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ABSTRACT

Husbands' Wages and Married Women's Labor Supply in Urban China

This study examines the impact of husbands' wages on their wives' labor force participation rates and hours worked in urban China from 1995 to 2018. We find that an increase in husbands' wages reduces the labor force participation rate of married women with similar education levels. Controlling for gender identity—in particular, an aversion to the wife earning more than her husband—strengthens the income effect of husbands' wages. The labor supply effect of husbands' wages is more significant for younger and less-educated women and those with more children. The employed women's hours worked are negatively correlated with their husbands' wages, which is more significant for married women of older cohorts and with more children. This study helps us better understand the trend of the female labor supply in urban China. It sheds light on the impact of gender identity, welfare inequalities across families, and the well-being of households facing economic shocks.

JEL Classification: D13, D31, J16, J21

Keywords: husbands' wages, female labor force participation, hours worked, gender identity

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1. Introduction

Labor supply decisions are crucial for the well-being of household members and determine the total labor input of an economy. Relative to men, women's labor supply is more subject to changes in market wages and household income and wealth (Blundell and MaCurdy, 1999; Alenezi and Walden, 2004; Albanesi and Prados, 2022). Despite extensive literature in Western countries showing that the female labor supply is sensitive to family income, up-to-date evidence in China is scarce due to data limitations. This study examines the impact of husbands' wages on married women's labor supply in urban China using microdata from the China Household Income Project (CHIP) for 1995, 2002, 2013, and 2018.[1]

Married women account for over 40% of the working-age population in China. Despite a significant increase in urban employment and women's rising education levels, the labor force participation rate of married women in urban China has declined substantially since the 1990s (Meng, 2012; Hare, 2016; Wu, 2022). We argue in this paper that the growth in household income renders the extra income of a working wife less valuable due to diminishing marginal returns.[2] This hypothesis potentially explains the changes in the female labor force participation rate in urban China, given the substantial wage growth over the past several decades.

Previous studies estimating the income effect of husbands' wages ignore the impact of social norms related to gender identity. Recent studies show that women adjust their labor supply to avoid becoming the primary breadwinner in a household (Bertrand et al., 2015; Jayachandran, 2021; Hare, 2016). To understand how gender identity norms affect the estimation, imagine an increase in men's wages; in this situation, wives might quit the labor market due to the income effect. Meanwhile, their probability of earning more than their husbands decreases, which encourages women to participate in the labor market. Neglecting the negative impact of gender identity on the female labor supply leads to an underestimation of the direct income effect of an increase in husbands' wages.

Estimating the impact of husbands' wages also faces other challenges. Unobserved factors might be correlated with husbands' wages and their wives' labor supply, and measurement error is common when using survey information on husbands' wages. We employ an instrumental

1 Based on the structural model, some studies estimate married women's cross-labor supply elasticities to husbands' wages (Goldin, 1990; Juhn and Murphy, 1997; Devereux, 2004; Albanesi and Prados, 2022). Previous literature also focuses on the impact of husbands' wages on wives' hours worked (Mroz, 1987; Euwals, 2001; Blau and Kahn, 2007; Bertrand et al., 2015).

2 This explanation is consistent with the U-shaped hypothesis in the studies of female labor supply behavior (Goldin, 1986; Gaddis and Klasen, 2014).

variable (IV) approach to address these problems. Following Blau and Kahn (2007), we use the decile of husbands' wages as one of our instruments since measurement error is less severe in wage deciles (Baker and Benjamin, 1997; Blau et al., 2002; Blau and Kahn, 2007). Our second instrument is the average wage within each province and industry over time, which is correlated with individuals' wages but is unlikely to be determined by the latter. Sample selection might cause further bias if not all husbands earn a wage. We use two approaches to correct the sample selection bias: (1) reweighting the sample with positive husbands' wages to represent the whole sample and (2) using predicted wages for nonworking husbands.

Using China Household Income Project (CHIP) surveys between 1995 and 2018, we find that, given women's education (and other standard observable characteristics), a 1% increase in husbands' wages leads to a 0.018 percentage point reduction in wives' labor force participation rate. Once we control for a proxy for gender identity, the absolute value of this coefficient increases significantly to 0.024. As a result, an average increase in husbands' wages between 1995 and 2018 (1.7 natural logarithms) would lead to an approximately four percentage point decrease in married women's labor participation rates, approximately 25% of the decrease in married women's labor participation rates in urban China. Correcting for endogeneity and selection problems does not significantly alter our results.

We also find that the impact became weaker in the extensive margin (labor force participation) but turned stronger in the intensive margin (working hours) from 2002 to 2018. Considering the total impact, we show that the role of husbands' wages in women's unconditional hours worked became stronger from 2002 to 2018. The effect on labor force participation is more significant for young married women, those with low levels of education and those with more children. For employed women, we find a negative correlation between husbands' wages and women's hours worked. The increase in husbands' wages significantly affects the hours worked of both old-age cohorts and married women with more children.

This study makes several contributions to the literature. First, it provides insight into the declining female labor force participation in urban China. Studies have examined this phenomenon from different perspectives, such as household structure, economic fluctuations, educational opportunities, wealth status, and social norms (Du and Dong, 2010; Maurer-Fazio et al., 2011; Fu et al., 2016; Chen and Ge, 2018; Li et al., 2020; Albanesi and Prados, 2022; Wu, 2022). Nevertheless, it is puzzling to observe a decline in the labor force participation rate of married women who are more educated. Family income, which has risen markedly in urban China over the past three decades, provides a viable explanation.

Married couples make joint labor supply decisions to smooth out each other's wage shocks (Zhang, 2014). Several studies have examined the impact of husbands' wages on the female labor supply (Blau and Kahn, 2007; Zhang, 2014; Park and Shin, 2020). Recent evidence suggests that the growth in top earnings for married men since the early 1990s exerted a sizable negative impact on the labor supply of their wives (Albanesi and Prados, 2022). In urban China, Yao and Tan (2005) find that adverse labor market conditions, rather than an increase in husbands' wages, caused the decline in married women's labor force participation during 1995–2002. Guo (2012) reaches a similar conclusion using data from the China Health and Nutrition Survey between 2000 and 2006. However, Wu (2015) suggests that the income effect of husbands' wage increase results in a decline in women's labor force participation.[3] Using CHIP data from 1995 to 2018, our study covers a period more extended than previous studies, and we consider the impact of husbands' wages on both intensive and extensive margins of married women's labor supply.

Second, our study is related to a growing literature emphasizing gender identity norms (Fortin, 2015; Chen and Ge, 2018; Bertrand et al., 2015; Xu and Huang, 2018; Fang et al., 2021; Si, 2022). We take attitudes toward gender identity as given and examine their impact on our estimation. If the norm that stipulates that a man should earn more than his wife influences women's labor decisions, the direct income effect of an increase in husbands' wages might be attenuated by the indirect effect of the lower probability of wives being the breadwinner. We provide concrete evidence for this conjecture.

Third, our results indicate that solely considering the income or consumption inequality between households underestimates the welfare differences across households. Bick et al. (2018) find that because of the greater number of hours worked in developing countries, the welfare differences across countries are larger than when ignoring the difference in hours worked. Our findings show that high-income families enjoy more leisure by reducing married women's labor supply. Considering leisure in addition to consumption leads to a larger welfare inequality between high- and low-income families.[4] Finally, our study is related to the literature on the added worker effect and speaks to the welfare-related consequences of the economic crisis. Studies show that husbands' loss of employment leads their wives to increase their labor

[3] Wu (2015) does not explicitly estimate the impact of husband's wages on female labor force participation.
[4] When parental time plays a vital role in human investment in children, the above relationship implies that rich families can invest more in their children, which leads to a larger gap in children's human capital accumulation and reduces intergenerational mobility.

supply (Ashenfelter, 1980; Fernandes and Felício, 2005). Our findings suggest that wives will increase their labor supply to reduce the adverse impact of their husbands' declining wages.

The remainder of this paper is organized as follows. Section 2 introduces the household survey data used in this study and describes the changes in married women's labor force participation rates and hours worked in urban China. Section 3 presents the empirical specifications. Section 4 presents and discusses the impact of husbands' wages on female labor force participation and hours worked. Section 5 analyzes the endogeneity and sample selection issues. The following section focuses on the heterogeneous effects of husbands' wages on married women's labor supply decisions. Section 7 concludes.

2. Data description and labor supply of married women in urban China

2.1. CHIP survey

We use the urban module of the CHIP surveys for 1995, 2002, 2013, and 2018. The urban survey was conducted in 10–15 provinces or provincial-level municipalities, covering 6,000–12,000 urban households each round; it covers China's major geographic regions and includes detailed information on the demographic characteristics of households and their members. The four waves contain identical or similar variables of individual characteristics, making them comparable over time.

