Economic Inquiry

WHY ARE U.S. WOMEN DECREASING THEIR LABOR FORCE PARTICIPATION IF THEIR WAGES ARE RISING?

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Given the traditional interpretation of women's labor force participation rate (LFPR) trends as movements along a positively sloped labor supply curve, it is surprising that the recent downward trend in U.S. women's LFPR has occurred over a period when women's real wages were commonly believed to be rising. I find that almost two-thirds of the decline since 2000 is attributable to aging of the adult female population. The remainder, due to declining labor force participation for women under 55, becomes less puzzling in light of my evidence that the wage/education locus faced by women actually may have worsened since 2000. (*JEL* J21, J31, J82)

I. INTRODUCTION

For many decades, the labor force participation rate (LFPR) of U.S. women rose along with their real wages. Claudia Goldin's Ely Lecture to the American Economic Association (2006) described women's increased engagement in market work as "the most significant change in labor markets during the past century." The traditional economic interpretation of this trend was that it represented a movement along a positively sloped labor supply function, in which the substitution effect of rising wages dominated the income effect (Ashenfelter and Heckman 1974; Mincer 1962; Smith and Ward 1985).[1]

More recently, however, the trend has changed. As shown in Figure 1, based on the Integrated Public Use Microdata Series (IPUMS) version of the March Current Population Survey (CPS), the LFPR for women, at least 16 years old, had hit a "plateau" by the late 1990s. This development already has been documented in several recent studies.[2] But Figure 1 also shows that, instead of remaining on a plateau, U.S. women's LFPR has declined since 2000, moving from 61% in 2000 to 57% in 2015. The annual average LFPR statistics reported by the Bureau of Labor Statistics, which are based on all 12 CPS months, show a similar post-2000 decline, from 59.9% in 2000 to 56.7% in 2015. Figure 2 shows similar trends for women in the 25–54 age range. This downward trend is unique among the 35 Organization for Economic Cooperation and Development (OECD) countries. Between 2000 and 2014, for all OECD countries except for the United States, the LFPR trend for women aged 15–64 either goes up (e.g., France, Germany, Greece) or remains relatively stable (e.g., Finland, Denmark). No OECD country shows a declining trend in female LFPR like the United States does. Blau and Kahn (2013) report that

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1. A recent literature (Bishop, Heim, and Mihaly 2009; Blau and Kahn 2007; Heim 2007) finds that U.S. women's wage elasticity of labor supply is now lower than it used to be, but still finds it to be positive.

2. See Lee (2014) and the references therein. The apparent arrival of the plateau may have been slightly delayed by the 1994 CPS redesign, which Polivka and Miller (1998) find raised the measured female LFPR by about 1 percentage point.

ABBREVIATIONS

CPI-U-RS: Consumer Price Index Research Series
CPS: Current Population Survey
IPUMS: Integrated Public Use Microdata Series
LFPR: Labor Force Participation Rate
OECD: Organization for Economic Cooperation and Development
ORG: Outgoing Rotation Groups
PCE: Personal Consumption Expenditures
PSID: Panel Study of Income Dynamics

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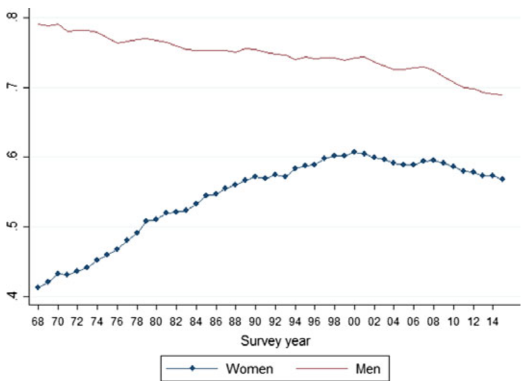
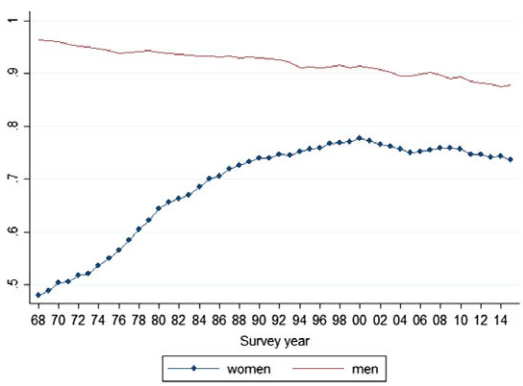
FIGURE 1
Labor Force Participation Rates for Men and Women, Aged 16 or Older



Note: This figure shows civilian labor force participation rates for U.S. men and women, aged 16 or older based on IPUMS March CPS data (1968–2015).

FIGURE 2
Labor Force Participation Rates for Men and Women, Aged 25–54

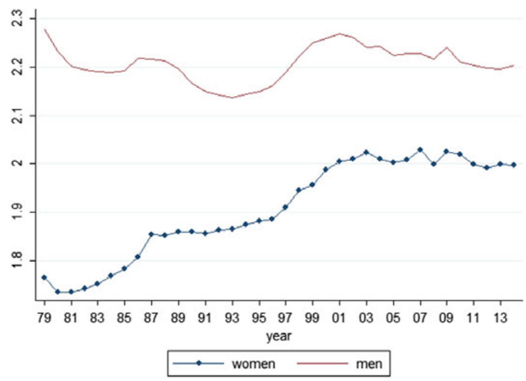


Note: This figure shows civilian labor force participation rates for U.S. men and women, aged 25–54 based on IPUMS March CPS data (1968–2015).

U.S. women's LFPR was the sixth highest among 22 OECD countries in 1990, but it fell to 17th in 2010.

While U.S. women's labor force participation has been decreasing, their real wages are commonly believed to be rising. Eckstein and Lifshitz (2011) document the rise in women's wages until the Great Recession, and Moffitt (2012) divides the female population into different age and education groups and finds that real wages were

FIGURE 3
Log Hourly Earnings for Men and Women, Aged 25–54



Note: I calculate the average log hourly earnings for both men and women aged 25–54 between 1979 and 2014 using IPUMS March CPS data. I restrict my sample to people who were not self-employed and worked at least 100 hours over the year, and I exclude the cases where either income or work hours are imputed. I measure hourly earnings by annual wage and salary income divided by work hours in the same year. All numbers are adjusted by the CPI-U-RS and the base year is chained: 1982–1984 = 100.

rising for most age-education groups between 1999 and 2007. Elsby, Shin, and Solon (2016) look beyond 2007 and find that women's real wage growth stalled out during the Great Recession. With some additional years of data, Figure 3 shows that the upward trend in women's real wages that went beyond 2000 had not resumed as of 2014.[3]

Given the traditional interpretation of women's labor force participation trends as movements along a positively sloped labor supply curve, it is surprising that the recent downward trend has occurred during a period when women's real wages appeared to be growing before stalling out during the Great Recession. This raises this paper's main question: Why are U.S. women decreasing their labor force participation if their wages are at a higher level than before?

This question has not been answered in the existing literature. The small "post-plateau" literature includes Macunovich (2010), who studied

3. Income and hours statistics in March CPS data are for the previous calendar year, so the 1980–2015 surveys generate average hourly earnings measures for 1979–2014. I express these in 1982–1984 dollars by deflating by the CPI-U-RS. Because the survey question about income changed slightly in 1980, I exclude survey years before 1980 to have a consistent measure.

labor force participation of women aged 25–54 through 2009; Moffitt (2012), who studied the employment/population ratio for women aged 16–64 through 2007; Aaronson et al. (2014), who discussed labor force participation through 2014; and Black, Schanzenbach, and Breitwieser (2017), who focused on the long-run trend in prime-age women's labor force participation. Generally, these studies find that the downward trend is common across women of ages below 55 and different races, educational backgrounds, and marital statuses. In addition, there is no measured factor that is found to be powerful in explaining the decline in women's labor force participation. Hence, the question raised above remains unsolved. My study extends the earlier work in several ways. First, my analysis extends through 2015. Second, unlike some of the previous studies, I include women older than 54 and 64. Third, and most important, I discover the potentially important role of declining real wages for women.

