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Gender Wage Ratio and Intra-household Resources Allocation in China: Evidence from the China Health and Nutrition Survey

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Abstract: The gender wage gap is a critical measurement of gender equality in the labor market. On the demand side in the labor market, gender differences in labor pricing can shape the household decision regarding intra-household resource allocation. Understanding how labor pricing, namely wages, affects the resources allocated to women is important to improve women's welfare in developing countries. Previous research focuses on the effects of gender norms in China, such as son preferences, on intra-household resource allocation. This paper examines how the gender wage gap affects the resources allocated to women within the household. To capture the wage shock in the labor market, I construct the gender- specific Bartik variables. The results indicate that the increases in female-to-male wages between couples improve women's nutrition intake. This work serves to inform about improving women's welfare in the family and labor market.

Keywords: Gender wage gap, intro-household resources allocation, Bartik variable

1. Introduction

The gender wage gap is a prevalent issue in labor markets globally and has been a prominent topic of interest in labor economics. Existing literature based on the field of family economics suggests that factors such as "intergenerational differences," "marital quality," and "child gender" play significant roles in explaining the gender wage gap. This is because women tend to take on more household responsibilities within traditional gender roles, allocating more time to domestic labor, which in turn leads them to invest less in their careers and accept relatively lower wages [1]. In China, the main factors contributing to the gender wage gap are analyzed from the perspectives of industry segregation, occupational segmentation, gender discrimination, marketization, and trade [2]. The Global Gender Gap Report published by the World Economic Forum indicates that on average, women's wages are only slightly higher than half of men's average wages [3]. Despite the substantial economic development and progress in China over the past three decades of reform and opening-up, research suggests that the wage gap between women and men continues to widen [4]. With the relaxation of China's two-child and three-child birth policies, trends of employment discrimination against women are expanding. In Chinese culture, the long-standing belief in the division of labor with men working outside and women managing household affairs undoubtedly affects the allocation of time for Chinese

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women between household labor and the labor market. However, a higher gender wage ratio not only implies equal standing for men and women in the workplace but also provides women with more opportunities for resource allocation within the family [5]. Therefore, what is the impact of the gender wage ratio on household resource allocation? How is resource allocation determined? This study aims to assist the government in formulating policies to promote equal status for women in the labor market and improve gender wages, ultimately enhancing women's well-being and protecting their legitimate rights within the family.

Previous literature has shown that an increase in the gender wage ratio in American society benefits the average quality of female spouses, enabling them to invest more time in work [5]. For example, the introduction of birth control pills has contributed to increased working and labor hours for women, thereby increasing their wage income, narrowing the gender wage gap, and improving the male-female wage ratio [6]. Therefore, the gender wage ratio will change the allocation of household resources by altering the working time of men and women within the family. In another research area, other researchers have found that contemporary women are increasingly engaged in occupations that require relatively high cognitive skills. In contrast, industries in which men are predominantly employed tend to emphasize physical skills. The increase in the price of cognitive skills is beneficial for increasing women's income in the workplace, thereby improving the gender wage ratio between men and women [7]. An increase in the gender wage ratio between men and women will help women gain more equal family status, thereby reducing domestic partner violence against women [8]. Duncan's [9] study in Brazil found that enhancing mothers' control over family resources contributed to improved health levels for their children. Another important aspect of research on the allocation of resources within families is risk diversification among family members. Fortunately, reducing the gender wage ratio is also beneficial for improving women's education levels and narrowing gender experience gaps [1]. Li and Wu [10] found that preferences for sons affect the allocation of family resources, which is a key characteristic of equal family status. Scholars' literature indicates that increasing the number and types of dowries for women helps improve their bargaining position in the family, thereby better altering the allocation of resources within the family [11]. Differences in the allocation of household resources may lead to varying mortality rates between males and females. Those considered to contribute more to family income are believed to receive better resources [12]. Therefore, an increase in the share of women's income will affect the tendency of household expenditure, making the allocation of family resources more reasonable and enhancing women's bargaining power [13]. On the technological side, agricultural technological changes also help promote a significant increase in family income, increase calorie consumption, and make the allocation of family resources more reasonable. Furthermore, it improves the nutrition status of children and women [14]. At the same time, with the changing times, the traditional patriarchal system in Chinese families is gradually disintegrating, and patriarchal attitudes are gradually fading, which is conducive to a more equal distribution of family resources between men and women [15].