We focus on married women aged between 20 and 55 who have local urban *hukou*. Economic growth and increasing labor demand in urban areas have resulted in massive population movements from rural areas to cities (Combes et al., 2015). Due to China's household registration system (i.e., the *hukou* system), there is labor market segregation between urban natives and migrants in terms of access to jobs (Démurger et al., 2009), wages (Qu and Zhao, 2017), welfare, and other aspects (Meng and Zhang, 2001). To consider migrant observations, we would also have to examine the location choices and the employment status of migrants' spouses, as many of them are left behind in rural areas. To make the study more focused, we restrict our analysis to married women with local urban *hukou*.[5]

[5] The economic activity associated with labor force participation might significantly differ between rural and urban areas. In particular, rural residents' labor force participation involves multiple activities, including farm work, business operation, and off-farm employment (which may also include migration). In contrast, most urban residents participate in the labor market as employees, which means that the labor force participation rates are not comparable between rural and urban areas. In addition, the labor force participation of married women in rural areas might be more heavily affected by whether

Table 1 Descriptive statistics

	1995		2002		2013		2018	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Characteristics of wives								
Years of schooling	10.01	2.94	10.47	2.99	10.95	3.26	10.92	3.52
College or above	15.54	36.23	20.77	40.57	29.00	45.38	32.33	46.78
Age	40.15	7.56	42.40	7.28	42.17	7.67	43.20	7.89
Wage (Yuan)	8835	4991	14545	10695	37662	45427	50086	87779
Log wage	8.93	0.61	9.32	0.83	10.27	0.77	10.45	0.90
Characteristics of husbands								
Years of schooling	10.96	3.05	11.18	2.97	11.48	3.23	11.38	3.40
College or above	29.05	45.4	31.81	46.58	36.38	48.11	36.09	48.03
Age	42.52	8.22	44.52	7.51	44.08	7.76	44.89	7.96
Wage (Yuan)	10703	5778	19517	13943	51305	43139	69038	67774
Log wage	9.16	0.51	9.68	0.66	10.62	0.71	10.85	0.79
Characteristics of family								
# children	1.12	0.56	0.94	0.48	1	0.6	1.11	0.69
# children below 6	0.13	0.35	0.08	0.27	0.13	0.35	0.2	0.44
# children 6–12	0.32	0.49	0.24	0.44	0.23	0.44	0.26	0.50
# children 13–18	0.37	0.54	0.3	0.49	0.25	0.46	0.24	0.46
Observations	5,181		5,228		4,041		5,162	

Notes: Wages are adjusted to the 1995 price level. The descriptive statistics on wages and the logarithm of wages are restricted to individuals with positive wage earnings, so the sample size is smaller than the sample size reported in the "wage" row of the table.

Further deleting outliers and observations with missing information left us with 5,181 urban households in 1995, 5,228 in 2002, 4,041 in 2013, and 5,162 in 2018. Table 1 reports summary statistics of our sample, from which some major patterns are apparent. From 1995 to 2018, urban women's schooling increased from 10.01 to 10.92 years and that of urban men's increased from 10.96 to 11.38. Although husbands' education levels were higher than those of their wives, the gap narrowed steadily. Men and women experienced a dramatic wage increase from 1995 to 2018; the growth of women's wages was slower than that of their husbands. The standard deviations of wages suggest that wage inequality between husbands and wives rose during this period. The standard deviation of the logarithmic wage shows a similar upward trend.

2.2. Married women's labor force participation

A woman participates in the labor force if she is employed or actively looking for a job. Table 2 reports the labor force participation rates of married women with urban *hukou*, which

grandparents can provide childcare and whether they should care for the older adults within the households. Considering these concerns, this study focuses on married women with urban *hukou*.

declined from 88.63% in 1995 to 77.34% in 2002 and then continued to decline at a slower pace. In 2018, the labor participation rate of married women was approximately 72.60%.[6] Men's labor force participation rate was higher than women's; the gap between the two rates increased from 7% in 1995 to 21% in 2018.

Table 2 Married women's labor force participation rates and hours worked

	1995	2002	2013	2018	1995	2002	2013	2018
	A. Labor force participation (%)				B. Annual hours worked			
Wives	88.63	77.34	75.16	72.60	2027	2220	2323	2197
By wife's age								
20–35	98.02	93.96	85.90	80.18	2035	2240	2292	2134
36–55	84.94	73.11	72.19	70.70	2023	2213	2333	2214
By wife's education								
Middle school and below	82.46	62.75	63.32	62.99	2072	2376	2433	2281
Senior high school	93.89	84.86	76.36	71.73	2001	2181	2326	2227
College and above	96.00	94.01	92.00	87.95	1964	2099	2205	2085
By husband's wage quintile								
Lowest group	93.33	74.81	68.15	66.56	2072	2369	2394	2268
Second group	92.02	74.77	75.78	73.72	2032	2276	2427	2200
Middle group	91.61	78.24	82.72	75.89	2004	2206	2330	2236
Fourth group	87.98	77.15	78.12	74.07	1988	2132	2286	2141
Top group	87.00	80.99	80.28	78.82	1999	2123	2210	2136
Husband's participation/hours worked	95.29	92.06	93.01	93.55	2045	2290	2379	2366

Notes: The labor force participation rate is defined as the proportion of labor force participants in the corresponding working age population.

Table 2 also reports married women's labor force participation rates for different subgroups. The labor force participation rates were lower for older than for younger women across all years. Notably, younger women's participation dropped sharply by 18 percentage points from 1995 to 2018. Participation among women with below senior high school education was much lower and dropped steeply from 82.46% to 62.99% during this period.

Splitting the sample based on husbands' wages shows that the labor participation of married women changes with husbands' wages, and the change is nonmonotonic. In 1995, wives' participation rates decreased with husbands' wages. Such a pattern did not emerge in the following survey. Instead, their correlation is positive, especially for low and middle income groups, which might result from assortative mating. We will discuss the implication of rising

[6] We also use the Chinese General Social Survey (CGSS) and China Household Financial Survey (CHFS) to examine the changes in the labor force participation rates of urban married women. Descriptive statistics of CGSS show that married women's labor force participation rates fluctuated around 72-73% in most of the 2010s, similar to our estimates using CHIP. In terms of hours worked, married women's weekly hours worked decreased slightly from 46.5 to 45.6. The CHFS data indicate a more volatile pattern in the labor force participation rates of urban married women between 2013-2019, fluctuating between 64% and 69%. Married women's annual hours worked increased from 1,757 in 2013 to 2,173 in 2019, equivalent to an increase in weekly hours from 33.79 to 41.79. Furthermore, both surveys indicate a similar negative correlation between women's labor supply decisions and their husbands' wages, as found in our research.

homogamy for our estimation in Section 3 and control for women's (and their spouses') education in our labor supply regressions.

2.3. Hours worked

Panel B of Table 2 reports the hours worked by employed women, an extensive measure of their labor supply behavior.[7] Columns 5–8 in Table 2 show that women's annual hours worked increased from 2,027 in 1995 to 2,197 in 2018, equivalent to an increase in weekly hours from 38.98 to 42.25. Husbands' hours worked were higher than those of their wives, and the annual difference widened from 18 hours in 1995 to 169 hours in 2018. Women with higher education levels worked shorter hours, and the difference in hours worked among different education groups widened from 1995 to 2018. Calculations by husbands' income groups show that hours worked were fewer for wives married to high-income men.

3. Empirical model

3.1. Husbands' wages and women's labor force participation

To investigate the factors influencing women's labor force participation decisions, particularly the role of husbands' wages, we use four rounds of cross-sectional CHIP data from 1995 to 2018 to estimate the following linear probability model (LPM):

$$P_w = \alpha + \beta_1 * ln(husWage) + \beta_2 age_w + \beta_3 edu_w + \beta_4 age_h + \beta_5 edu_h + \beta_6 X + \delta_c + \gamma_t + \epsilon \qquad (1)$$

P_w is a dummy variable indicating married women's labor force participation status. $husWage$ is the husband's annual wage, the independent variable of our primary interest. Vector age_w includes the wife's age and its square and cubic terms. edu_w is the wife's years of schooling. There are several reasons to control for age and education. First, educated women tend to marry men who earn higher wages owing to assortative mating. Excluding education from the labor supply equation, the observed link between husbands' wages and married women's labor force participation rates may be positive. Second, education indicates an individual's willingness to earn market wages and the opportunity cost of dropping out of the labor force (Blau and Kahn, 2007). Similarly, women's age may also influence their reservation wages and the potential to earn market wages and be correlated with their husbands' wages. Women's demographic characteristics (e.g., education and age) are controlled to proxy for their potential income.

[7] Although not reported to conserve space, assigning zero hours worked women without a job produces patterns similar to labor force participation. We estimate the impact of husbands' wages on women's unconditional hours worked (assigning zero to non-employed women) in section 6.2.