My analysis proceeds in two steps. In Section II, I replicate the literature on U.S. women's LFPR and I update it to 2015. Using shift-share analyses and Oaxaca decompositions to disaggregate the LFPR trend with respect to several demographic characteristics, I look in detail at the decline and find that almost two-thirds of the 4-percentage-point drop in the LFPR between 2000 and 2015 is attributable to the aging of the adult female population.[4] In particular, the population share increased for those aged 55–69, who have relatively low labor force participation, and decreased for those aged 30–49, who have relatively high labor force participation. Another insight from this exercise is that the other third of the 4-percentage-point drop comes mainly from within-group decreases in labor force participation for those under the age of 55. This leads to my paper's main question: Why did women under age 55 decrease their labor force participation if their real wages were rising?

In Section III, I conduct Oaxaca decompositions of women's post-2000 real wage changes using both March CPS and Panel Study of Income Dynamics (PSID) data. I discover that the apparent increase in women's real wages is more than accounted for by the large increase in women's educational attainment. Once I condition on education, U.S. women's real wages have not increased since 2000 and may even have decreased by a few percentage points. Thus, the locus of wage/education opportunities faced by U.S. women has not improved since 2000 and may have worsened. Viewed in that light, the LFPR decrease for women under age 55 becomes less surprising.

These findings point in a new direction for understanding women's LFPR decline. Discovering that during the period 2000–2015, the LFPR for women under age 55 dropped while their real wages were decreasing implies that the decline in their labor force participation may be more consistent with a labor demand shift along a positively sloped labor supply curve. For some time, much of the discussion about the decline in men's labor force participation has focused on labor-demand-related explanations because men's wages have stagnated or fallen. Given that women's real wages also were stagnant or decreasing, perhaps women are now responding to the same forces as men. My findings suggest that future researchers should consider whether the recent decline in women's labor force participation is related to the same demand-side factors (such as globalization and technological change) that many analysts (such as Council of Economic Advisers 2016) have used to account for men's declining labor force participation.

II. LFPR DISAGGREGATION

In this section, I disaggregate women's LFPR and investigate the details of its decline since 2000. My data come from the IPUMS version of the March CPS (Ruggles et al. 2015) between 1968 and 2015. I restrict my sample to noninstitutionalized civilian women aged 16 and above, and I use CPS supplement weights in all analyses. The LFPR is defined as the share of the population that is either employed or unemployed. I start with a shift-share analysis of how women's LFPR changes with their age structure and education. Then I move to Oaxaca decompositions and further examine compositional changes in other demographic characteristics, including marital status, child rearing, and race.

A. Shift-Share Analysis

First, I perform shift-share analyses to disaggregate women's LFPR by age. The 2000–2015 period over which women's LFPR declined is a period in which the baby boomers started reaching retirement age. It seems plausible that this

4. This finding of the important role of changing age composition is consistent with some recent studies on U.S. aggregate labor force participation rates (e.g., Aaronson et al. 2014; Krueger 2017).

aging of the adult female population might play a role in the post-2000 decline in women’s labor force participation.

The shift-share methodology disaggregates the change in women’s LFPR into two parts: a composition effect and a within-group effect. The composition effect describes how much changes in age structure shift overall female LFPR by holding women’s LFPR for each age group constant at its base year level. The within-group effect is measured by holding age groups’ population shares constant. I divide the sample into 13 age groups: 16–19, 20–24, 25–29, …, 65–69, 70–74, and 75 and above.

The equation for doing the disaggregation is:

$$\bar{y}_t - \bar{y}_s = \sum_g \pi_t^g \bar{y}_t^g - \sum_g \pi_s^g \bar{y}_s^g$$

$$= \sum_g \pi_t^g \bar{y}_t^g - \sum_g \pi_t^g \bar{y}_s^g + \sum_g \pi_t^g \bar{y}_s^g - \sum_g \pi_s^g \bar{y}_s^g$$

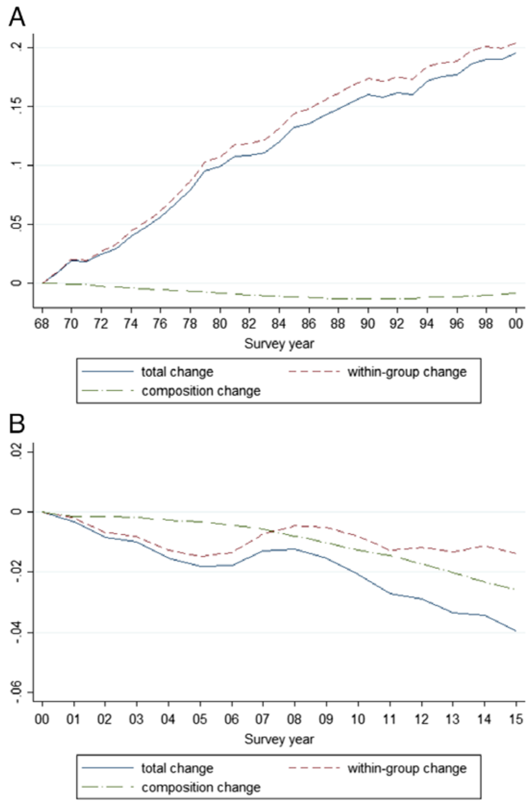
$$\text{(1)} \qquad = \sum_g \left(\pi_t^g - \pi_s^g\right) \bar{y}_s^g + \sum_g \pi_t^g \left(\bar{y}_t^g - \bar{y}_s^g\right)$$

where $\bar{y}_t$ is the overall LFPR in year t, and the left-hand side of the above equation is the total change in women’s LFPR from year s to year t. Age group is indexed by g. π_t^g denotes the population share of age group g in year t, and $\bar{y}_t^g$ is the LFPR of age group g in year t. Thus, the first term on the last line of the right side of Equation (1) captures the composition effect from population share changes between years t and s, and the second term is the within-group effect from LFPR changes within each age group.

I perform this shift-share analysis separately for the 1968–2000 period of women’s rising labor force participation and the 2000–2015 period of declining participation. In each analysis, I use the earliest year as base year s. The year-by-year shift-share decomposition results are shown in Figure 4. First, consistent with the findings in Lee (2014), the rise in the female LFPR between 1968 and 2000 comes from within-group increases. The composition effects are always negative and very close to zero, which suggests that the age structure change in 1968–2000 had little impact on the overall trend in female labor force participation.

The results for the 2000–2015 period are very different. According to Panel B in Figure 4, the within-group effect is somewhat volatile, reflecting cyclical movements associated with the period’s two recessions. Once the dust has settled in 2015, though, about two-thirds of the 4-percentage-point reduction in the LFPR is due to

FIGURE 4
Decomposition of the LFPR Changes for Women Aged 16 and Older. (A) 1968–2000 and (B) 2000–2015



Note: The shift-share analyses disaggregate changes in women’s LFPR between the base year, which is 1968 in Panel A and 2000 in Panel B, and each year after then into a composition effect from population share changes and a within-group effect from LFPR changes within each age group.

age composition changes, and about one-third is due to within-group changes.

The details of the 2000–2015 disaggregation are spelled out in Table 1. The “Total” row at the bottom of the table shows that the LFPR declined by almost 4 percentage points, from 60.69 to 56.73, with 2.58 of that decline coming from the age composition effect.[5] Inspection of

5. Alternatively, Equation (1) can be written as $\sum_g \left(\pi_t^g - \pi_s^g\right) \bar{y}_t^g + \sum_g \pi_s^g \left(\bar{y}_t^g - \bar{y}_s^g\right)$, where within-group effects are calculated by holding population shares unchanged at base year levels and composition effects are the sum of changes in population shares within each age group weighted by their LFPR in year t. I have run the disaggregation in this alternative way and verified that my results are not sensitive to which version I use.