In this study, I utilized data from the China Health and Nutrition Survey (CHNS) [16], which commenced in 1989 and constitutes a longitudinal survey project. CHNS conducts household surveys encompassing a wide range of topics including demographic characteristics, economic development, public resources, and health indicators. In this study, I employed the proportion of nutritional intake to gauge intra- family resource allocation, adhering to the approach of Li and Wu [10]. A larger proportion of a wife's nutritional intake indicates that more family resources are allocated to women in this household.

In the household, the investment of men and women in the labor market is closely tied to the allocation of resources within the family. Therefore, simple regression analysis cannot provide conclusive evidence on how the gender wage ratio affects intra-family resource allocation. For instance, gender attitudes can influence the distribution of resources within the family and also impact

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the investment of men and women in the labor market, leading to a potential issue of missing variables in regression analysis. On the other hand, the allocation of resources within the family can result in different working hours between men and women, thereby affecting the gender wage ratio, potentially causing a problem of reverse causality in regression analysis. To address endogeneity issues in regression analysis, I employed the Bartik variable in this study [17]. Following the approach of Shenhav [5], I used the Bartik variable, which captures exogenous shocks in the labor market, and these shocks exhibit heterogeneity across gender and occupations. By utilizing this Bartik variable, I found that an increase in the gender wage ratio led to a 5.3% increase in protein intake in family nutrition. Hence, it is evident that the gender wage ratio has an impact on the allocation of family nutrition resources.

The increase in the gender wage ratio has led to an augmentation of resources allocated to women within households. In developing countries, women's welfare plays a crucial role in enhancing overall physical health. This implies that many individuals globally will benefit from this.

The structure of the following sections is as follows: Section 2 provides a description of the data. Section 3 discusses the empirical strategy. Results are presented in Section 4. Section 5 offers a conclusion.

2. Data

This study utilized data from the China Health and Nutrition Survey (CHNS). The CHNS employs a multi-stage, stratified, cluster random sampling method and is a collaborative research project between the China National Center for Food Safety Risk Assessment (CFSA) and the Population Research Center at the University of North Carolina at Chapel Hill in the United States. Its purpose is to investigate the impact of China's economic transformation and the implementation of the family planning policy on the nation's health and nutrition status. The survey commenced in 1989 and has been conducted seven times to date, covering urban and rural areas in nine provinces. The survey content encompasses demographic characteristics, economic development, public resources, and health indicators, among other topics. Additionally, there is detailed community-level data available, including information on social service facilities such as food markets and medical institutions. These advantages render CHNS uniquely valuable for exploration. Similar to the method used by Li and Wu [10] to measure intra-family resource allocation, this study utilized nutritional intake data to gauge intra-family resource allocation.

Table 1. Summary Statistics

	(1) **Male**	**(2)** **Female**
Annual wages, inflated to 2015 RMB	13873.56 (22174.34)	9651.61 (13844.78)
Age	39.49 (6.48)	37.57 (6.44)
1 = Han ethnicity	0.96 (0.21)	0.95 (0.21)
Body mass index (BMI)	23.16 (3.17)	22.61 (3.01)

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Table 1. (continued).