We also consider additional control variables of the husband's education (edu_h) and age (age_h), although assortative mating and the collinearity of education and wages reduce the need to control for them. As the educational homogeneity of marriage increases in urban China (Nie and Xing, 2019), the wife's education can reflect her spouse's schooling, depending on the degree of educational assortative mating. Furthermore, as important determinants of personal income, the husband's education and age will not play a significant role in his wife's labor supply decision once his wage is controlled. Nonetheless, we control for spouses' demographics to estimate the impacts of husbands' wages on wives' labor supply decisions within given marriage patterns.

X represents other control variables. The number of children under the age of 18 in the family is controlled in the labor supply equations because it depends on fertility preferences and household income (Becker, 1965). Women who prefer a smaller family are more inclined to work in the labor markets (Ngo, 2020). High-income families also have more children, which discourages women from working outside of the home. Similarly, wives might increase their labor market participation if grandparents can provide childcare or they might need to withdraw from the labor market to take care of elderly relatives (Maurer-Fazio et al., 2011). We then control for the number of elderly relatives aged 60–70, 71–80, and above 80 in the family.

As *husWage* in Equation 1 is annual wage rate, which is a product of the hourly wage rate and annual hours worked, there might be a correlation between hours worked and annual wages.[8] If their housework time is substitutable, wives will further reduce market work time when their husbands work more. Husbands' hours worked may also reflect some unobservable characteristics. Controlling for the husband's hours worked alleviates these concerns. The sector of employment may affect husbands' wages and fringe benefits. The wages in the public sector do not account for all fringe benefits, including affordable housing and childcare services. In this case, the wife might be more inclined to participate in the labor force. We control for a variable indicating the husband working in the public sector. Finally, we control for city and

[8] We thank the anonymous referee for pointing out the possible division bias that emerges when the hourly wages are obtained by dividing weekly wages by weekly working hours, which is an important issue when estimating the self-elasticity of hours worked to one's hourly wage (Borjas, 1980). And the bias is more severe when the hours worked and wages refer to the same period. Our main task, however, is to estimate the impact of the husband's wage on the wife's working hours. In estimating the cross-elasticity (instead of self-elasticity), the wife's hours worked only appear in the regression as the dependent variable. The key independent variable (the husband's wage) is annual rather than hourly rate and we do not calculate the husband's hourly wage by dividing his annual wage by hours worked. Controlling for both hours worked and annual wages is also more flexible than controlling for hourly wages (dividing annual wages by hours worked). In addition, we use annual wages instead of hourly wages when controlling for the wife's wages in Equation (2), circumventing the task of calculating hourly wages.

year fixed effects (δ_c and γ_t) to account for unobservable regional characteristics (such as living costs) and time trends.

When estimating Model 1 (and the following Models 2 and 3), we keep our specification parsimonious. For example, one may suspect that the effects of education, age and other factors on female labor supply vary over time, and therefore, we should control for interactions between these characteristics and year dummies. Household wealth and home ownership also play an important role in the labor market decisions of married women (Albanesi and Prados, 2022). Adding these factors to the estimation changes the empirical results little; thus, we do not consider them in the following.[9]

3.2. Husbands' wages and women's hours worked

Women are more likely to adjust their hours worked or the flexibility of their jobs (i.e., the intensive margin of labor supply) according to family income changes. Based on Devereux (2004) and Blau and Kahn (2007), we investigate the impact of husbands' wages on the hours worked by employed women using the following specification:

$$H = \delta_0 + \delta_1 * ln(wifeWage) + \delta_2 * ln(husWage) + \delta_3 X + \eta \quad (2)$$

H is the hours worked by married women. We control for the annual wages of husbands (*husWage*) and wives (*wifeWage*). X is a vector of control variables, including the wife's age, years of schooling, number of children, number of elderly individuals in the household, and their husband's age and years of schooling, hours worked, and city of residence in addition to year effects. A difference between Models 1 and 2 is that we control for wives' wages in Model 2 and do not control them in Model 1. We use women's education and age to proxy potential earnings in Model 1 because they are unavailable for nonworking women.

3.3. Gender identity and married women's labor supply

An increase in the husband's wages reduces the probability that the wife earns more than her husband. Conversely, a decrease in the husband's wages threatens his status as the primary breadwinner. When a woman earns more (potential or actual) than her husband, she may adjust her labor supply by working fewer hours, taking a lower-paying job, or withdrawing from the labor market to avoid violating the established gender roles (Bertrand et al., 2015; Xu and Huang, 2018; Fang et al., 2021). As the husband's absolute wage is correlated with changes in relative income within the household, ignoring the impact of gender identity might bias our

[9] See Table 8 in the appendix for results controlling for household wealth and home ownership.

estimates of the direct income effect of an increase in the husbands' wages on the female labor supply. We control for the impact of gender identity by including the probability that the wife's potential wage is higher than that of her husband in our previous specifications.

Following Bertrand et al. (2015), we assigned each woman to a demographic group according to age, education, and the province of residence.[10] We then compute the wage percentiles within a demographic group $w_t^p, p \in \{5,10,...,95\}$, for each survey year. w_t^p is the p^{th} percentile of the wage distribution for wives of a given age group, education, and province. The probability that the wife's potential income exceeds her husband's actual wage is equal to $Pr\text{WifeEarnsMore} = \frac{1}{19}\sum_p 1\{wifeWage_i^p > husWage_i\}$. In other words, *PrWifeEarnsMore* measures the likelihood that the wife would earn more than her husband if her income were a random draw from the population of working women in her demographic group (Bertrand et al., 2015).[11] Appendix Table 6 describes the descriptive statistics of *PrWifeEarnsMore* used for our empirical analysis. The likelihood that a wife potentially earns more than her husband was approximately 0.27 in 2018. This likelihood has declined over time, which is driven by the changes in the wife's relative contribution, as well as the expansion of the gender wage gap in urban areas since the start of the new century (Ma, 2022).

We use this probability, which is driven by changes in the wives' and husbands' relative incomes, as the independent variable to investigate its impact on husbands' absolute income. The specification is as follows:

$$supply = \mu + \lambda_1 * ln(husWage) + \lambda_2 * PrWifeEarnsMore + \lambda_3 X + \upsilon \quad (3)$$

where *supply* refers to the wife's decision to participate in the labor market or to adjust her hours worked. *PrWifeEarnsMore* represents the social norm of gender identity, as defined above. *husWage* is the husband's annual wage. *X* includes non-income controls, such as the wife's and the husband's years of schooling, age, the husband's hours worked, a dummy indicating if the husband works in the public sector, the number of children, the number of elderly individuals in the household, city of residence, and year. Based on Model 3, we can

[10] The three age groups we consider are younger age group (aged between 20–30), middle-age group (aged between 31–40) and older age group (aged between 41–55). The three educational groups are less educated group (less than senior high school); middle school education, and more educated group (with college degrees).

[11] Several variables can reflect traditional gender norms. Considering the measure of gender identity proposed by Bertrand et al. (2015) is important for our analysis since our task is to control for gender norms that are correlated with the husbands' wages (the core independent variable of this paper). The way we construct PrWifeEarnsMore makes it a natural candidate control variable, and it is more correlated with labor market distortions. Other variables, such as sex ratios, might not be correlated with the husbands' wages as strong. Meanwhile, Xu & Huang (2018) and Fang et al. (2021) also follow Bertrand et al. (2015) to construct similar proxy for gender identity. They show that gender identity distorts wives' labor market behavior in China.

separate the direct and indirect effects of an increase in husbands' wages on married women's labor supply decisions.

3.4. Endogeneity and sample selection

Estimating Models 1–3 faces econometric difficulties. First, unobservable factors might simultaneously affect the husband's wage and the wife's labor supply decisions. Some non-labor income, benefits, and familial support from grandparents might be correlated with the husband's wages and the wife's labor supply decisions simultaneously. For instance, the low wages of a husband working in the public sector can be compensated by other fringe benefits. If the fringe benefits include free or affordable childcare services, the wife will have more time to participate in the labor market. For another instance, if the grandparents could provide childcare, then the wife would stay in the labor market rather than become a full-time housewife. At the same time, the husband could look for a high-wage job, creating a spurious correlation between husbands' wages and women's labor supply. Second, the wife's labor force participation may affect her husband's wages. For instance, if the wife does not work, the husband might choose among a wider range of jobs to increase his earnings. To address the endogeneity problem, we perform IV estimation for Models 1–3. Following Blau and Kahn (2007), husbands' wages are instrumented by their own wage decile since the measurement error in wage deciles is less frequent than in actual levels. Additionally, since the average wages remain correlated with current personal wages, we use the average wages within each province and industry over time (from the China Labor Statistics Yearbook) as a second set of instruments.[12]

Families with nonwork husbands are excluded from investigating the impact of a husband's income on the wife's labor force participation.[13] There may be systematic differences between the unemployed and employed samples, causing selection bias in the OLS estimation. We correct the sample selection bias by reweighting the sample with wages and predicting wage earnings for husbands who do not work. In the reweighting approach, we estimate the probit model using a male sample aged under 60.[14] The dependent variable indicates whether the

[12] Noted that the women's wages might also be endogenous. We employ the same instruments for women's wage and re-estimate Equation (2). After both husbands' wages and wives' wages are instrumented, as well as addressing the selection bias, the correction results are very similar to our findings in Table 5.