TABLE 1
Disaggregation of Female LFPR by Age Groups between 2000 and 2015

	Composition Effect	Within-Group Effect	2000 LFPR ($\bar{y}_s^g$)	2015 LFPR ($\bar{y}_t^g$)	2000 Population (π_s^g)	2015 Population (π_t^g)
16–19	−0.45	−0.99	48.75	33.13	7.25	6.33
20–24	0.01	−0.53	72.48	66.39	8.49	8.51
25–29	−0.13	−0.36	77.98	73.68	8.56	8.40
30–34	−0.64	−0.30	76.21	72.52	9.10	8.25
35–39	−1.98	−0.18	75.97	73.64	10.38	7.78
40–44	−2.07	−0.37	79.91	75.21	10.47	7.88
45–49	−0.95	−0.37	79.55	74.99	9.28	8.09
50–54	0.64	−0.34	75.91	72.09	7.96	8.80
55–59	1.47	0.34	62.75	66.74	6.23	8.57
60–64	1.07	0.72	41.40	50.79	5.05	7.63
65–69	0.39	0.56	20.71	29.39	4.58	6.45
70–74	0.03	0.28	10.28	16.16	4.39	4.68
75+	0.01	0.17	3.91	5.83	8.27	8.64
Total	−2.58	−1.37	60.69	56.73		

Notes: All numbers are in percentage points. The disaggregation of female LFPR by age groups between 2000 and 2015 is based on Equation (1), in which the composition effect is the change in population share within each age group times its LFPR in 2015, and the within-group effect is the LFPR change holding population shares unchanged at the level in 2000. The composition effect and the within-group effect in the "Total" row at the bottom is calculated by adding up the numbers in the same column.

the last four columns makes clear where that composition effect comes from. Between 2000 and 2015, the population shares of age groups 55–59, 60–64, and 65–69 grew considerably, and those groups have relatively low labor force participation. At the same time, population shares declined appreciably for age groups 30–34, 35–39, 40–44, and 45–49, groups with relatively high labor force participation.

The other 1.37 of the LFPR decline comes from the within-group changes displayed in the "within-group effect" column. One interesting feature here is the 2000–2015 rise in labor force participation for all groups aged 55 and above. This remarkable development has been documented and analyzed by Goldin and Katz (2016) and Goldin and Mitchell (2017). This rise in older women's labor force participation, however, is dominated by the substantial reductions in labor force participation shown by every age group less than 55 years old.

Table 2 explores the within-age-group trends of women's LFPR by different education levels. I reapply Equation (1) for every age group between 2000 and 2015, and divide each age group into three education categories: high school or less, some college, and college completion or more. Comparing the composition effects and the within-group effects in the last column suggests that for women aged below 55, the decline in their labor force participation is driven almost entirely by the decreasing labor force participation within age-education groups. For every age group above 55 years old, both the within-group effect and the composition effect contribute to the rise in their labor force participation, but the former is much larger. Columns 1 through 3 in the upper panel indicate that the positive composition effect for all age groups comes mainly from a rising trend toward higher education, which is associated with higher labor force participation.

Looking in detail at the within-group effects reported in columns 1 through 3 in the lower panel, two things stand out. First, regardless of the education levels, LFPR increases for all women above 55 years old except for less-educated women aged 55–59. Second, labor force participation declines for all women aged below 55 at all education levels with only one exception (women aged 35–39 with college degree), the largest decline occurs among the youngest women, and less-educated women in general have experienced larger declines.

B. Oaxaca Decomposition

To extend the analysis to encompass other demographic shifts besides changes in age structure and educational attainment, I conduct a series of Oaxaca (1973) decompositions in Table 3. These decompositions are based on the equation:

$$
\begin{aligned}
\bar{y}_t - \bar{y}_s &= \bar{X}_t\hat{\beta}_t - \bar{X}_s\hat{\beta}_s \\
&= \bar{X}_t\hat{\beta}_t - \bar{X}_t\hat{\beta}_s + \bar{X}_t\hat{\beta}_s - \bar{X}_s\hat{\beta}_s \\
&= \bar{X}_t\left(\hat{\beta}_t - \hat{\beta}_s\right) + \left(\bar{X}_t - \bar{X}_s\right)\hat{\beta}_s \qquad (2)
\end{aligned}
$$

TABLE 2
Disaggregation of Female LFPR by Age and Education, 2000–2015

Age	Education: High School or Less	Some College	College or More	Total
Composition Effect				
16–19	−0.3	0.3	0.3	0.2
20–24	−5.2	3.1	2.7	0.6
25–29	−5.5	−0.4	7.9	1.9
30–34	−6.9	0.0	8.0	1.2
35–39	−7.4	−1.1	9.0	0.5
40–44	−8.0	−2.0	11.3	1.3
45–49	−3.9	−0.3	5.1	0.8
50–54	−5.4	1.4	5.2	1.3
55–59	−7.9	3.0	7.4	2.5
60–64	−7.1	3.4	6.8	3.1
65–69	−3.8	2.5	4.3	3.1
70–74	−1.3	0.8	1.6	1.1
75+	−0.4	0.1	0.5	0.2
Within-Group Effect				
16–19	−13.4	−2.3	−0.1	−15.8
20–24	−2.0	−4.2	−0.5	−6.7
25–29	−2.4	−1.5	−2.3	−6.2
30–34	−3.9	−0.5	−0.5	−4.8
35–39	−3.8	−0.8	1.8	−2.9
40–44	−3.5	−1.5	−1.0	−6.0
45–49	−2.2	−1.5	−1.6	−5.3
50–54	−2.6	−2.1	−0.4	−5.1
55–59	−0.1	0.8	0.8	1.5
60–64	2.5	1.0	2.7	6.3
65–69	2.7	1.5	1.5	5.6
70–74	2.8	0.8	1.2	4.7
75+	0.4	0.3	0.9	1.7

Notes: All numbers are in percentage points. Based on Equation (2), I run the shift-share analysis for each age group separately. The change in the average labor force participation rates for women in each age group between 2000 and 2015 is decomposed into the composition effect and the within-group effect by three education groups: high school or less, some college, and college completion or more. Thus the upper panel shows the composition effect from changes in the education structure in each age group, and the lower panel describes the within-group effect from LFPR changes within each age-education group. The "Total" column shows the composition effect and the within-group effect in each age group by adding up the numbers in columns 1 through 3.

where, as in Equation (1), the left side is the change in the overall female LFPR between years s and t. X is a vector of demographic characteristics, including age and possibly education levels, marital status, number of children, and race. $\overline{X}_t$ is a vector of all the averages for each element of X in year t, and since all the elements of X are expressed as dummy variables, it also represents the population shares of each demographic group. The second term on the last line of the right side of Equation (2) is the part of changing labor force participation "explained" by changes in the demographic composition of the adult female population, and the first term is the "unexplained" part.

The first column of Table 3 reports the decomposition where X is comprised of dummy variables for the same age categories used in Section II.A. Of course, the resulting decomposition exactly duplicates the one shown in Table 1 (with the bonus that it provides accompanying standard errors). The rest of the table adds other demographic characteristics besides age. The X vector for column 2 includes three education categories as defined in the previous subsection: high school or less, some college, and college completion or more. The third column supplements age with three categories for marital status: married, never married, and other (including divorced, separated, or widowed). The fourth column uses three categories for child rearing: with children under age five, with children aged above five, and without children. The fifth column includes three race categories: white, black, and other. Finally, the sixth column simultaneously includes all of the above.