1 = 4-year college or higher	0.09 (0.29)	0.07 (0.26)
3-Day Ave: Energy (kcal)	2580.42 (665.44)	2195.29 (633.99)
3-Day Ave: Carbohydrate (g)	346.31 (100.19)	299.45 (88.92)
3-Day Ave: Fat (g)	89.71 (41.37)	79.24 (48.84)
3-Day Ave: Protein (g)	82.19 (25.81)	70.13 (21.08)
Number of children	1.42 (0.68)	
Number of biological boy children	0.76 (0.59)	
1 = Urban area	0.59 (0.49)	
Wife's share of energy intake	0.46 (0.05)	
Wife's share of carbohydrate intake	0.46 (0.05)	
Wife's share of fat intake	0.47 (0.08)	
Wife's share of protein intake	0.46 (0.05)	
Observations	1029	

Our sample includes couples in which members are aged from 25 to 54. Due to the fact that most men and women before the age of 25 are still in school and have not yet participated in the labor market, I dropped them from our sample. Similarly, most men and women after the age of 54 are getting retired, and their income primarily consists of pensions rather than wages, so I also drop them from our sample. At the same time, I only keep households with one only one couple residing in, as the intra- household resource allocations are heterogeneous among households with different numbers of marital relationships. On the other hand, I only include couples in which both members are

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employed during the survey due to their recorded wages in the data. Table 1 shows the summary statistics. In this data table, I can find that the average wages of men and women is 13,874 RMB and 9,652 RMB, respectively. The average Inflated-adjusted wages of women are lower than those of men. In terms of education level, the share of higher education of the female group also lags behind that of the male group. Women with a bachelor's degree or above account for 7% of the total female group, while men with a bachelor's degree or above account for 9% of their group. In terms of household nutrition intake, the share of women's nutrition intake in the couple's nutrition intake takes up less than 50%. Specifically, the share of women's calorie intake takes up around 46%, and fat and protein intake takes up around 47% and 46%, respectively. Besides, the average ages for husbands and wives are 39.49 and 37, respectively. 96% of males are Han Chinese, and 95% of females are Han Chinese. As for the health proxies, the average BMI for husbands is 23.16, while the average BMI for wives is 22. 61. In a family, each couple has an average of 1.42 children, while each mother has an average of 0.76 boys. Couples living in urban areas account for 59%.

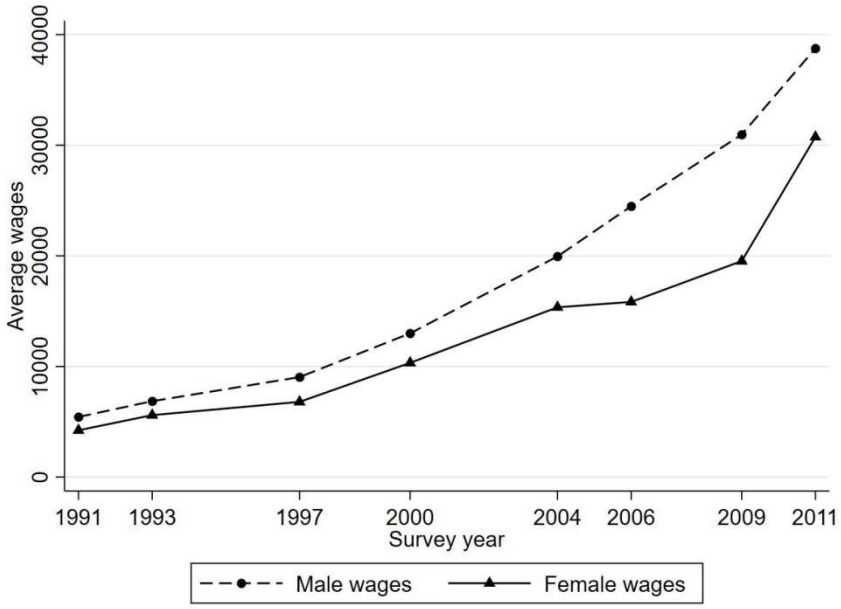

Figure 1. Development in Male and Female Wages

Figure 1 shows that the male and female wages increased in our sample. From 1991 to 2009, the wages of men and women continued to increase, and the gender wage gap between men and women remained basically unchanged but continued to widen. From 2009 to 2011, the gender wage gap narrowed.