[13] It should be noted that the proportions of unemployed husbands are 5.98% in 1995, 1.36% in 2002, 7.32% in 2013, and 6.55% in 2018.

[14] The dependent variable is whether the husband has reported a positive wage. The controls include age and its square and cubic terms, education, the interaction of age and schooling, number of children, number of elderly individuals, and city of residence.

husband has wages, and the probability of having wages is predicted using the estimation results. The reciprocal of this predicted probability is the new weight to re-estimate regression Models 1–3. In the second approach, we predict wages for unemployed husbands. In applying both approaches, we employ IV analyses to solve the endogeneity problem.

4. Empirical results

4.1. Husbands' wages and women's labor force participation

Columns 1–5 in Table 3 report the baseline results with women's labor force participation status as the dependent variable. Using pooled cross-sectional data and controlling only the year dummies (Column 1), for a 1% increase in husbands' wages, the probability of labor force participation increases significantly by 0.0308 percentage points. The positive correlation between women's labor force participation and husbands' wages is likely a result of assortative mating (Schwartz, 2010), by which high-income husbands marry high-ability women who are more inclined to work. We use women's age (and its square and cubic terms) and education as indicators of women's work orientation and potential income (Column 2). Given wives' age and education levels, their labor force participation is negatively correlated with their husbands' wages: a 1% increase in husbands' wages leads to a 0.01 percentage point decrease in their probability of labor force participation. It is also likely that husbands with higher wages prefer larger families, which requires women to spend more time in home production. Thus, we control for the number of children and elderly family members. The negative correlation between husbands' wages and married women's labor force participation rates remains largely unchanged, with the coefficient magnitude decreasing slightly (Column 3).

As mentioned above, we control for husbands' age and schooling to estimate the average impact of husbands' wages on wives' labor supply within different marriage types. We also add control variables of husbands' hours worked and an indicator of the public sector. Husbands' wages still have a significantly adverse impact on married women's labor force participation: a 1% increase in husbands' earnings leads to a 0.0177 percentage point reduction in the probability of their wives' labor force participation (Column 4).

Table 3 Husband's wage and female labor force participation, OLS

	(1)	(2)	(3)	(4)	(5)
Husband's wage	0.0308***	-0.0111**	-0.0093**	-0.0177***	-0.0235**
	(0.0047)	(0.0047)	(0.0047)	(0.0052)	(0.0092)
Wife's education		0.0237***	0.0241***	0.0226***	0.0231***
		(0.0010)	(0.0010)	(0.0012)	(0.0014)

PrWifeEarnsMore					-0.0151
					(0.0178)
Husband's hours worked	NO	NO	NO	YES	YES
Husband's age & education	NO	NO	NO	YES	YES
Husband works in the public sector	NO	NO	NO	YES	YES
Number of children	NO	NO	YES	YES	YES
Number of elderly	NO	NO	YES	YES	YES
Wife's age	NO	YES	YES	YES	YES
City FE	NO	YES	YES	YES	YES
Obs.	18,484	18,484	18,484	17,646	17,646
R-squared	0.0287	0.2608	0.2667	0.2566	0.2567

Notes: 1). The wife's age and its square and cubic terms are controlled in Columns 2 – 5, and the husband's age and its square and cubic terms are controlled in Columns 4 and 5. 2). Year dummy variables are controlled in each column. 3). Standard errors in parentheses; significance levels are *0.10, **0.05, and ***0.01.

Column 5 shows that when the probability of the wife's potential wage exceeding her husband's actual wage is higher, the wife is less likely to participate in the labor market, but the coefficient is not statistically significant. Comparing Columns 4 and 5 shows that controlling *PrWifeEarnsMore* significantly increased the effect of the husband's wage on the likelihood that the wife is in the workforce, as the absolute value of the coefficient rises to 0.0235. Increases in husbands' wages lead to decreases in the probability that their wives' potential wages is higher than that of their husbands, which leads to an increase in the probability of women participating in the labor force. The above results also indicate that previous estimates of the income effect of husbands' wages were underestimated.

To appreciate the magnitude of the impact of husbands' wages, notice that their logarithmic wage increased by approximately 1.7 natural logarithms from 9.16 in 1995 to 10.85 in 2018 (see Table 1). The above result in Column 4 indicates that one log-point increase in husbands' earnings leads to a 1.77 percentage point reduction in women's labor force participation rate. The increase in husbands' wages from 1995 to 2018 caused an approximately three (=1.7*1.77) percentage point decrease in married women's labor participation rates, approximately 19% of the decrease in married women's labor participation rates in urban China from 1995–2018. Considering the impact of gender identity, the contribution of increases in husbands' wages is much larger (25%). For comparison, the rise in women's education levels leads to a two percentage point increase in the probability of women's labor force participation rate. Therefore, the rise of women's education and family income are counteracting forces affecting married women's labor supply decisions.

4.2. Husbands' wages and women's hours worked

We estimate how husbands' wages influence married women's hours worked in Table 4. The dependent variable is wives' annual hours worked. The OLS model yields a significantly adverse wage effect. After controlling for the wife's characteristics, the estimated coefficient of the husband's wages is -112.7. When the husband's education, hours worked and sector choice are considered, the adverse impact of the husband's wages on his wife's labor supply decision further increases (Column 2).[15] The results also show that women's wages significantly increase their hours worked. The responsiveness of women's labor supply to their wages is statistically larger than the cross-wage labor supply elasticities (i.e., the elasticity to husbands' wages).

After controlling for a proxy of gender identity (*PrWifeEarnsMore*), changes in husbands' wages significantly reduce the hours worked by married women (Column 3), and the absolute value of the coefficient rises by 34%. Our evidence sheds light on the impact of gender identity on married women's hours worked and accounts for the role of gender identity in affecting husbands' direct income effect in urban China.

Table 4 Husbands' wages and married women's hours worked, OLS

	(1)	(2)	(3)
Husband's wage	-112.7***	-145.0***	-194.1***
	(11.65)	(11.62)	(18.90)
Wife's education	-28.02***	-25.38***	-21.26***
	(2.423)	(2.355)	(2.652)
Wife's wage	196.0***	213.5***	216.1***
	(12.43)	(12.43)	(12.48)
PrWifeEarnsMore			-121.2***
			(33.11)
Husband hours worked	NO	YES	YES
Husband's age & education	NO	YES	YES
Husband works in the public sector	NO	YES	YES
Number of children	YES	YES	YES
Number of elderly	YES	YES	YES
Wife's age	YES	YES	YES
City FE	YES	YES	YES
Obs.	14,342	13,994	13,994
R-squared	0.114	0.261	0.262

Notes: 1). The wife's age and its square and cubic terms are controlled in each column. 2). Year dummy variables are also controlled in each column, but estimates are not presented due to space constraints. 3). Standard errors in parentheses; significance levels are *0.10, **0.05, and ***0.01.

[15] The estimated coefficient of husbands' hours worked is positive, indicating that the husband and wife's home production time is complementary. When the husband's hours worked variable is not controlled, this complementary relationship reduces the impact of the husband's wages on his wife's (conditional) hours worked.

5. Addressing endogeneity and sample selection bias

Since the husband's wage can only be observed when he has a job and reports positive wages, a sample selection bias may exist. We used two approaches to correct the selection bias. First, following Chiquiar and Hanson (2005), we construct a new weight for those employed so that the employed husbands, rightly reweighted, represent the whole sample. We estimate the working probability of the male sample aged under 60 and reweight the male sample with positive wages. Since the weight is calculated based on the observable characteristics of working-age men, only when the correlation between the observable and unobservable characteristics is strong is the correction estimation close to the unbiased results.

Second, based on the personal demographics and corresponding wage level of the labor market participants, we predict wage earnings for unemployed husbands. The prediction method directly complements the information of nonparticipants, but it might cause other estimation biases. For instance, there may be unobservable characteristics that make the error term of wages differ between participants and nonparticipants in the labor market. Additionally, wage prediction might bring more measurement errors. These two methods are based on the observable characteristics of husbands, and the correction results may still show estimation bias. Using IVs can correct the estimation bias to a certain extent.