Three aspects of the results particularly stand out. First, in every analysis, changes in age structure continue to explain approximately two-thirds of the 4-percentage-point decline in the LFPR. The change in race structure, especially the rising share of Hispanic women in the population, also depresses women's LFPR, but only by a very small amount. Second, this decline occurred despite a shift toward education groups with higher labor force participation. Most importantly, between 2000 and 2015, the percentage that completed college increased from 21% to 29%, and this group displays a LFPR about 15 percentage points higher than for those with high school or less. The dramatic rise in U.S. women's educational attainment has been thoroughly documented in previous research (Goldin 2006; Goldin, Katz, and Kuziemko 2006; Lee 2014), and it will play an important role in the wage analysis of the next section. Third, considering additional demographic characteristics besides age, especially education, only increases the "unexplained" component, so we continue to face the question of why within-group reductions in labor force participation, especially for those under age 55, occurred despite apparent growth in real wages.[6]

6. I have performed the alternative version of the Oaxaca decompositions by rewriting Equation (2) into $\overline{X}_s\left(\hat{\beta}_t - \hat{\beta}_s\right) + \left(\overline{X}_t - \overline{X}_s\right)\hat{\beta}_t$, where the explained parts are calculated using coefficients from regressions for the year

TABLE 3
Oaxaca Decomposition of Female LFPR between 2000 and 2015

	(1)	(2)	(3)	(4)	(5)	(6)
Total difference	−0.040	−0.040	−0.040	−0.040	−0.040	−0.040
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Explained part	−0.026	−0.012	−0.022	−0.024	−0.029	−0.012
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Unexplained part	−0.040	−0.027	−0.017	−0.015	−0.011	−0.027
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Age	−0.026	−0.025	−0.025	−0.028	−0.026	−0.026
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Education		0.012				0.013
		(0.001)				(0.001)
Marital status			0.003			0.002
			(0.000)			(0.000)
Childrearing				0.004		0.003
				(0.000)		(0.000)
Race					−0.003	−0.003
					(0.001)	(0.001)
N	131,498	131,498	131,498	131,498	131,498	131,498

Notes: The Oaxaca decompositions are based on Equation (2), in which the change in women's average labor force participation rates between 2000 and 2015 is decomposed into the explained part and the unexplained part. The lower panel reports specifically how much each demographic characteristic explains the LFPR trend. (II) *Age* includes 13 age ranges. *Education* has three categories: high school or less, some college, and college completion or more. *Marital status* includes married, never married, and other. *Childrearing* contains three dummies: with children under age 5, with children above age 5, and without children. Last, there are three *race* categories: white, black, and other. I restrict my sample to women who are aged 16 and above. Standard errors are in parentheses.

III. FEMALE WAGE DECOMPOSITION

The previous section's result that the decline in women's LFPR since 2000 applies to all age groups under 55 begs the question of why their labor force participation stopped rising and even decreased somewhat at a time when their real wages apparently were still rising. This section therefore uses both the March CPS and the PSID to put the post-2000 trend in women's real wages under the microscope.

With both data sets, I conduct Oaxaca decompositions of real wage changes for women aged 25–54 between 2000 and 2014, the last year available in the PSID. Later I use the CPS to extend the analysis to 2015. The main virtue of the PSID is that it collects detailed information on work experience. On the other hand, its sample size is relatively small, and the sample's cumulative attrition since the survey's advent in 1968 calls into question the representativeness of the sample remaining in recent years. The CPS offers a much larger and more representative sample, but its lack of direct experience measures forces me to impute years of full-time work by following the longstanding but problematic practice of subtracting years of schooling plus six from age. The tradeoffs between the two data sets motivate my use of both, with comparisons that take account of each data set's strengths and weaknesses.

2014 instead of the base year 2000, and the unexplained parts are the changes in the coefficients multiplied by base-year demographics. My results are not sensitive to which version I use.

A. Data

I use 2000 as the base year because this is around when the female LFPR began to drop, and initially I compare it with the year 2014, the latest year presently available in the PSID. I restrict my sample to women aged 25–54 because they are relatively attached to the labor force and because the previous section documented that the post-2000 decline in labor force participation applied to this age group.

In the IPUMS March CPS data, I measure hourly earnings by annual wage and salary income (including each respondent's total pretax wage and salary income, i.e., money received as an employee) divided by her work hours in the same year. Alternatively, I could use the Outgoing Rotation Groups (ORG) portion of the CPS data, which has self-reported hourly wages. The biggest concern for using the ORG sample is the potential selection bias. Unlike the March CPS data that keep observations of

TABLE 4
Summary Statistics on Women's Log Hourly Earnings, Aged 25–54

	CPS			PSID		
Year	**Mean Log Real Wage**	**Mean Log Real Wage (PCE)**	**Standard Error**	**Mean Log Real Wage**	**Mean Log Real Wage (PCE)**	**Standard Error**
2000	1.988	2.075	0.004	2.066	2.153	0.016
2002	2.011	2.109	0.004	2.071	2.169	0.016
2004	2.011	2.115	0.005	2.070	2.173	0.016
2006	2.008	2.122	0.005	2.106	2.220	0.016
2008	1.999	2.124	0.005	2.138	2.263	0.016
2010	2.020	2.142	0.005	2.110	2.232	0.016
2012	1.992	2.123	0.005	2.099	2.229	0.017
2014	1.998	2.132	0.005	2.104	2.238	0.017

Notes: In the CPS, I measure hourly earnings by annual wage and salary income divided by work hours in the same year. In the PSID, hourly earnings are measured as total labor income divided by annual work hours. I restrict my sample to wives or female heads in the Survey Research Center core and immigrant families. In both data sets, I restrict my sample to women aged 25–54 who were not self-employed and worked at least 100 hours over the year. I exclude the cases where either income or work hours are imputed. The means are weighted. The earnings are adjusted by the CPI-U-RS in columns 1 and 4, and by the PCE deflator in columns 2 and 5. The base year for both deflators is chained: 1982–1984 = 100.

those who worked sometime in the past year, the earnings questions in the ORG sample only concern individuals who are currently employed. Therefore, I use the March CPS for my main results, and I use the ORG sample only for a robustness check. I restrict my sample to women who were not self-employed and worked at least 100 hours over the year. I use CPS supplement weights and I exclude the cases where either wage and salary income or working hours are imputed.

In the PSID data, hourly earnings are measured as total labor income divided by annual work hours. I restrict my sample to wives or female heads in the Survey Research Center core and immigrant families sample.[7] Again I restrict to those who were not self-employed and worked at least 100 hours, and I use core/immigrant family longitudinal weights. I exclude cases in which either work hours or any part of total labor income is imputed. As pointed out in Shin and Solon (2011), there are several cases from 1994 on in which wage and salary income is coded as 1 for negative or zero income. I exclude those observations as missing values.

According to Table 4, women's mean log real hourly earnings at the end of the period are a little higher than at the beginning. For example, in the CPS, the mean log real wage based on the Consumer Price Index Research Series (CPI-U-RS) increased from 1.988 to 1.998, an increase of 0.010. With the personal consumption expenditures (PCE) deflator from the national income accounts used as an alternative deflator, the wage increase of 0.057 is even larger. In the PSID, women's log hourly earnings are larger than in the CPS for all years, but the trend is similar.[8]

B. Results

In the Oaxaca decompositions with both the March CPS and the PSID, I control for years of schooling, a quadratic in work experience, race, and the geographic region where the individual is living at the interview time. I also will report specifications that add controls for occupation, marital status, and number of children.

The CPS stopped reporting exact years of schooling in 1992, and instead measured education with new questions providing a choice of categories. Therefore, I adopt the method in Table 2 of Jaeger (1997) to measure years of schooling. Since the CPS does not have work experience data, I impute experience as age minus years of education minus six. This imputation will overstate many women's actual work experience, which is the main reason I will supplement my CPS analysis with a PSID analysis. The PSID also will enable me to control for a quadratic in job tenure, defined as the

7. For reasons explained in footnote 11 of Shin and Solon (2011), I do not use the Survey of Economic Opportunity sample, the so-called poverty sample.

