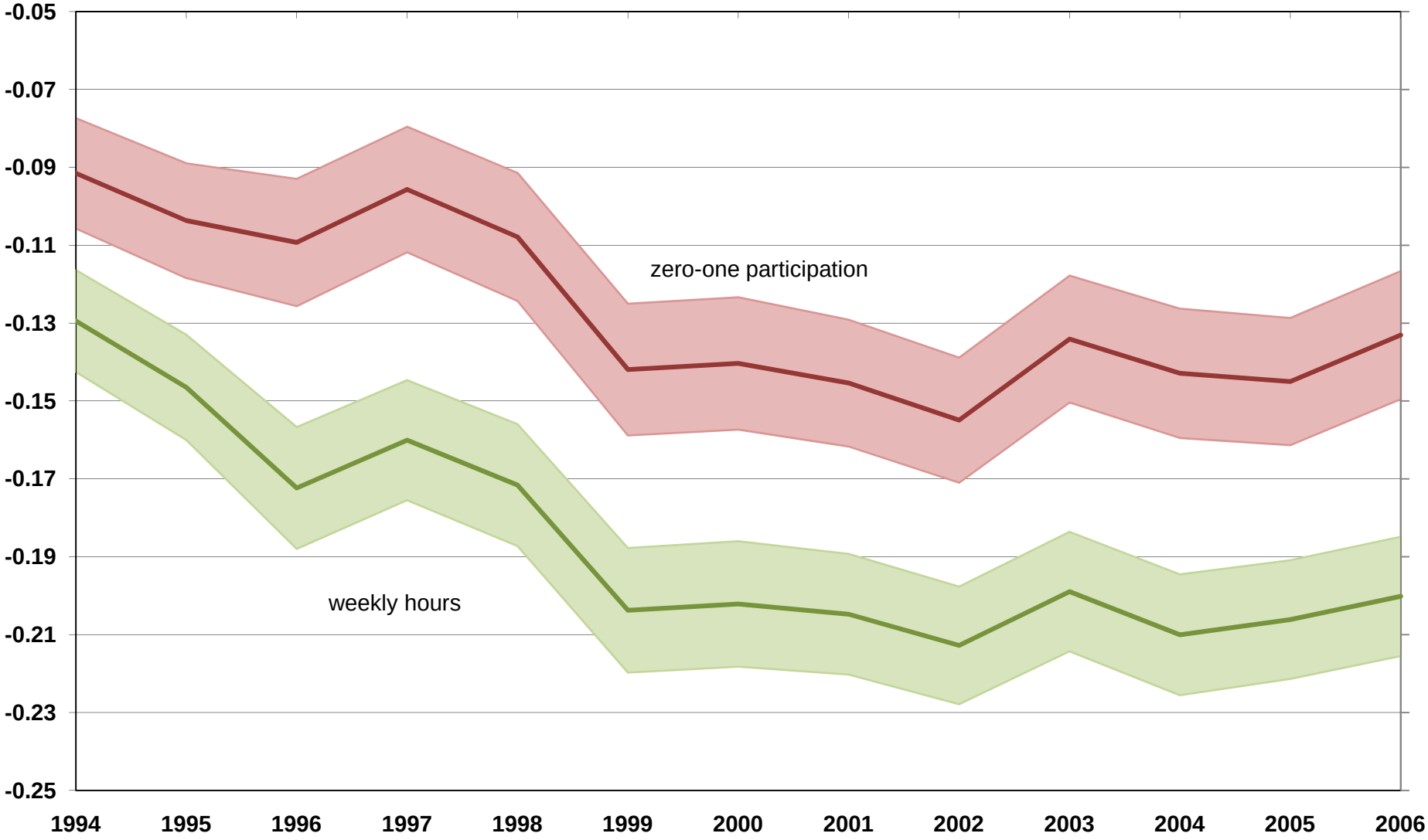

Figure 5

Cross-wage elasticities and error bands by birth-year cohort
(equations control for children, elasticities are weighted)

