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# GENDER AND WORK COMPENSATION IN CHINA'S INDUSTRIAL SECTOR

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The gender gap in earnings is analyzed using data for 250,000 Chinese industrial firms in 2004. The skill-weighted gender wage is estimated to be 12 percent and stems entirely from the female wage disadvantage among employees with below college education. Firms' payments to social insurance programs do not give further polarization of earnings, and descriptive statistics contradict the notion that women are segregated into sectors with low program participation rates. Narrower gender wage gaps are found in more labor intensive industries and in private domestic firms, suggesting that the market transition has not hurt the relative wages of female industrial workers. Finally, women's earnings disadvantage is fully accounted for by smaller contributions to value added, suggesting that firms do not wage-discriminate against female employees.

**JEL Codes**: I30, J16, J71, O10

**Keywords**: China, gender wage gap, non-wage compensation

## 1. INTRODUCTION

The question of gender-related wage discrimination and earnings differences is of great economic and social importance. China's female labor force is the largest in the world, reaching 640 million in 2004. China is also the largest country in transition from a planned to a market economy with a rapidly expanding and evolving labor market. How female employees are faring in this transition is important, not only to women's welfare. Discriminatory treatment that discourages labor market participation and skills investments would damage Chinese long-term growth, and thereby also affect the world.

In this paper, I assess the gender wage gap in China's industrial sector by drawing on a large and nationally representative firm-level dataset. This data allows the calculation of gender wage gaps by education level, as well as by industrial sector, firm ownership, and geographical region. As such, I explore the main dimensions of China's market transition, i.e. the expansion of private and foreign industrial ownership, the expansion of light consumer goods production, and the geographically diverse market liberalization.

My study is also the first quantitative analysis of whether non-wage compensation contributes to a wider gender gap in earnings. In China's new social insurance system, mandatory provisions carry a total cost equal to nearly half of the

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total wage bill (Banister, 2005).[1] Previous research has argued that insurance cover has become increasingly gender-biased during the transition period, stemming an over-representation of women in evading firms (Wang, 2006; Razavi, 2007).

To assess the existence of wage discrimination, I use the method offered by Hellerstein and Neumark (1999) and Hellerstein *et al*. (1999) to calculate and compare women's relative wages to their relative productivity. This method has the advantage of circumventing the need to rely on control variables in the wage equation to capture all gender-related productivity differences. As pointed out by, for example, Altonji and Blank (1999), observable individual-level characteristics are unlikely to properly capture these differences, thus overestimating the degree of discrimination. Indeed, the unexplained proportion of the wage gap has been large in previous studies, often exceeding two thirds of the gap (see Shen and Deng, 2008, for a survey). Firm level data, instead, allows direct estimation of women's relative productivity from the firm's production function. The popularity of Hellerstein and Neumark's method also has the advantage of making the results comparable to the numerous studies conducted for other countries.[2]

The dataset includes all large and medium-sized industrial enterprises, as well as the majority of those designated as "small." Importantly, it includes the precise educational attainment of each employee, each employee's gender, as well as firm expenditures on various social insurance items. Using this highly representative data improves substantially on the statistical precision of previous studies, in particular compared to Dong and Zhang's (2009) unique study of 998 firms in the late 1990s. Nevertheless, the use of cross-sectional data also merits caution in interpreting the results, as the statistical analysis relies on control variables to capture gender-related wage and productivity differences across firms.

The descriptive analysis offers a uniquely comprehensive picture of women's employment on the industrial labor market. It shows overrepresentation of women in firms with private ownership, in particular among those with investment from outside the Chinese mainland. There is also substantial gender segregation across industries. Women make up less than a third of the workforce in heavy industry, but approach two thirds in the textile, tailoring, and leather sectors.

In the nationwide sample, the estimates show an average skill-weighted gender wage gap of 12 percent. This is a narrow gap compared to those found in studies of other countries, when using similar methodologies and data.[3] Adding firm payments to social insurance programs to the wage bill does not give evidence that non-wage payments contribute to further gender polarization of average earnings.