8. Preliminary analysis suggests that the difference in levels stems mainly from differences in measured distributions of annual hours. Because of the similarity in trend, I have not made this a major focus of my study.

TABLE 5
Summary Statistics

	CPS				PSID			
	2000		2014		2000		2014	
Variable	**Obs**	**Mean**	**Obs**	**Mean**	**Obs**	**Mean**	**Obs**	**Mean**
ln(earnings)	33,931	1.99	25,997	2.00	2,100	2.07	2,069	2.10
Years of education	33,931	13.63	25,997	14.26	2,100	13.66	2,069	14.79
Work experience (in years)	33,931	19.75	25,997	19.20	2,100	8.64	2,069	7.26
Job tenure (in years)	NA	NA	NA	NA	2,100	6.53	2,069	6.71
Occupation								
Professional	9,826	0.31	9,090	0.37	593	0.32	754	0.36
Farmers	17	0.00	10	0.00	0	NA	0	NA
Managers and officials	4,249	0.14	3,021	0.12	288	0.15	232	0.12
Clerical	8,552	0.26	5,853	0.24	491	0.26	454	0.22
Sales workers	1,690	0.06	1,162	0.05	81	0.05	174	0.08
Craftsmen	480	0.02	284	0.01	42	0.02	80	0.04
Operatives	2,176	0.07	1,189	0.05	123	0.06	36	0.02
Service workers	4,657	0.14	4,025	0.16	248	0.13	316	0.16
Farm laborers	99	0.00	59	0.00	11	0.01	0	NA
Other laborers	445	0.01	179	0.01	21	0.02	11	0.01
Race								
White	27,485	0.81	20,411	0.77	1,712	0.83	1,751	0.85
Black	4,311	0.14	3,332	0.15	187	0.08	172	0.08
Other	2,135	0.06	2,254	0.08	201	0.09	146	0.07
Marital status								
Married	22,008	0.62	15,620	0.57	1,604	0.70	1,506	0.65
Never married	5,405	0.18	5,943	0.25	199	0.15	321	0.21
Other	6,518	0.20	4,434	0.17	297	0.16	242	0.14
Number of children								
0	10,706	0.41	8,777	0.40	905	0.48	874	0.49
1	8,533	0.23	6,464	0.23	402	0.22	451	0.20
2	9,715	0.25	7,012	0.24	469	0.20	488	0.20
3	3,735	0.09	2,770	0.09	187	0.08	184	0.07
4	940	0.02	732	0.02	41	0.02	53	0.02
5	220	0.01	179	0.01	13	0.01	14	0.01
6	82	0.00	63	0.00	3	0.00	5	0.00

Notes: All numbers are adjusted by sample weights. *ln(earnings)* are adjusted by the CPI-U-RS and the base year is chained: 1982–1984 = 100. I include the geographical region where one lives in the Oaxaca decompositions but its statistics are not reported here due to space limits. Basically, my sample spreads almost equally across the four regions (Northeast, Midwest, South, and West).

number of years the individual has worked for her present employer.

Summary statistics are reported in Table 5. All statistics except for log real hourly earnings (deflated initially by the CPI-U-RS) refer to the survey years 2001 and 2015. Earnings are measured for the preceding calendar years, 2000 and 2014. Education levels between the two data sets are very close, and both show an increase from 2001 to 2015. In the CPS, the increase is from 13.63 in 2001 to 14.26 in 2015; in the PSID, women's years of schooling increase from 13.66 in 2001 to 14.79 in 2015. There are also nontrivial changes in occupation, such as a rising share of women working in professional or service occupations and a declining share in clerical jobs or occupations such as managers, officials, and operatives, and there also is a trend toward lower marriage rates.

The Oaxaca decompositions are based on the equation:

$$\begin{aligned}\overline{\mathrm{logw}_t} - \overline{\mathrm{logw}_s} &= \overline{X}_t\hat{\beta}_t - \overline{X}_s\hat{\beta}_s \\ &= \overline{X}_t\hat{\beta}_t - \overline{X}_t\hat{\beta}_s + \overline{X}_t\hat{\beta}_s - \overline{X}_s\hat{\beta}_s \\ &= \overline{X}_t\left(\hat{\beta}_t - \hat{\beta}_s\right) + \left(\overline{X}_t - \overline{X}_s\right)\hat{\beta}_s \qquad (3)\end{aligned}$$

where $\overline{logw_t}$ represents women's average log real hourly earnings in year t. Hence, the left side of the equation is the 2000–2014 change in women's average log real hourly earnings. X is a vector of demographic characteristics, including educational attainment, work experience, geographic location, etc. Thus $\overline{X_t}$ is the vector of women's average levels of the demographic characteristics in year t. The first term on the right side of the last line of Equation (3) is the unexplained part and the second term is the explained part, representing how much of the change in women's hourly earnings is explained by changes in education, work experience, and other demographic characteristics.

The decomposition results are reported in Table 6.[9] My preferred specification, specification 1, controls for education, work experience (including job tenure in the PSID), race, and geographic region. I prefer this to, for example, also controlling for occupation (as in specification 2) because it seems unwise to partial out changes in women's occupational distribution when measuring changes in women's wage opportunities. In the CPS analysis sample, the total change in female log real hourly earnings between 2000 and 2014 is 0.010. The explained part is much larger at 0.071. The large explained component stems from the rise in women's educational attainment. In the CPS analysis sample, women's average education increased from 13.63 in 2001 to 14.26 in 2015. Multiplying the 0.63 education increase by a 2000 education coefficient estimate of 0.124 yields the 0.078 contribution of education to the explained component. The unexplained component is −0.060. That is, women's real wages would have declined by about 6% between 2000 and 2014 had it not been for beneficial changes in characteristics of female workers, especially their educational attainment. This represents a worsening in women's wage opportunities in the sense that the wage/education locus women faced in 2014 was inferior to the one they faced in 2000.

In the PSID results for specification 1, the total 2000–2014 change in log real hourly earnings is 0.038. The explained component is 0.096, again because of a substantial rise in women's educational attainment. The unexplained component, −0.059, is a little smaller in magnitude than in the CPS. The smallness of the PSID-CPS discrepancy may seem surprising at first because the PSID enables direct measurement, instead of imputation, of women's work experience. Previous studies, such as Wellington (1993), often have stressed the importance of accounting for women's actual work experience. Those studies, however, pertained to periods of rapid increase in women's labor force participation and hence in their actual work experience. During my 2000–2014 period, women's labor force participation did not change so much, so the distinction between trends in actual and imputed work experience is of less consequence. Over this period, the important contributor to the explained component is the change in educational attainment.

For completeness, in the other columns of Table 6, I explore the effects of adding controls for (arguably endogenous) occupation, marital status, and number of children. In both the CPS and the PSID, the unexplained component is somewhat diminished in magnitude by adding these controls, but it still remains between −0.042 and −0.052. That is, once one nets out the effects of changes in women's characteristics, most importantly their rising educational attainment, it still appears that women's wage opportunities worsened somewhat between 2000 and 2014. This makes the post-2000 LFPR decline among women under age 55 considerably less surprising. It also suggests that women's labor force participation is still trending along a positively sloped labor supply curve.

The point can be illustrated with this simple back-of-the-envelope calculation. The Oaxaca decompositions in Table 6 suggest that, after accounting for demographic changes including the rise in education, women's real wages as measured with the CPI-U-RS deflator declined by about 6% between 2000 and 2014. During the same period, women's labor force participation dropped by about 4 percentage points, from 61% in 2000 to 57% in 2014. As two-thirds of the decrease results from the aging of the adult female population, the within-age-group decline is then about 1.3 percentage points, proportionally a 2.2% reduction relative to a base of about 60%. Dividing that 2.2% by a 6% real wage decline implies a labor supply elasticity of about 0.37, a figure well within the range of the research cited in footnote 1.