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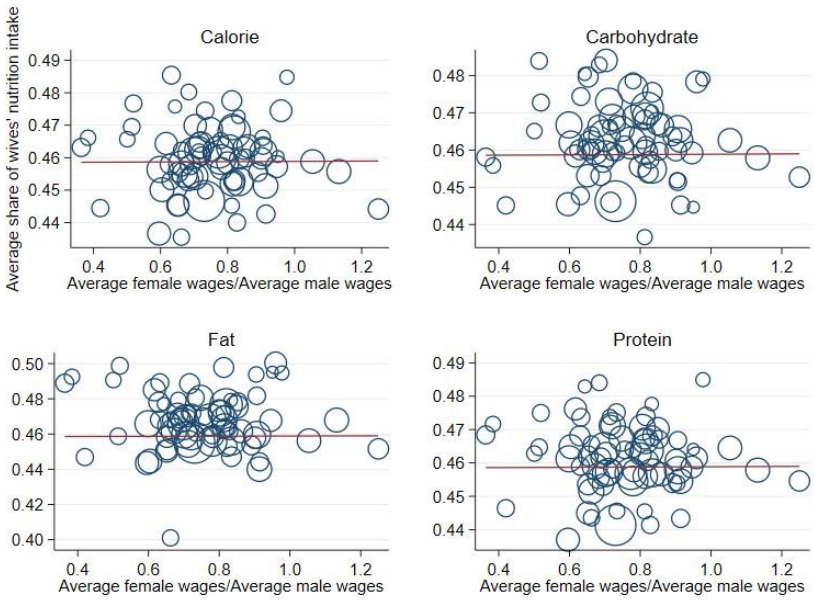

Figure 2. Correlation between Gender Wage Ratio and Share of Wife's Nutrition Intake

These four figures represent the relationship between the intake of calories, carbohydrates, fats, and proteins by men and women in households and the gender wage ratio. The X-axis represents the ratio of female to male wages, while the Y-axis represents the proportion of female nutritional intake in household intake. Each point corresponds to each province in different years weighted by the number of couples, while a straight line is a fitting line of a series of points. The slope of the fitting line is positive, indicating a positive correlation between the gender wage ratio and the ratio of women's nutritional intake in the household. In these figures, I do not find the raw correlation between the gender wage gap and the wife's share of nutrition intake. However, considering the endogenous issues, the figures cannot reach the conclusion that the gender wage gap has no effect on the intra-household resource allocation.

3. Empirical Strategy

The main issue in this study is to solve the endogenous issues in the regression analysis. Three types of problems might cause the endogeneity in the regression. First is about the omitted variables. Couples have unobservable characteristics and preferences related to the labor division within the household and also the intra- household resources allocation. For instance, gender norms favoring the notion of housewives over working women and valuing men over women might overestimate the effects of gender wage ratio on the wife's share of nutrition intakes. Second, the reversed causality should be of concerns as men take jobs requiring more labor investments and offering higher salaries, which leads to more nutrition intakes in their daily life compared to their wives with less work load. Third, the measurement errors in the wages causes biases in estimations. The self-reported wage data suffers from data imputation and misreports. To cope with the endogenous problem, I am using the Bartik variable which captures the demand shock in the labor market and hence not related to individuals' subjective options. Followed by Shenhav [5], the Bartik variable for marriage market m in year t for gender g is

$$W_{mt}^{g}=\sum_{j}\frac{E_{jm,t_0}^{g}}{E_{m,t_0}^{g}}\times W_{jt,-p}^{g}, \quad (1)$$