After using IVs and constructing new weights to solve the endogeneity and sample selection bias, the results still indicate a significantly adverse correlation between husbands' wages and wives' labor supply decisions. The coefficient of husbands' wages on married women's labor force participation is approximately -0.017, which is very similar to the estimates calculated by OLS. Furthermore, using the income prediction method and employing the instrumental variables, married women's labor supply also significantly decreases with an increase in husbands' wages. Considering gender identity produces results showing a stronger effect of husbands' wages.

As discussed previously, after husbands' wages are instrumented by wage deciles and average wages, the OLS estimates (see Table 3 and Table 4) and the correction results in Table 5 are very similar. Additionally, correcting for sample selection bias indicates that the sample selection bias is not serious. The implication of the comparisons implies that endogeneity and selection problems do not significantly alter our results. Therefore, we focus on the OLS regressions in the following study.

Table 5 Husbands' wages and women's labor supply, IV

	Reweighting		Wage Prediction	
	(1)	(2)	(3)	(4)
	FLFP	Hours worked	FLFP	Hours worked
A:Basic IV				
Log husband's wage	-0.017***	-153.550***	-0.021***	-202.565***
	(0.005)	(10.444)	(0.006)	(12.760)
Observations	16,010	12,701	17,374	13,767
R-squared	0.264	0.255	0.256	0.261
Weak identification test	11731	7591	4631	2858
B: Control gender identity				
Log husband's wage	-0.022**	-249.633***	-0.026*	-360.964***
	(0.011)	(21.811)	(0.014)	(29.575)
PrWifeEarnsMore	-0.010	-220.414***	-0.010	-285.439***
	(0.022)	(41.272)	(0.023)	(44.642)
Observations	16,010	12,701	17,374	13,767
R-squared	0.264	0.255	0.256	0.254
Weak identification test	2779	1905	933.7	569.1

Notes: 1).Instruments used in this table are the decile in which the husband's actual wage offer falls, and the average wage within each province and industry from China Labor Statistics Yearbook, 1995, 2002, 2013, and 2018, respectively. 2). All regressions control the wife's education and age, the number of children and elderly in the household, husband's education and age, the husband's hours worked, a dummy indicating that the husband works in the public sector, city of residence, and year dummy variables. 3). Standard errors are in parentheses; significance levels are *0.10, **0.05, ***0.01.

6. Heterogeneous effects and time trends

6.1. Heterogeneous effects

We analyze the heterogeneous effect of husbands' wages on women's labor supply decisions by estimating the models by women's age, education, and the number of children. Figure 1 provides estimates of the labor force participation analysis (with and without consideration of gender identity). We find that the impact of the husband's wages is larger in the younger age group. An explanation is that the 20- to 35-year-olds are more likely to have younger children and have a relatively more significant labor force participation response to changes in their husbands' wages.

A significantly negative relationship between husbands' wages and wives' labor force participation is observed in the less educated group; for those with middle school education or lower, a 1% increase in the husband's wages significantly lowers his wife's participation by 0.03 percentage points (without controlling for gender identity). However, for more educated women (i.e., with high school or college degrees), the impact of husbands' wages is small and statistically insignificant.

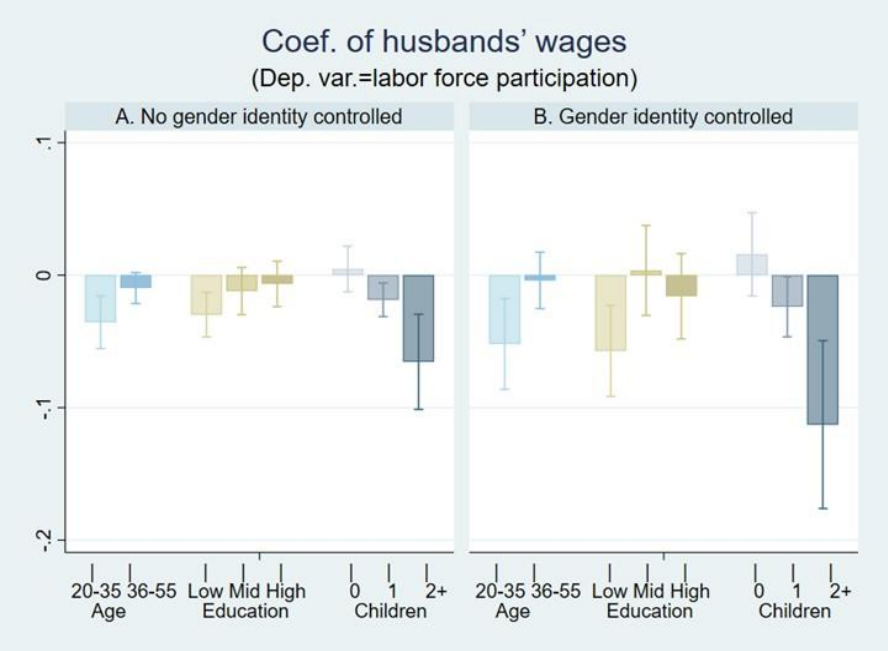

Figure 1 Heterogeneous effect of husbands' wages on women's labor force participation

Notes: 1) All coefficients are calculated separately in regressions controlling for the husband's wage, the wife's own education and age, the number of children and elderly in the household, the husband's education and age, the husband's hours worked, a dummy indicating that the husband works in public sectors, city of residence, and year dummies. 2) The three groups by education are those with less than senior high school education (Low), those who have completed senior high school (Mid), and those with degrees above the senior high school level (High).

Figure 1 also shows the results for women with different numbers of children. The negative correlation between the husband's wages and the wife's probability of labor force participation is significant in families with children: a 1% increase in the husband's earnings reduces the probability of one-child wives' participation by 0.019 percentage points, whereas the corresponding reduction for mothers of more than one child is 0.065 percentage points (without controlling for gender identity). The rising demand for childcare leads to a larger decline in married women's labor force participation rates in response to increases in their spouses' wages.[16]

The right panel of Figure 1 depicts how women's labor force participation responds to increases in their husbands' wages when controlling for the effect of gender identity and indicates a larger impact of husbands' wages.[17]

[16] Xu et al. (2020) also provide evidence that, with the increase in the father's income, the role of married women in the family and childcare is particularly important. Recently, Liu et al. (2022) employ microdata from the sixth population census and find that the decline in childbearing willingness in rural China significantly increases the negative impact of fertility on female labor supply.

[17] Note that the impact of gender identity is negative but not significant for women with low levels of education. In contrast, the coefficient of PrWifeEarnsMore that is driven by changes in relative income is positive and statistically insignificant for the more educated group.

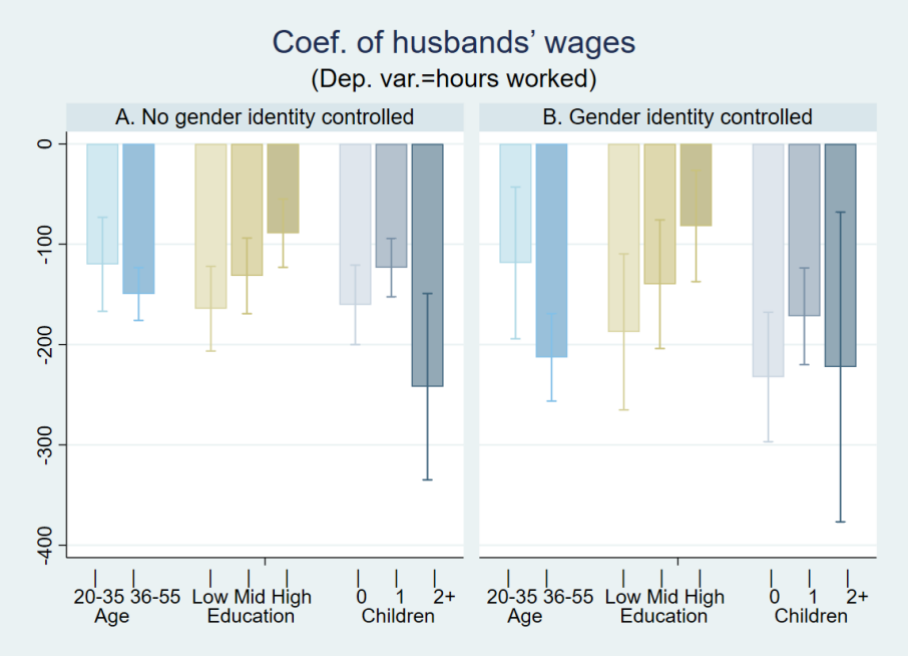

Figure 2 Heterogeneous effect of husbands' wages on married women's hours worked

Notes: 1) All coefficients are calculated separately in regressions controlling for the husband's wage, the wife's wage, the wife's own education and age, the number of children and elderly in the household, the husband's education and age, the husband's hours worked, a dummy indicating that the husband works in public sectors, city of residence, and year dummies. 2) The three groups by education are those with less than senior high school education (Low), those who have completed senior high school (Mid), and those with degrees above the senior high school level (High). 3) Estimates for hours worked only consider employed women aged 20-55 years.