This pattern is echoed in the disaggregated results in Table 7. Using the CPS data, I compute the changes in women's labor force participation and the changes in their log real wages between 2000 and 2014 separately for each age-education group at the prime work ages. The "Total" column, which reports the changes in women's LFPR or their log real wages within each age group from 2000 to 2014, suggests that women's labor force participation dropped for all age groups while their real wages were still rising except for two groups: 25–29 and 50–54. Columns 1 through 3 show that within

9. I have performed the alternative version of the Oaxaca decompositions as stated in footnote 6 and verified that I obtain similar results. I have checked the robustness of my results to excluding the top and bottom 1% or 10% of wage observations. Moreover, using White's standard error correction does not change my results.

TABLE 6
Oaxaca Decomposition of Female Log Real Hourly Earnings between 2000 and 2014

	CPS			PSID		
	Specification (1)	**Specification (2)**	**Specification (3)**	**Specification (1)**	**Specification (2)**	**Specification (3)**
Total difference	0.010	0.009	0.009	0.038	0.002	0.002
	(0.007)	(0.007)	(0.007)	(0.023)	(0.023)	(0.023)
Explained part	0.071	0.056	0.051	0.096	0.054	0.054
	(0.003)	(0.004)	(0.004)	(0.014)	(0.016)	(0.016)
Unexplained part	−0.060	−0.047	−0.042	−0.059	−0.052	−0.052
	(0.006)	(0.006)	(0.006)	(0.021)	(0.021)	(0.022)
Education	0.078	0.058	0.057	0.104	0.062	0.059
	(0.003)	(0.003)	(0.003)	(0.011)	(0.010)	(0.009)
Work experience	−0.005	−0.005	−0.006	−0.010	−0.024	−0.024
	(0.001)	(0.001)	(0.001)	(0.008)	(0.007)	(0.007)
Occupation		0.005	0.005		0.016	0.016
		(0.002)	(0.002)		(0.008)	(0.008)
Demographics	−0.003	−0.002	−0.005	0.002	0.001	0.003
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.005)
N	59,928	57,063	57,063	4,114	3,904	3,904

Notes: The Oaxaca decompositions disaggregate the change in women's log real wages between 2000 and 2014 into an explained part and an unexplained part, based on Equation (3). The explained part represents how much of the change in women's log hourly earnings is explained by changes in education, work experience, and other demographic characteristics. The lower panel reports specifically how much each characteristic explains the wage trend. Job tenure, defined as the number of years one has worked for the present employer, is included in the category of *work experience* for the PSID, along with work experience, which is defined as number of years worked since age 18 in the PSID, and is imputed as age minus years of education minus six in the CPS. *Demographics* in specification (1) includes three race categories and four dummies for the geographical region one lives in. I further include three marital statuses and number of children one has in *Demographics* in specification (3). Hourly earnings are adjusted by the CPI-U-RS and the base year is chained: 1982−1984 = 100. Standard errors are in parentheses.

most age-education groups, LFPRs and wages have concurrently fallen. It is especially true for less-educated women, whose labor force participation declines as well as their real wages for all age groups. There are only a few exceptions and all occur among women with college degree or more. For some age groups with high education level, their wages and labor force participation move in opposite directions. Surprisingly, like less-educated women, highly educated women also experienced real wage declines after 2000.

To further explore the trend in women's real wages within age groups, I decompose the wage changes between 2000 and 2014 by three education categories for each age group using the shift-share analysis based on Equation (1). Change in women's log real wages within each age group between 2000 and 2014 is then decomposed into the composition effect from education structure changes for each age group in column 5, and the within-group effect from the wage changes within each age-education group in column 6. Obviously, the wage rise for women between 30 and 49 years old is completely due to the composition effect that mainly comes from the trend toward higher education. After adjusting for the changing education composition, women's wages in fact dropped for every age group. In other words, the finding of the declining composition-adjusted wage trend for women aged between 25 and 54 in Table 6 holds for every age group within that age range.

The post-2000 decline in women's real wages makes demand-related explanations a natural candidate for explaining the decreasing trend in women's LFPR. It is likely that less-educated women leave the labor force because of the declining labor market opportunities for less-skilled female workers (similar to a story often told about less-educated men). However, it is surprising to see that real wages for highly educated women are not increasing, either. The within-group decline in women's real wages, especially the decline among highly educated women, points future researchers to focus attention on understanding the decline in composition-adjusted women's wages in order to more fully explain the behavior of the female LFPR over the last 15 years or so.

In estimating the wage equation, a well-known problem is that wages are not observed for those not working (in my analysis, those that worked fewer than 100 hours in a calendar

TABLE 7
Changes in Women's LFPR and Log Real Wages by Age and Education between 2000 and 2014, Aged 25–54

	Education					
Age	**High School or Less**	**Some College**	**College or More**	**Total**	**Composition Effect**	**Within-Group Effect**
Changes in women's LFPR						
25–29	−0.07	−0.06	−0.07	−0.05	0.02	−0.07
30–34	−0.12	−0.03	0.01	−0.03	0.01	−0.04
35–39	−0.07	−0.02	0.03	−0.01	0.01	−0.02
40–44	−0.07	−0.09	−0.04	−0.04	0.02	−0.06
45–49	−0.05	−0.05	−0.04	−0.03	0.01	−0.05
50–54	−0.04	−0.07	0.01	−0.01	0.03	−0.03
Changes in women's log real wages						
25–29	−0.06	−0.17	−0.12	−0.06	0.06	−0.12
30–34	−0.05	−0.10	−0.06	0.02	0.09	−0.07
35–39	−0.07	−0.11	−0.01	0.05	0.10	−0.05
40–44	−0.06	−0.04	0.03	0.09	0.10	−0.01
45–49	−0.01	−0.08	−0.03	0.01	0.05	−0.04
50–54	−0.08	−0.07	−0.07	−0.02	0.05	−0.07

Notes: In columns 1 through 3, using the CPS data, I compute the changes in women's labor force participation and the changes in their log real wages between 2000 and 2014 for each age-education group at the prime work ages. The "Total" column reports the changes in women's LFPR or their log real wages from 2000 to 2014 within each age group. Then I reapply Equation (1) to disaggregate the changes within each age group by three education categories: high school or less, some college and college, completion or more.

year).[10] However, the problem of selection into the workforce is less of a concern in this specific context for two reasons. First, the Oaxaca decomposition takes account of changing labor force composition as a main channel behind wage changes. It thus explicitly addresses the concern about selection (at least on observables). Second, in the post-2000 period when women's real wages have stagnated, or even declined, it is unlikely that selection is driving the wage change. Nonetheless, I have followed Mulligan and Rubinstein (2008) in performing Heckman's two-step estimation and found that considering selection hardly changes my results at all.

C. Further Analyses

The Gender Wage Gap. My finding of worsened wage opportunities for women may come as a surprise to readers familiar with the substantial literature (surveyed by Blau and Kahn 2017) that shows a declining wage gap between women and men. To address this apparent puzzle, I supplement the Oaxaca decompositions for women in Table 6 with parallel analyses for men in Table 8. Table 8 shows that the unexplained component is even more negative for men than it is for women. For example, specification 1 in the CPS yields a −0.081 unexplained component for men, compared to −0.060 for women. The implied 2000–2014 reduction of about 2% in the female-male wage gap is altogether consistent with the empirical literature on female-male wage convergence.

Breaking the Wage Trend into Subperiods. Moffitt (2012) finds that the within age-education wages for women between 1999 and 2007 were rising. To reconcile with his finding, I break down the wage trends into two periods, 2000–2007 and 2007–2014, and run the Oaxaca decompositions separately.