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The marriage market is defined by ages (25-34,35-44,45-54), education (lower high school, high school graduation, some college, 4-year university or higher), and ethnicity (han, others), and province. $\frac{E^g_{jm,t_0}}{E^g_{m,t_0}}$ is the share of employed population for occupation j in marriage market m in the year leading the sample t_0. $w^g_{jt,-p}$ is the average wages for occupation j in the place other than province p here the marriage market is located. Fixing the employment population at the beginning of sample period, the Bartik variable capture the wages shock to occupation outside the local marriage market, and hence capture the exogenous variations unrelated to the preferences and characteristics of the couples living in the local marriage market. For the couple c, their gender wage ratio is

$$gender\ wage\ ratio_{ct} = W^{wife}_{mt} / W^{husband}_{mt} \tag{2}$$

which is the ratio of the Bartik variable for wife's marriage market over the Baritk variable for husband's marriage market.

4. Results

I estimate the effects of gender wage ratio on the wife's share of nutrition intake by using the following estimation equation:

$$logY_{ct} = \beta_1 \log WageRatio_{ct} + \beta_2 FamIncome_{ct} + \beta_3 BMI_{c_f t} + \beta_4 BMI_{c_m t} + \beta_5 Hsize_{ct} + \beta_6 Child_{ct} + \beta_7 Boy_{ct} + \beta_8 Urban_{ct} + \delta_g + \gamma_p + \psi_t + \epsilon_{ct} \tag{3}$$

Y_{ct} are the wife's share of nutrition intake between the members of a couple. In the regressions, the dependent variables are the wife's share of calories intake, carbohydrates intake, fats intake and protein intake, respectively. $WageRatio_{ct}$ are the Bartik-form of gender wage gap. β_1 are the main coefficient of interests, estimating the elasticity of wife's nutrition intake with respective to gender wage gap within the couple. The economic condition can be the factor affecting the couple's preferences over intra-household resources allocation. I include the joint income of the couple, $FamIncome_{ct}$, into the regression. Besides, the couple's health conditions are the factors affecting how the couple allocation the nutrition intake. The regression includes $BMI_{c_m t}$ and $BMI_{c_f t}$, which are the husband's and wife's BMI index, respectively. The BMI indices are measured by weight over the squared height. I also consider the family formation, proxied by the total member residing in the household, $Hsize_{ct}$, the indicator for any children residing in the household, $Child_{ct}$, and the indicator for the wife has given birth to a boy, Boy_{ct} [10] . Regional differential effects on intra-household nutritional allocation are capture by the indicator for living in the urban areas, $Urban_{ct}$.

Couples have heterogenous preferences over intra-household resources allocation. To capture the unobserved preferences, I include a series of fixed effects. δ_g are the fixed effects of the combination of characteristics of both husband and wife. The characteristics of husband and wife are divided by education (high school dropout and below, high school graduation, college degree, bachelor's degree and above), ethnicity (Han, ethnic minorities) and age group (25-34 years old, 35-44 years old, 45-54 years old). Each sex is divided into 24 characteristic groups, and according to the different characteristics of the husband and wife, the couple can be divided into 576 characteristic groups. γ_p are the fixed effects of provinces. And ψ_t represents the year fixed effects. This regression reflects the change of women's household nutritional intake with the change of the gender wage ratio, their family income, male and female BMI index, number of family members, whether they have children, whether they have boys, whether they are urban, and the difference in education level, regional culture, and time.