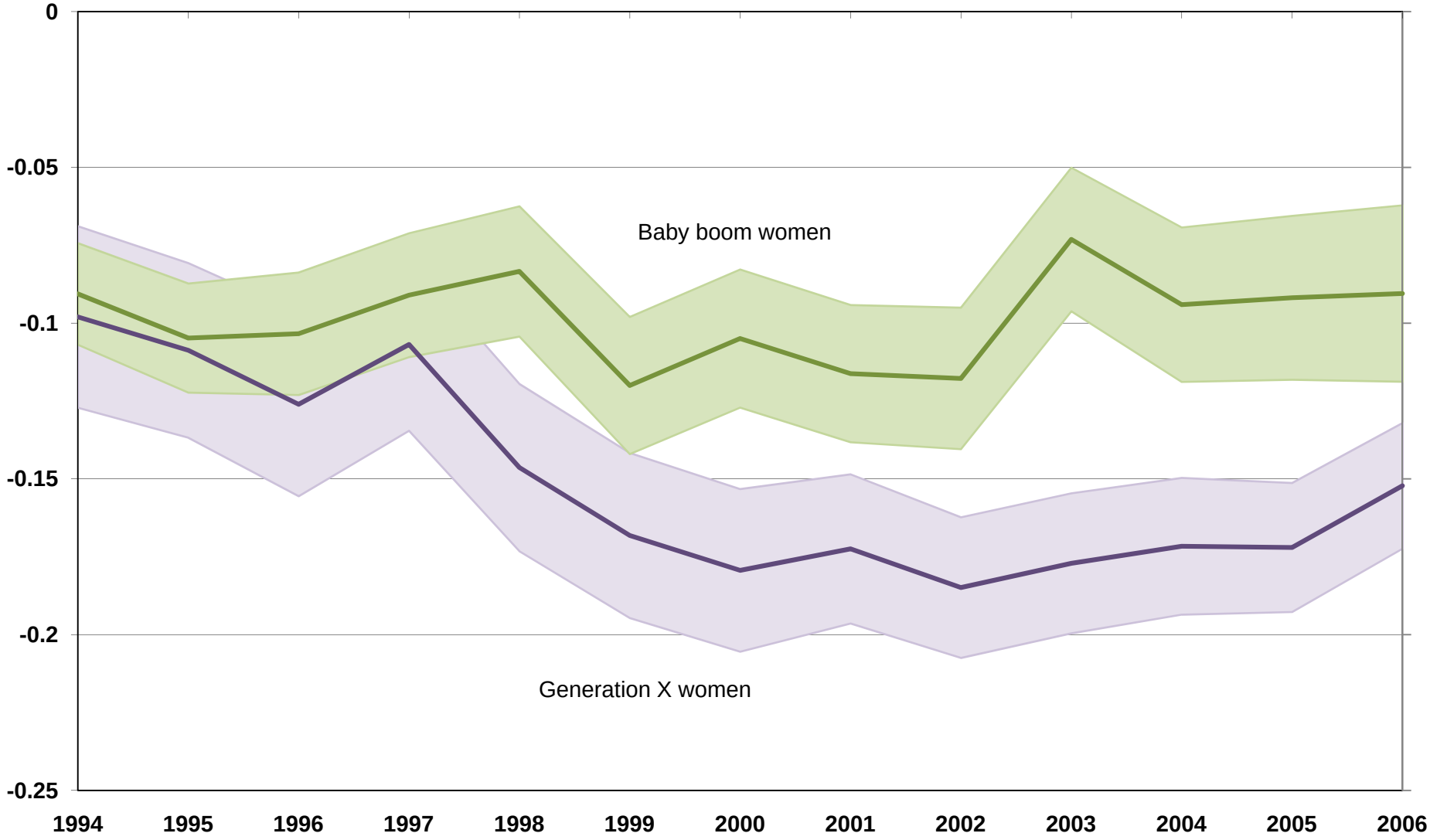

Figure 6

Cross-wage elasticities and error bands, women with and without children
(equation controls for children, elasticities are weighted)