There are some interesting changes in the heterogeneous effects of husbands' wages on women's hours worked (see Figure 2). First, unlike the results for labor force participation rates, the adverse impact of husbands' wages on wives' hours worked is larger for the older group. According to the definition of children (i.e., household members under 18 years of age) in this study, a large portion of the older cohorts (36–55 years old) had no school-age children as the children had grown up and left the household.[18] For married women aged 36–55 or those without children, changes in their husbands' wages lead to a significant increase in income-driven demand for leisure. The responsiveness of their hours worked to their husbands' wages is larger than that of their counterparts. In contrast, for women with more than one child, their husbands' wages have a large impact on whether they participate in the labor market, as well as a significantly adverse impact on their labor supply decision. Second, for each of the three education groups, husbands' wages have a significantly adverse impact on wives' hours worked, and this impact decreases with women's education level.[19]

[18] In the old-age group, the proportion of women with no children is 48.74%.

[19] We also focus on how husbands' wages influence their wives' unconditional hours worked (including married women with zero or no hours worked). The findings are similar to the impacts of husbands' wages on married women's labor force

6.2. Temporal trends

Inspired by the evolution of female labor force participation catalyzed by economic development, we estimate changes in the impacts of husbands' wages on wives' labor supply decisions using four waves. As shown in the left panel of Figure 3, after controlling for married women's characteristics and their husbands' education, wives' labor force participation declined in response to increases in their husbands' wages from 2002 to 2018. However, this correlation is statistically significant in 2002 and 2018. More specifically, a 1% increase in husbands' income causes a reduction in the probability of married women's participation by 0.031% in 2002 and 0.020% in 2018.[20] When considering gender identity, the impact of husbands' wages still seems to grow weaker in 2018 (see the right panel of Figure 3).

Controlling for women's characteristics and husbands' schooling, married women's hours worked was negatively correlated with husbands' wages in 2002, 2013, and 2018 (see Figure 4). The effect grew stronger over time. With a reduction in institutional constraints and an end to the planned assignment of workers to work units during this period, an increase in per capita income allows women with high earning husbands to work fewer hours.

participation, with the negative effect of husbands' wages being much larger among younger women, those with children, and those with lower education.

[20] In 2013, the impact of husbands' wages was insignificant. One possible reason is that a nonlinear relationship between husbands' wages and wives' labor force participation rates exists. Therefore, we take the dummies of husbands' wage group as the independent variable to investigate the role of husbands' income groups on wives' participation. Compared with the lowest wage groups, the results show that the coefficient of the dummy variables in 1995 is close to zero and has little change, which indicates that the differences of married women's labor force participation rates among different wage groups are insignificant. In the following years, women's labor force participation rates decrease with increases in husbands' wages. It is worth noting that in 2013, with increases in husbands' wages, the coefficients of dummy variables of different wage groups reflect trends of first rising and then declining. This can explain why the coefficient of husbands' wages in 2013 is not significant.

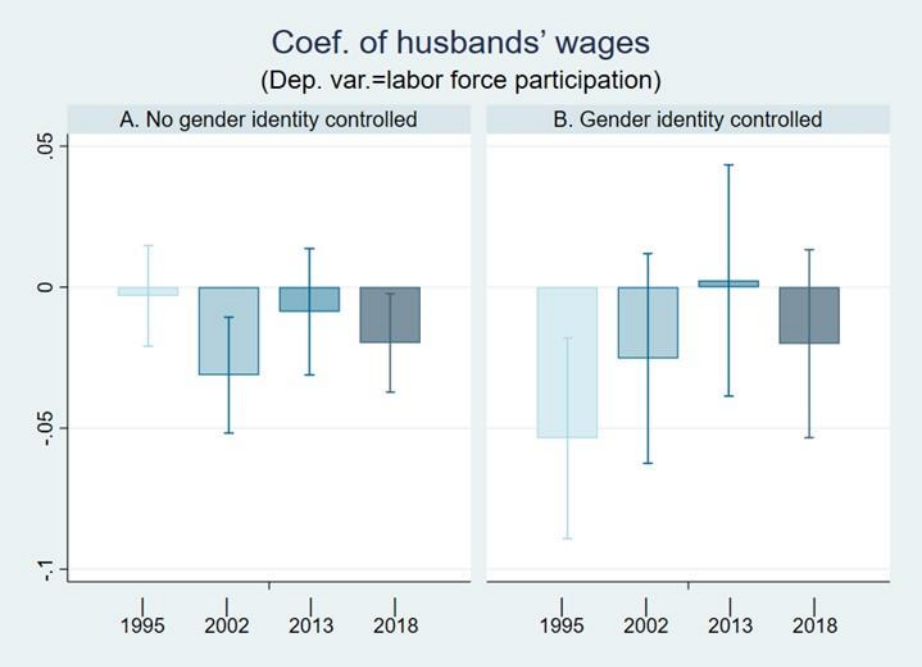

Figure 3 The effect of husbands' wages on female labor force participation by year

Notes: All coefficients are calculated separately in regressions controlling for the husband's wage, the wife's own education and age, the number of children and elderly in the household, the husband's education and age, the husband's hours worked, a dummy indicating that the husband works in the public sector, city of residence, and year dummies.

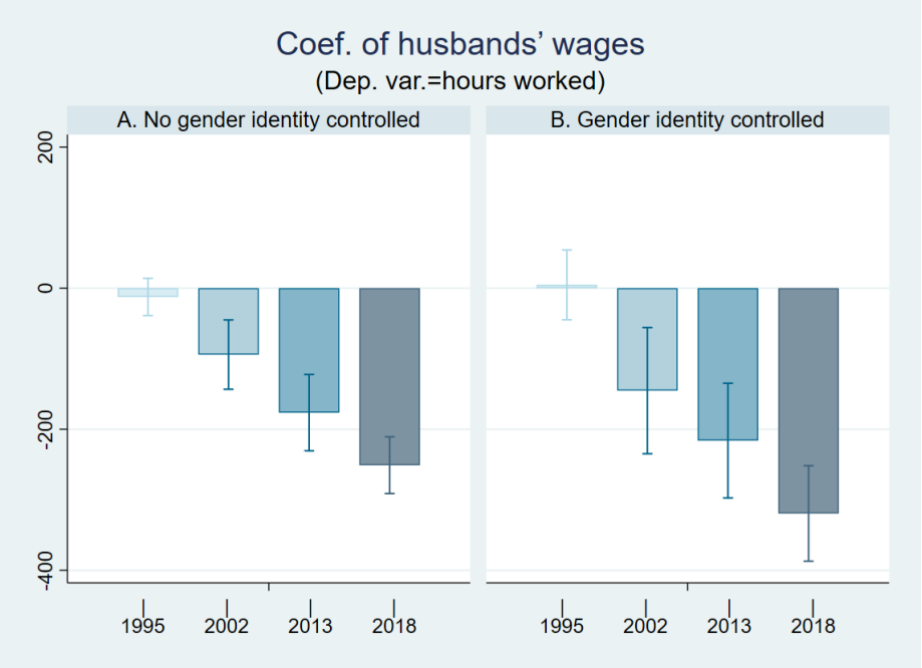

Figure 4 The effect of husbands' wages on women's hours worked by year

Notes: All coefficients are calculated separately in regressions controlling for husband's wage, the wife's wage, the wife's own education and age, the number of children and elderly in the household, the husband's education and age, the husband's hours worked, a dummy indicating that the husband works in the public sector and city of residence.

Furthermore, we estimate how husbands' wages influence wives' unconditional hours worked. Specifically, we assign zero hours worked to those unemployed women and those who do not participate in the labor markets. Figure 5 shows the temporal trends in the impacts of husbands' wages on wives' unconditional hours worked using four waves of CHIP surveys. The findings are largely similar to the impacts of husbands' wages on married women's conditional hours worked. More specifically, the time trends analysis indicates that the role of husbands' wages on women's unconditional hours worked became stronger from 2002 to 2018.