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As shown in **Table 2**, regression equation 1, shown in column 1, shows that the gender wage ratio has no significant effect on the wife's calorie intake within the household. However, the higher the BMI of men, the lower the proportion of calories consumed by their wives within the household. In addition, from the regression formula 1, compared with women who have given birth to girls, the proportion of calories in the household of women who have given birth to boys has increased by 1.7%. In addition, women's BMI index and whether there are children living within the household have no effect on the share of women's calorie intake. From regression equation 2, the gender wage ratio has no significant effect on the wife's carbohydrate intake within the household. The higher the BMI index of men, the share of carbohydrate intake in the family will be significantly reduced by 38.9%. Moreover, the share of carbohydrate intake of women who had given birth to a boy increased by 1.7% compared to women who gave birth to girls. Looking at the regression formula 3, the gender wage ratio has no significant effect on the proportion of wife's fat intake within the family, while the increase in the BMI index of men has led to a small increase in women's fat intake in the family, and whether women have given birth to boys has no significant impact on women's fat intake in the family. From column 4, regression formula 4, the gender wage ratio had a significant impact on the wife's protein intake within the household, increasing the share by 5.3%. In addition, the higher the BMI of men, the lower the wife's protein intake within the household. In addition, women who had given birth to boys had significantly better protein intake than women who had given birth to girls. Overall, couples' joint income, the size of the family and the index of a woman's BMI, whether they have children, or whether they live in a town have no significant effect on women's nutritional intake.

Table 2. Effects of Gender Wage Ratio on Wife's Share of Nutrition Intake

	-1 log(wife's share of calorie intake)	**-2 log(wife's share of carbohydrate intake)**	**-3 log(wife's share of fat intake)**	**-4 log(wife's share of protein intake)**
log(gender wage ratio)	0.014	0.017	0.051	0.053*
	-0.022	-0.023	-0.036	-0.029
couple's joint income	0	0	0	0
	0	0	0	0
husband's BMI	-0.003**	-0.004***	0.001	-0.002*
	-0.001	-0.001	-0.002	-0.001
wife's BMI	0.001	0.002	-0.001	0
	-0.001	-0.001	-0.002	-0.001
number of members within the household	0.003	-0.004	0.007	0.003
	-0.006	-0.005	-0.01	-0.006

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Table 2. (continued)

1 = wife gave to a boy	0.017*	0.017*	0.009	0.026***
	-0.009	-0.01	-0.015	-0.01
1 = children existing in the household	0.004	0.009	-0.008	0.003
	-0.011	-0.011	-0.022	-0.01
1 = living in the urban area	-0.007	-0.009	0.001	-0.006
	-0.009	-0.009	-0.015	-0.009
Observations	1029	1029	1029	1029
group fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes

5. Conclusion

With the rapid development of modern society, more and more women are coming forward to seek equal treatment. On a global scale, the issue of gender wage differences between men and women still exists. In China, the gender work concept of "men leading outside, women leading inside" is deeply imprinted in the hearts of Chinese people. In this research, I analyzed data from the China Health and Nutrition Survey (CHNS) using the Bartik variable. Analysis shows that the difference in gender wage ratio will have a significant impact on women's protein intake in households, resulting in a 5.3% increase in the proportion.

From a policy standpoint, the implications are manifold. The research findings underscore the pressing need for government intervention to rectify the gender wage gap and foster a fairer labor market. Policymakers could consider implementing comprehensive measures, such as wage transparency initiatives, incentivizing companies to promote gender diversity at all levels of their organizations, and investing in education and training programs to empower women in traditionally male-dominated sectors.

Moreover, the far-reaching implications extend beyond the labor market. The increase in women's protein intake signifies the intersection of economic and social dimensions of gender inequality. Therefore, it becomes imperative to design policies that not only address income disparities but also promote access to quality healthcare, nutrition, and education.

Furthermore, the research underscores the significance of promoting women's welfare holistically. Policies that facilitate work-life balance, affordable childcare, and robust mechanisms to combat workplace discrimination are essential components of fostering gender parity. Lastly, the findings emphasize the need to safeguard women's legitimate rights within the family unit. Policymakers should consider initiatives that empower women in decision-making processes, protect against domestic violence, and ensure equitable access to familial resources.

In summation, this research serves as a resource for policymakers seeking to navigate the complex landscape of gender equality. It bolsters the case for comprehensive policies that champion equal treatment, economic empowerment, and social justice for women, ultimately fostering a more inclusive and equitable society.

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