The decomposition results for the 2000–2007 period in Table 9 show a positive unexplained part. Specifically, real wages for women aged 25–54 increased by about 4% between 2000 and 2007. The wage growth during this time period is almost completely explained by women's higher educational attainment. Conditional on education, women's real wages increased by merely 0.3% according to specification 1 with the CPS. This is consistent with Table 4 in Moffitt (2012), in which he finds positive within age-education changes in log real wages for all women between 25 and 54 years old for the 1999–2007 period.

10. This is another reason for not using the ORG of the CPS data. As a robustness check, I have applied the Oaxaca decompositions to the ORG sample and the results are qualitatively similar to those in Table 6.

TABLE 8
Oaxaca Decomposition of Male Log Real Hourly Earnings between 2000 and 2014

	CPS			PSID		
	Specification (1)	**Specification (2)**	**Specification (3)**	**Specification (1)**	**Specification (2)**	**Specification (3)**
Total difference	−0.053	−0.059	−0.059	−0.058	−0.074	−0.074
	(0.007)	(0.007)	(0.007)	(0.025)	(0.025)	(0.025)
Explained part	0.028	0.011	0.001	0.052	0.027	0.014
	(0.003)	(0.004)	(0.004)	(0.014)	(0.016)	(0.016)
Unexplained part	−0.081	−0.070	−0.060	−0.110	−0.101	−0.088
	(0.007)	(0.006)	(0.006)	(0.024)	(0.024)	(0.024)
Education	0.041	0.028	0.028	0.066	0.045	0.046
	(0.003)	(0.002)	(0.002)	(0.010)	(0.008)	(0.008)
Work experience	−0.008	−0.009	−0.006	−0.008	−0.019	−0.012
	(0.002)	(0.001)	(0.001)	(0.009)	(0.009)	(0.008)
Occupation		−0.005	−0.004		0.004	0.005
		(0.002)	(0.002)		(0.007)	(0.007)
Demographics	−0.005	−0.004	−0.017	−0.005	−0.004	−0.025
	(0.001)	(0.001)	(0.002)	(0.005)	(0.004)	(0.007)
N	62,014	59,976	59,976	4,091	3,933	3,933

Notes: The Oaxaca decompositions disaggregate the change in men's log real wages between 2000 and 2014 into an explained part and an unexplained part, based on Equation (3). See the notes below Table 6 for variable definitions. Hourly earnings are adjusted by the CPI-U-RS and the base year is chained: 1982–1984 = 100. Standard errors are in parentheses.

TABLE 9
Oaxaca Decomposition of Female Log Real Hourly Earnings between 2000 and 2007

	CPS			PSID		
	Specification (1)	**Specification (2)**	**Specification (3)**	**Specification (1)**	**Specification (2)**	**Specification (3)**
Total difference	0.042	0.043	0.043	0.040	0.002	0.002
	(0.006)	(0.006)	(0.006)	(0.022)	(0.022)	(0.022)
Explained part	0.039	0.025	0.022	0.009	−0.014	−0.014
	(0.003)	(0.003)	(0.003)	(0.012)	(0.013)	(0.014)
Unexplained part	0.003	0.019	0.021	0.030	0.016	0.016
	(0.006)	(0.006)	(0.006)	(0.019)	(0.019)	(0.019)
Education	0.041	0.030	0.029	0.016	0.004	0.004
	(0.003)	(0.002)	(0.002)	(0.008)	(0.006)	(0.005)
Work experience	−0.001	−0.002	−0.003	−0.010	−0.023	−0.023
	(0.001)	(0.001)	(0.001)	(0.006)	(0.006)	(0.006)
Occupation		−0.003	−0.003		0.003	0.003
		(0.002)	(0.002)		(0.008)	(0.008)
Demographics	−0.001	−0.001	−0.002	0.004	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.004)
N	63,285	60,351	60,351	4,075	3,861	3,861

Notes: The Oaxaca decompositions disaggregate the 2000–2007 change in the log real hourly earnings for women aged 25–54 into an explained part and an unexplained part, based on Equation (3). See the notes below Table 6 for variable definitions. Hourly earnings are adjusted by the CPI-U-RS and the base year is chained: 1982–1984 = 100. Standard errors are in parentheses.

The trend in women's real wages is then reversed after 2007. Unlike the 2000–2007 period, the unexplained part for the post-2007 period is negative in Table 10. Reading from the preferred specification with the CPS, women's real wages have declined by about 3% since 2007, despite the positive effect of women's education, which would have increased their real wages by 4%. Conditional on education, the decline in women's real wages is as large as 6%.

Combining the results in Table 9 and 10 suggests that the age-education-adjusted women's wages recovered from the recession in the early 2000s and rebounded back to, or even went beyond, the initial level before the Great Recession. Women's real wage level then fell again during the Great Recession, more than offsetting the rise before 2007, and most importantly, it has not yet come back to the level prior to the Great Recession.

TABLE 10
Oaxaca Decomposition of Female Log Real Hourly Earnings between 2007 and 2014

	CPS			PSID		
	Specification (1)	**Specification (2)**	**Specification (3)**	**Specification (1)**	**Specification (2)**	**Specification (3)**
Total difference	−0.031	−0.034	−0.034	−0.002	0.000	0.000
	(0.007)	(0.007)	(0.007)	(0.023)	(0.023)	(0.023)
Explained part	0.033	0.033	0.030	0.100	0.078	0.076
	(0.003)	(0.004)	(0.004)	(0.014)	(0.015)	(0.015)
Unexplained part	−0.064	−0.067	−0.064	−0.102	−0.078	−0.076
	(0.006)	(0.006)	(0.006)	(0.020)	(0.020)	(0.020)
Education	0.039	0.030	0.029	0.099	0.069	0.069
	(0.003)	(0.003)	(0.003)	(0.011)	(0.009)	(0.009)
Work experience	−0.005	−0.005	−0.005	0.004	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.007)	(0.006)	(0.006)
Occupation		0.008	0.008		0.011	0.011
		(0.002)	(0.002)		(0.007)	(0.007)
Demographics	−0.001	0.000	−0.002	−0.003	−0.002	−0.004
	(0.001)	(0.001)	(0.001)	(0.004)	(0.003)	(0.004)
N	55,351	53,032	53,032	4,099	4,071	4,071

Notes: The Oaxaca decompositions disaggregate the 2007–2014 change in the log real hourly earnings for women aged 25–54 into an explained part and an unexplained part, based on Equation (3). See the notes below Table 6 for variable definitions. Hourly earnings are adjusted by the CPI-U-RS and the base year is chained: 1982–1984 = 100. Standard errors are in parentheses.

Wage Trend before 2000. As discussed at the beginning of this paper, the traditional interpretation of the rising female LFPR before 2000 was that it constituted a movement along a positively sloped labor supply curve in response to rising real wages. To check that real wages really were still rising during the later period of rising labor force participation, I reapply my Oaxaca decomposition of real wage change for the period 1984–1998. 1984 is a convenient starting point because the PSID did not record wives' race before the 1985 survey year.

The results in Table 11 are consistent with the traditional interpretation. In the preferred specification with the CPS, the total change is 0.181. Less than one-third of that wage growth can be explained by changes in women's characteristics, among which education again plays the biggest role. Two-thirds of the wage rise remains unexplained. After netting out changes in women's characteristics including education, women's real wages grew by about 13%. This 1984–1998 trend contrasts sharply with the 2000–2014 trend documented in Table 6.

Extending to 2015. The Oaxaca decompositions presented thus far stop at 2014 because that is the last year presently available in the PSID. The CPS-based decompositions, however, can be extended to 2015, and I present those in Table 12. The total 2000–2015 change in women's average log real wage is 0.055, much larger than the 0.01 increase through 2014. Even so, the increase again is more than accounted for by the substantial rise in women's educational attainment. In specification 1, once the effects of changes in women's characteristics, especially education, have been netted out, the unexplained component shows a real wage reduction of about 2%.