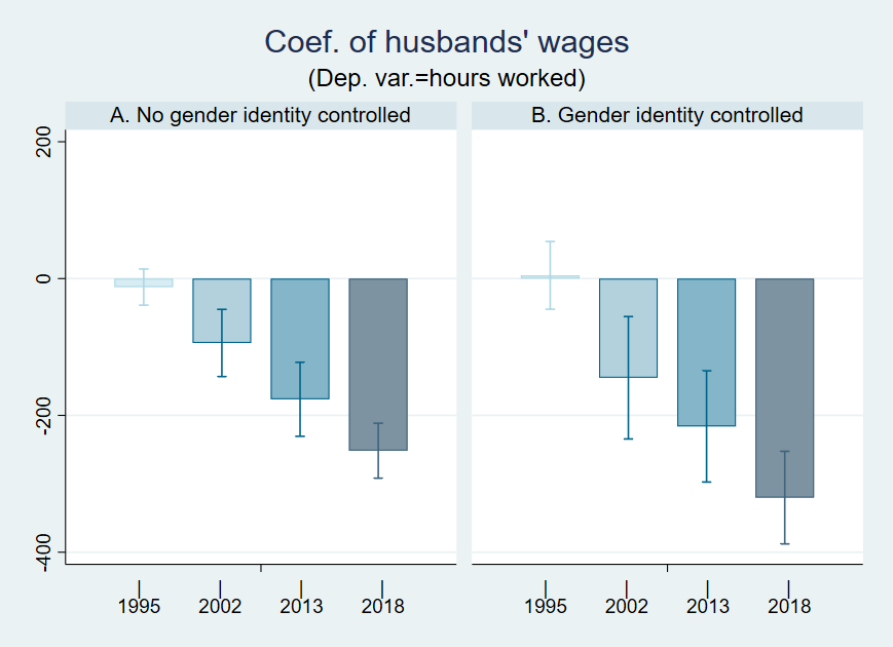

Figure 5 The effect of husbands' wages on women's unconditional hours worked by year

Notes: 1) All coefficients are calculated separately in regressions controlling for the husband's wage, the wife's wage, the wife's own education and age, the number of children and elderly in the household, the husband's education and age, the husband's hours worked, a dummy indicating that the husband works in the public sector and city of residence. 2) We assign zero hours worked to non-employed women.

7. Conclusion

Over the past two decades, China has experienced a sharp decline in urban women's labor force participation rates. This study examines the impacts of husbands' wages on married women's labor supply decisions. Using four waves of urban household survey data from the CHIP in 1995, 2002, 2013, and 2018, we find that given women's education and age, husbands' wages play a significantly adverse role in married women's labor force participation, and this adverse impact declined from 2002 to 2018. Growth in husbands' income decreases the probability of a gender-role reversal in earnings within households and affects women's labor supply decisions. We then control for a proxy for gender identity norms and provide evidence that the effect of husbands' absolute income increases significantly. Our results are robust to correcting

endogeneity and sample selection bias. We also find that the adverse impact of husbands' wages on wives' labor force participation is much larger for couples who are young, less educated, and have more children. Considering the intensive margins of the labor supply, we find a negative correlation between husbands' wages and women's hours worked. The increase in husbands' wages significantly affects the hours worked of old-age cohorts and married women with more children.

Our findings help understand the changes in married women's labor force participation rates in urban China. Women's labor supply is of great significance to the sustainable growth of an economy. However, their labor force participation rates experienced a sharp decline in urban China despite rising educational levels of women. The results show that the rise in family income—especially increases in husbands' wages—is the main reason for the decline in labor force participation among married women in urban areas.

Second, our findings shed light on the impact of traditional gender roles on the labor supply of married women. Ignoring the negative impact of gender identity on the female labor supply may understate the true direct income effect of married men in urban China. Third, the correlation between husbands' wages and married women's labor supply decisions identified in this study is consistent with the added worker effect and helps to understand how households respond to economic fluctuations. If husbands' incomes decrease owing to wage cuts or unemployment, formerly nonparticipating wives can enter the labor force or increase their hours worked, as suggested by the added-work effect.

In addition, this study helps evaluate welfare differences across different families. Our results provide evidence that low-income families consume less and enjoy less leisure. Thus, welfare inequality is greater than income inequality. Moreover, higher wages among married men may induce their wives to work less and spend more time on the human capital investment involved in rearing children, thus reducing the intergenerational mobility of human capital and causing persistent income inequality across generations.

References

Albanesi, S., & Prados M. J. (2022). Slowing women's labor force participation: the role of income inequality. NBER Working Papers, No. 29675.

Alenezi, M., & Walden M. L. (2004). A new look at husbands' and wives' time allocation. *Journal of Consumer Affairs*, 38(1), 81–106.

Ashenfelter, O. (1980). Unemployment as disequilibrium in a model of aggregate labor supply. *Econometrica*, 48(3), 547–564.

Baker, M., & Benjamin D. (1997). The role of the family in immigrants' labor-market activity: an evaluation of alternative explanations. *American Economic Review*, 87(4), 705–727.

Becker, G. S. (1965). A theory of the allocation of time. *Economic Journal*, 75(299), 493–517.

Bertrand, M., Pan, J., & Kamenica, E. (2015). Gender identity and relative income within households. *The Quarterly Journal of Economics*, 130(2), 571–614.

Borjas, G. (1980). The Relationship Between Wages and Weekly Hours of Work: The Role of Division Bias. *Journal of Human Resources*, 15(3), 409-423.

Bick, A., Fuchs-Schündeln N., & Lagakos D. (2018). How do hours worked vary with income? Cross-country evidence and implications. *American Economic Review*, 108(1), 170–99.

Blau, F. D, & Kahn L. M. (2007). Changes in the labor supply behavior of married women: 1980–2000. *Journal of Labor economics*, 25(3), 393–438.

Blau, F. D., Kahn, L. M., Moriarty, J. Y., & Souza, A. P. (2002). The role of the family in immigrants' labor-market activity: Evidence from the United States. Social Science Electronic Publishing.

Blundell, R., & MaCurdy T. (1999). Labor supply: A review of alternative approaches. *Handbook of Labor Economics*, 3, 1559–1695.

Chen, X., & Ge S. (2018). Social norms and female labor force participation in urban China. *Journal of Comparative Economics*, 46(4), 966–987.

Chiquiar, D., & Hanson G. H. (2005). International migration, self-selection, and the distribution of wages: Evidence from Mexico and the United States. *Journal of Political Economy*, 113(2), 239–281.

Combes, P. P., Démurger S., & Li, S. (2015). Migration externalities in Chinese cities. *European Economic Review*, 76: 152–167.

Démurger, S., Gurgand, M., Li, S., & Yue, X. (2009). Migrants as second-class workers in urban China? A decomposition analysis. *Journal of Comparative Economics*, 37(4), 610–628.

Devereux, P. J. (2004). Changes in relative wages and family labor supply. *Journal of Human Resources*, 39(3), 698–722.

Du, F., & Dong X. (2010). An empirical study of women's labor participation and preschool education choice in the transitional period. *Journal of World Economy*, 33(2), 51–66.

Euwals, R. (2001). Female labour supply, flexibility of working hours, and job mobility. *The Economic Journal*, 111(471), 120–134.

Fang, Y., Lan J., & Yang Y. (2021). The impact of gender identity on female labor supply and household income structure: Perspectives from education and rural-urban differences. *China Economic Quarterly*, 21(05), 1711–1730.

Fernandes, R., & Felício F. D. (2005). The entry of the wife into the labor force in response to the husband's unemployment: a study of the added worker effect in Brazilian metropolitan areas. *Economic Development and Cultural Change*, 53(4), 887–911.

Fortin, N. M. (2015). Gender role attitudes and women's labor market participation: Opting-out, aids and the persistent appeal of housewifery. *Annals of Economics and Statistics*, 117/118, 379–401.

Fu, S., Liao Y., & Zhang J. (2016). The effect of housing wealth on labor force participation: Evidence from China. *Journal of Housing Economics*, 33: 59–69.

Gaddis, I., & Klasen S. (2014). Economic development, structural change, and women's labor force participation. *Journal of Population Economics*, 27(3), 639– 681.

Goldin, C. (1986). The female labor force and American economic growth, 1890-1980. in Stanley L. Engerman & Robert E. Gallman eds. *Long-term Factors in American Economic Growth*, University of Chicago Press.

Goldin, C. (1990). Understanding the gender gap: An economic history. New York: Oxford University Press.

Guo, X. (2012). Determinants of the labor supply of married womens' labor force participation in China - An analysis based on the standardized regressive coefficient. *Population and Economics*, 2(5), 47–51. (in Chinese)

Hare, D. (2016). What accounts for the decline in labor force participation among married women in urban China, 1991–2011? *China Economic Review*, 38: 251–266.

Jayachandran, S. (2021). Social norms as a barrier to women's employment in developing countries. *IMF Economic Review*, 69(3), 576–595.

Juhn, C., & Murphy K. M. (1997). Wage inequality and family labor supply. *Journal of Labor Economics*, 15(1, Part 1), 72–97.

Li, H., Li J., Lu Y., & Xie H. (2020). Housing wealth and labor supply: Evidence from a regression discontinuity design. *Journal of Public Economics*, 183: 1-28.