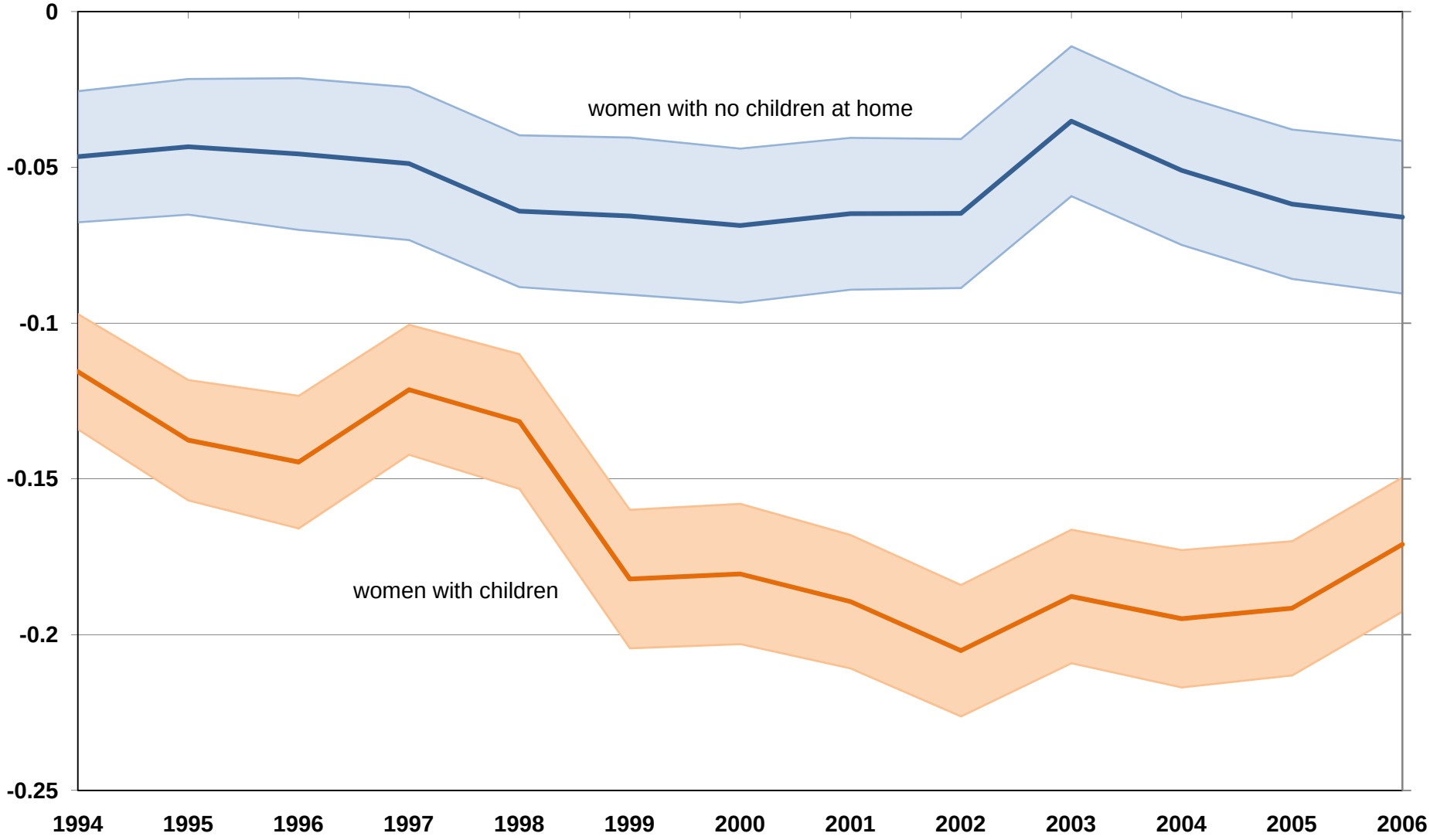

Table A1
Descriptive Statistics

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Variable means married men and women ages 25-54													
Women's participation rate (percent)	75.2	75.2	75.6	75.8	75.4	75.4	75.3	75.2	75.3	74.9	74.4	75.0	74.9
Men's participation rate (percent)	94.9	94.8	94.9	94.9	95.1	94.9	94.8	94.7	94.6	94.4	94.4	94.5	94.5
Women's hourly wage rate (ln)	2.41	2.42	2.42	2.45	2.49	2.51	2.53	2.56	2.58	2.59	2.59	2.60	2.60
Men's hourly wage rate	2.76	2.77	2.77	2.79	2.82	2.85	2.87	2.89	2.90	2.90	2.90	2.90	2.91
Women's usual weekly hours*	26.6	26.7	26.9	27.1	27.1	27.1	27.2	27.0	26.9	26.7	26.7	27.0	27.1
Number of observations													
Participation	53,352	53,173	46,764	46,572	46,091	46,330	45,941	48,774	52,303	51,236	49,403	48,176	46,847
Hours*	51,571	51,544	45,338	45,338	44,958	45,233	44,836	47,488	50,747	49,765	48,021	46,866	45,702
Fraction of sample in subgroup:													
Generation X	30.1%	33.2%	36.6%	40.2%	43.1%	46.6%	50.2%	53.4%	57.3%	61.0%	64.8%	68.6%	72.4%
With children <18	68.1%	67.8%	68.2%	68.3%	67.9%	67.4%	67.1%	66.8%	67.3%	67.2%	66.9%	67.0%	67.6%

*The hours analysis excludes the unemployed (who are labor force participants) and excludes those at work who have missing hours (usual weekly hours vary and we cannot fill in with hours last week or contract hours). Nonparticipants are included with zero hours. Hours are measured on primary job.