Alternative Deflator. The Oaxaca decompositions presented in Tables 6–12 measured real wages on the basis of the CPI-U-RS. As already seen in Table 4, however, the PCE deflator measured less cumulative inflation from 2000 to 2014 than did the CPI-U-RS, so deflating by the PCE indicator leads to a more positive measure of real wage growth. Table 13 shows the results of redoing the Oaxaca decompositions using the PCE deflator instead of the CPI-U-RS.

Focusing first on the CPS results, with the PCE deflator the total change in women's average log real wage is measured as 0.057, instead of the 0.01 found in Table 6 with the CPI-U-RS. With a logarithmic regression specification, the change in deflator does nothing but shift the intercept, so the explained component is unchanged and remains at 0.071. Subtracting this from the higher total change of 0.057 yields an unexplained component of −0.014. The parallel exercise with the PSID yields an unexplained component of −0.012. As before, the rise in women's educational attainment more than

TABLE 11

Oaxaca Decomposition of Female Log Real Hourly Earnings between 1984 and 1998

	CPS			PSID		
	Specification (1)	**Specification (2)**	**Specification (3)**	**Specification (1)**	**Specification (2)**	**Specification (3)**
Total difference	0.181	0.171	0.171	0.215	0.200	0.200
	(0.009)	(0.009)	(0.009)	(0.027)	(0.027)	(0.027)
Explained part	0.055	0.055	0.060	0.026	0.037	0.050
	(0.004)	(0.004)	(0.005)	(0.019)	(0.022)	(0.023)
Unexplained part	0.126	0.116	0.111	0.189	0.163	0.149
	(0.009)	(0.009)	(0.009)	(0.026)	(0.027)	(0.027)
Education	0.047	0.028	0.026	0.019	0.012	0.011
	(0.003)	(0.003)	(0.003)	(0.009)	(0.006)	(0.005)
Work experience	0.006	0.006	0.009	0.004	−0.005	0.002
	(0.002)	(0.002)	(0.002)	(0.015)	(0.016)	(0.016)
Occupation		0.018	0.018		0.031	0.031
		(0.003)	(0.003)		(0.009)	(0.009)
Demographics	0.002	0.003	0.007	0.004	−0.002	0.006
	(0.001)	(0.001)	(0.002)	(0.008)	(0.009)	(0.011)
N	37,285	35,291	35,291	3,322	3,002	3,002

Notes: The Oaxaca decompositions disaggregate the change in women's log real wages between 1984 and 1998 into an explained part and an unexplained part, based on Equation (3). 1984 is a convenient starting point because the PSID did not record wives' race before the 1985 survey year. See the notes below Table 6 for variable definitions. Hourly earnings are adjusted by the CPI-U-RS and the base year is chained: 1982–1984 = 100. Standard errors are in parentheses.

TABLE 12

Oaxaca Decomposition of Female Log Real Hourly Earnings between 2000 and 2015

	Specification (1)	**Specification (2)**	**Specification (3)**
Total difference	0.055	0.051	0.051
	(0.007)	(0.007)	(0.007)
Explained part	0.075	0.060	0.054
	(0.003)	(0.004)	(0.004)
Unexplained part	−0.020	−0.010	−0.003
	(0.006)	(0.006)	(0.006)
Education	0.084	0.063	0.061
	(0.003)	(0.003)	(0.003)
Work experience	−0.006	−0.007	−0.007
	(0.001)	(0.001)	(0.001)
Occupation		0.006	0.006
		(0.002)	(0.002)
Demographics	−0.003	−0.002	−0.006
	(0.001)	(0.001)	(0.001)
N	58,853	56,144	56,096

Notes: This table extends the results in Table 6 to the year 2015 by using the CPS only. The Oaxaca decompositions disaggregate the 2000–2015 change in the log real hourly earnings for women aged 25–54 into an explained part and an unexplained part, based on Equation (3). The explained part represents how much of the change in women's log hourly earnings is explained by changes in education, work experience, and other demographic characteristics. The lower panel reports specifically how much each characteristic explains the wage trend. *Work experience* is imputed as age minus years of education minus six. *Demographics* in specification (1) includes three race categories and four dummies for the geographical region one lives in. I further include three marital statuses and number of children one has in *Demographics* in specification (3). Hourly earnings are adjusted by the CPI-U-RS and the base year is chained: 1982–1984 = 100. Standard errors are in parentheses.

accounts for the increase in the real wage, but now the net reduction in the real wage is much smaller than estimated with the CPI-U-RS.

The difference in results across deflators leaves some ambiguity about whether or how much women's real wage opportunities worsened from 2000 to 2014. Even with the PCE deflator, though, the results indicate that the apparent growth in real wages is illusory in the sense that it would not have occurred without the substantial increase in women's education. Both deflators indicate that the locus of wage/education opportunities faced by women did not improve over this period.

IV. CONCLUSION

Over the many decades that women's labor force participation grew along with their real wages, the prevailing economic interpretation was that these trends constituted a movement along a positively sloped labor supply function. In Section II, I replicated previous work showing that the female LFPR hit a plateau sometime during the 1990s, and I extended that work to show that the plateau was followed by a 4-percentage-point drop since 2000. I found that about 65% of the 4-percentage-point drop is a consequence of the aging of the adult female population. The other 35% comes mainly from within-group decreases in labor force participation for those under the age of 55.

TABLE 13
Oaxaca Decomposition of Female Log Hourly Earnings between 2000 and 2014, Adjusted by the PCE Deflator

	CPS			PSID		
	Specification (1)	**Specification (2)**	**Specification (3)**	**Specification (1)**	**Specification (2)**	**Specification (3)**
Total difference	0.057	0.055	0.055	0.084	0.048	0.048
	(0.007)	(0.007)	(0.007)	(0.023)	(0.023)	(0.023)
Explained part	0.071	0.056	0.051	0.096	0.054	0.054
	(0.003)	(0.004)	(0.004)	(0.014)	(0.016)	(0.016)
Unexplained part	−0.014	−0.001	0.005	−0.012	−0.006	−0.006
	(0.006)	(0.006)	(0.006)	(0.021)	(0.021)	(0.022)
Education	0.078	0.058	0.057	0.104	0.062	0.059
	(0.003)	(0.003)	(0.003)	(0.011)	(0.010)	(0.009)
Work experience	−0.005	−0.005	−0.006	−0.010	−0.024	−0.024
	(0.001)	(0.001)	(0.001)	(0.008)	(0.007)	(0.007)
Occupation		0.005	0.005		0.016	0.016
		(0.002)	(0.002)		(0.008)	(0.008)
Demographics	−0.003	−0.002	−0.005	0.002	0.001	0.003
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.005)
N	59,928	57,063	57,063	4,114	3,904	3,904

Notes: The Oaxaca decompositions disaggregate the 2000–2014 change in the log real hourly earnings for women aged 25–54 into an explained part and an unexplained part, based on Equation (3). See the notes below Table 6 for variable definitions. Hourly earnings are adjusted by the PCE deflator and the base year is chained: 1982–1984 = 100. Standard errors are in parentheses.

Section III explored the question of why these women decreased their labor force participation at a time when their real wages were commonly believed to be still rising. The evidence from both the CPS and the PSID indicates that the post-2000 growth in real wages is more than accounted for by the substantial rise in women's educational attainment. The locus of wage/education opportunities faced by women did not improve after 2000 and, by some measures, got considerably worse. It therefore may be premature to abandon the traditional view that women's labor force participation is trending along a positively sloped labor supply curve. The simple back-of-the-envelope calculation presented in Section III.B suggests a positive labor supply elasticity of around 0.37. Measuring real wages with the PCE deflator instead of the CPI-U-RS deflator implies a smaller real wage reduction and accordingly a higher labor supply elasticity. In any case, once one recognizes the roles of the aging of the adult female population and the absence of real wage growth after 2000, the decline in women's labor force participation since 2000 becomes much less puzzling.

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