Liu, S., Jin T., Li M., & Zhou S. (2022). Fertility Policy Adjustments and Female Labor Supply: Estimation of Marginal Treatment Effect Using Chinese Census Data. *Journal of Human Resources*, 10. (In Chinese)

Maurer-Fazio, M., Connelly R., Chen L., & Tang L. (2011). Childcare, eldercare, and labor force participation of married women in urban China, 1982–2000. *Journal of Human Resources*, 46(2), 261–294.

Ma, X. (2022). Parenthood and the gender wage gap in urban China. *Journal of Asian Economics*, 80: 101479.

Meng, X. (2012). Labor market outcomes and reforms in China. *Journal of Economic Perspectives,* 26(4), 75–102.

Meng, X., & Zhang J. (2001). The two-tier labor market in urban China: occupational segregation and wage differentials between urban residents and rural migrants in Shanghai. *Journal of Comparative Economics*, 29(3), 485–504.

Mroz, T. A. (1987). The sensitivity of an empirical model of married women's hours of work to economic and statistical assumptions. *Econometrica*, 55(4), 765–799.

Ngo, A.P. (2020). Effects of Vietnam's two-child policy on fertility, son preference, and female labor supply. *Journal of Population Economics*, 33, 751–794.

Nie, H., & Xing C. (2019). Education expansion, assortative marriage, and income inequality in China. *China Economic Review,* 55: 37–51.

Park, S., & Shin D. (2020). Welfare consequences of rising wage risk in the United States: Self-selection into risky jobs and family labor supply adjustments. Working Paper Series 7967, Victoria University of Wellington, School of Economics and Finance.

Qu, Z., & Zhao Z. (2017). Glass ceiling effect in urban China: Wage inequality of rural-urban migrants during 2002–2007. *China Economic Review*, 42: 118–144.

Schwartz, C. R. (2010). Earnings inequality and the changing association between spouses' earnings. *American Journal of Sociology*, 115(5), 1524–1557.

Si, W. (2022). Higher education expansion and gender norms: evidence from China. *Journal of Population Economics*, 35, 1821–1858.

Wu, X. (2022). Fertility and maternal labor supply: Evidence from the new two-child policies in urban China. *Journal of Comparative Economics*, 50(2), 584–598.

Wu, Y. (2015). Untangling income and substitution effect: An explanation for changes in urban female labor force participation. Economic Research Journal, 3(4), 3–30. (in Chinese).

Xu, H., Zhao Z., & Zhang Z. (2020). The social status of parents and the cognitive and non-cognitive abilities of children. Working Paper. (in Chinese).

Xu, J., & Huang Y. (2018). Gender identity, marriage and labor behavior within households. *Economic Research Journal*, 53: 136–150. (in Chinese).

Yao, X. & Tan L. (2005). Family income and labor force participation of married women in urban China. *Economic Research Journal*, 5: 18–27. (in Chinese).

Zhang, S. (2014). Wage shocks, household labor supply, and income instability. *Journal of Population Economics*, 27, 767–796.

Appendix

Table 6 Summary statistics: women's relative wages and gender identity

	1995	2002	2013	2018	1995	2002	2013	2018
	A. Share of wife's wage (%)				B. Gender identity			
Wives	45.27	42.58	42.01	41.10	33.50	31.99	27.20	27.10
By wife's age								
20–35	45.65	41.84	42.28	41.29	36.86	30.48	28.14	27.38
36–55	45.10	42.76	41.91	41.04	32.18	32.37	26.94	27.03
By wife's education								
Middle school and below	43.27	40.00	40.03	38.14	28.05	27.11	22.85	22.51
Senior high school	46.00	42.90	41.62	40.84	36.63	32.88	27.87	25.70
College and above	48.44	46.66	44.34	44.38	42.90	40.35	33.20	35.26
By husband's education								
Middle school and below	45.31	43.50	41.13	39.32	33.94	35.85	27.42	25.81
Senior high school	44.93	42.27	41.94	41.44	33.87	32.03	28.20	28.00
College and above	45.58	41.88	42.74	42.47	32.52	27.27	26.06	27.95
By husband's age								
20–39	46.03	42.45	42.47	41.53	38.08	31.79	28.88	28.53
40–59	44.60	42.64	41.72	40.88	30.13	32.08	26.39	26.51
By husband's wage quintile								
Lowest group	52.49	54.44	50.27	49.57	72.54	69.86	71.27	66.47
Second group	46.98	44.02	45.38	42.44	46.78	40.77	38.48	34.49
Middle group	44.25	41.47	41.92	40.11	30.61	29.32	24.82	22.73
Fourth group	42.55	38.83	39.43	38.92	18.67	16.52	13.09	15.52
Top group	39.70	34.16	35.12	35.30	9.14	6.04	4.94	5.39
By number of children								
0	43.83	43.00	42.13	41.98	26.34	31.33	26.35	27.39
1	45.71	42.43	42.18	40.29	36.09	32.75	28.65	27.02
>=2	44.30	39.28	40.04	41.14	33.29	28.08	23.51	26.45

Notes: 1). The share of wives' wages is calculated as the share of the household labor wages earned by the wife. 2). Gender identity is defined as the likelihood that the wife would earn more than her husband if her income was a random draw from the population of working women in her demographic group. 3). The number of children is grouped according to the number of children under age 18 in the household.

Table 7 First stage of IV estimation

	Basic IV		Control gender identity	
	(1)	(2)	(3)	(4)
	Reweighting	Wage Prediction	Reweighting	Wage Prediction
The decile of husband's wage 1	-3.196***	-2.575***	-2.722***	-2.089***
	(0.019)	(0.028)	(0.029)	(0.044)
The decile of husband's wage 2	-2.652***	-2.114***	-2.268***	-1.720***
	(0.013)	(0.021)	(0.024)	(0.034)
The decile of husband's wage 3	-2.381***	-1.868***	-2.063***	-1.540***
	(0.013)	(0.020)	(0.021)	(0.030)
The decile of husband's wage 4	-2.113***	-1.637***	-1.833***	-1.349***
	(0.012)	(0.018)	(0.019)	(0.027)
The decile of husband's wage 5	-1.822***	-1.398***	-1.581***	-1.150***
	(0.011)	(0.017)	(0.016)	(0.023)
The decile of husband's wage 6	-1.526***	-1.156***	-1.332***	-0.957***
	(0.011)	(0.015)	(0.014)	(0.020)
The decile of husband's wage 7	-1.218***	-0.909***	-1.073***	-0.759***
	(0.011)	(0.013)	(0.012)	(0.016)
The decile of husband's wage 8	-0.932***	-0.678***	-0.835***	-0.578***
	(0.010)	(0.013)	(0.011)	(0.014)
The decile of husband's wage 9	-0.614***	-0.429***	-0.558***	-0.371***
	(0.010)	(0.012)	(0.010)	(0.012)
Average wages	0.020**	0.043***	0.023***	0.047***
	(0.008)	(0.010)	(0.008)	(0.010)
Observations	16,094	17,467	16,094	17,467
R-squared	0.958	0.917	0.961	0.920

Notes: 1). This table shows the first-stage regressions of IV estimates in Table 5. Instruments here are the decile in which the husband's actual wage offer falls and the average wage within each province and industry from *the China Labor Statistics Yearbook*, 1995, 2002, 2013, and 2018, respectively. 2). All regressions control the wife's education and age, the number of children and elderly in the household, the husband's education and age, the husband's hours worked, a dummy indicating that the husband works in the public sector, city of residence, and year dummy variables. 3). Standard errors are in parentheses; significance levels are *0.10, **0.05, ***0.01.

Table 8 Estimation results controlling for household wealth and homeownership

	Labor force participation			Hours worked		
	(1)	(3)	(4)	(5)	(7)	(8)
	Baseline	Financial assets	House	Baseline	Financial assets	House
Log husband's wage	-0.0235**	-0.0336***	-0.0206**	-194.1***	-186.4***	-196.4***
	(0.0092)	(0.0100)	(0.0093)	(18.90)	(20.54)	(19.05)
Wife's education	0.0231***	0.0225***	0.0230***	-21.26***	-20.93***	-20.53***
	(0.0014)	(0.0015)	(0.0014)	(2.652)	(2.832)	(2.657)
Wife's wage				216.1***	214.3***	215.4***
				(12.48)	(13.42)	(12.64)
PrWifeEarnsMore	-0.0151	-0.0152	-0.0086	-121.2***	-122.1***	-132.6***
	(0.0178)	(0.0192)	(0.0179)	(33.11)	(36.03)	(33.30)
Observations	17,646	15,314	17,391	13,994	12,173	13,804
R-squared	0.2567	0.2660	0.2613	0.262	0.259	0.264

Notes: 1). All regressions control the wife's education and age, the number of children and elderly in the household, the husband's education and age, the husband's hours worked, a dummy indicating that the husband works in public sectors, city of residence, and year dummy variables. 2). Standard errors are in parentheses; significance levels are *0.10, **0.05, ***0.01.