Table A2

Elasticities of participation or hours with respect to wages, full sample

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Women -- Participation													
Cross-wage elasticities													
Controlling for children	-0.092	-0.104	-0.109	-0.096	-0.108	-0.142	-0.140	-0.145	-0.155	-0.134	-0.143	-0.145	-0.133
Not controlling for children	-0.103	-0.114	-0.122	-0.107	-0.121	-0.156	-0.156	-0.162	-0.171	-0.153	-0.164	-0.161	-0.146
Own-wage elasticities													
Controlling for children	0.247	0.245	0.234	0.222	0.218	0.230	0.210	0.205	0.220	0.201	0.217	0.219	0.217
Not controlling for children	0.235	0.229	0.218	0.204	0.201	0.213	0.192	0.188	0.200	0.185	0.197	0.196	0.199
Men -- Participation													
Cross-wage elasticities													
Controlling for children	0.031	0.028	0.022	0.025	0.024	0.028	0.028	0.021	0.023	0.015	0.018	0.019	0.014
Not controlling for children	0.031	0.027	0.021	0.025	0.024	0.028	0.027	0.021	0.022	0.015	0.018	0.019	0.014
Own-wage elasticities													
Controlling for children	0.060	0.058	0.055	0.048	0.046	0.043	0.049	0.049	0.059	0.058	0.050	0.041	0.046
Not controlling for children	0.060	0.058	0.055	0.048	0.047	0.043	0.050	0.050	0.060	0.060	0.052	0.043	0.047
Women -- Usual Weekly Hours													
Cross-wage elasticities													
Controlling for children	-0.129	-0.146	-0.172	-0.160	-0.172	-0.204	-0.202	-0.205	-0.213	-0.199	-0.210	-0.206	-0.200
Not controlling for children	-0.144	-0.161	-0.189	-0.177	-0.190	-0.225	-0.225	-0.229	-0.237	-0.226	-0.240	-0.230	-0.221
Own-wage elasticities													
Controlling for children	0.246	0.266	0.308	0.289	0.288	0.292	0.275	0.272	0.280	0.268	0.283	0.281	0.281
Not controlling for children	0.246	0.260	0.301	0.280	0.279	0.283	0.266	0.260	0.267	0.256	0.269	0.264	0.269

Notes:

Participation elasticities computed from instrumental variables probit estimated coefficients applied to individual observations; see text.

Hours elasticities computed from estimated coefficients from linear instrumental variables regressions applied to individual observations; denominator (individual predictions of hours) is constrained to be positive. See text.

Table A3

Married women's elasticities of participation with respect to wages, by subgroup

Based on coefficient estimates from IV probit regressions with full interaction for subgroups

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Elasticity with respect to husband's wage													
Separately by woman's birth year													
Born in 1960 or earlier (Baby Boom)													
Controlling for children	-0.091	-0.105	-0.103	-0.091	-0.083	-0.120	-0.105	-0.116	-0.118	-0.073	-0.094	-0.092	-0.090
Not controlling for children	-0.103	-0.117	-0.116	-0.104	-0.098	-0.136	-0.119	-0.130	-0.130	-0.084	-0.104	-0.103	-0.101
Born after 1960 (Generation X)													
Controlling for children	-0.098	-0.109	-0.126	-0.107	-0.146	-0.168	-0.179	-0.172	-0.185	-0.177	-0.172	-0.172	-0.152
Not controlling for children	-0.108	-0.113	-0.136	-0.116	-0.156	-0.179	-0.196	-0.192	-0.205	-0.202	-0.199	-0.191	-0.167
Separately for women with and without children at home													
With children:													
Controlling for children	-0.116	-0.138	-0.145	-0.121	-0.132	-0.182	-0.181	-0.189	-0.205	-0.188	-0.195	-0.192	-0.171
Not controlling for children	-0.125	-0.147	-0.155	-0.132	-0.144	-0.196	-0.195	-0.205	-0.222	-0.207	-0.214	-0.208	-0.183
No children:													
One version	-0.047	-0.043	-0.046	-0.049	-0.064	-0.066	-0.069	-0.065	-0.065	-0.035	-0.051	-0.062	-0.066
Elasticity with respect to own wage													
Separately by woman's birth year													
Born in 1960 or earlier (Baby Boom)													
Controlling for children	0.257	0.267	0.235	0.231	0.212	0.238	0.220	0.214	0.210	0.173	0.199	0.204	0.209
Not controlling for children	0.230	0.234	0.203	0.200	0.183	0.208	0.192	0.186	0.185	0.152	0.180	0.187	0.193
Born after 1960 (Generation X)													
Controlling for children	0.223	0.212	0.230	0.219	0.227	0.226	0.204	0.203	0.239	0.224	0.230	0.232	0.224
Not controlling for children	0.272	0.244	0.259	0.227	0.232	0.225	0.200	0.195	0.220	0.211	0.210	0.205	0.207
Separately for women with and without children at home													
With children:													
Controlling for children	0.233	0.228	0.223	0.200	0.192	0.200	0.190	0.184	0.210	0.207	0.202	0.213	0.213
Not controlling for children	0.202	0.190	0.185	0.161	0.154	0.164	0.153	0.145	0.171	0.170	0.161	0.173	0.183
No children:													
One version	0.246	0.257	0.225	0.236	0.246	0.262	0.224	0.229	0.221	0.178	0.223	0.215	0.209

Notes: Elasticities computed from instrumental variables probit estimated coefficients applied to individual observations; see text.