Separating workers according to skill-level shows that unskilled women earn less than men with the same skill-level, while skilled women earn more. This result corresponds to previous studies using individual-level data, which have demon-

[1]Banister (2005) draws upon a survey conducted by China's Ministry of Labor, covering 11,704 urban enterprises in 51 large cities, to conclude that the standard wage measure of employee earnings should be increased by 53.8 percent to fully account for labor compensation actually paid by urban employers.

[2]Including analysis of the U.S. (Hellerstein *et al*., 1999; Hellerstein and Neumark, 2005); Israel (Hellerstein and Neumark, 1999); Germany (Bartolucci and Alberto, 2010); Japan (Asano and Kawaguchi, 2007); and China (Dong and Zhang, 2009).

[3]It is also slightly narrower than the gap found by Dong and Zhang (2009), although their sample selection combined with the imprecision of the estimate makes a comparison difficult.

strated a larger education premium for female than for male workers (Maurer-Fazio, 1999; Li, 2003). Further investigation of this result shows that it stems from wage setting in state-controlled sectors, while there is no statistically significant wage difference among highly educated workers in the foreign-owned sector. Separating firms by industrial sector also yields some added insights. The wage disadvantage of unskilled women is found to be smaller in light industry than in other sectors. Meanwhile, no correlation is found between the size of the gender wage gap and the level of regional development.

With respect to gender wage discrimination, the results show that although women with lower education levels earn on average less than men, their relative contributions to firms' value added is even lower. For the state-controlled sectors, this finding may be interpreted as further evidence of a lingering mismatch between women and jobs as a result of the state's labor allocation (as argued by Dong and Zhang, 2009). For the more recently established private sectors, an employer preference for unskilled female labor over male unskilled labor is confirmed by qualitative studies of Chinese factories. These studies highlight a preference for female unskilled labor motivated by women's perceived obedience and suitability for assembly line work (e.g. Pun, 2005, 2007).

The paper is organized as follows. Section 2 provides a brief overview of reforms to wage-setting and welfare systems in the post-1978 period and a review of previous research on gender-related wage gaps and discrimination in China. Section 3 explains the basic econometric framework, and Section 4 discusses the dataset, variables, and descriptive statistics. Benchmark estimation results and robustness checks are presented in Section 5, and Section 6 extends the analysis to variation by industry, ownership, and location. Section 7 concludes.

## 2. Wage and Non-Wage Compensation in Chinese Industry

In pre-reform socialist China, urban industrial workers enjoyed a system of guaranteed occupational and income security. This "Iron Rice Bowl" also provided access to social insurances (health care, pensions, education) that were distributed via state-owned work units. Equal labor market rights for men and women constituted an ethical commitment by the socialist state. It included judicial equality, the absence of gender bias with respect to entry into paid work, and access to social rights. Under this system, women's incomes improved radically: the gender-based wage differential narrowed and became small compared to that in other countries, particularly in urban areas (Croll, 1995). But with an industrial policy that emphasized heavy and capital-intensive industry, many women occupied blue collar positions for which they were physically disadvantaged, compared to men. The resulting skill mismatch was not reflected in the remuneration system which was determined at the central level (Korzec, 1992).

In the late 1970s, a series of radical reforms were enacted with respect to the industrial labor market. Transformation of the wage-setting system started in the early 1980s when firms were given autonomy over their remuneration levels within government guidelines. By the 1990s, these guidelines had evolved into the imposition of minimum wages (Shen, 2007). Another centerpiece of reform was the transfer of the labor allocation decision from the state to individual enterprises. By

1994, firms had been given the right to dismiss workers. This new authority was extensively practiced during a massive retrenchment program in the state-owned sector. Between 1997 and 2002, more than 28 million state employees were asked to leave their jobs (Dong and Xu, 2009).[4]

Reform aimed at streamlining the organization of state-owned enterprises (SOEs) came as a response to increasing competition from the rapidly growing private and foreign-owned sectors. These sectors also represented a problem from a social insurance perspective, because a growing number of firms were automatically excluded from insurance coverage. Simultaneously, problems were brewing in many state-owned firms where high pension costs hampered competitiveness. In the 1990s, the social system was dramatically overhauled with the aim of solving these problems.

Put simply, social insurance reform consisted of breaking up the enterprise-based entitlement model, known as the Labor Insurance Scheme (LIS), into separate social insurances. Instead of the insurance provided by each firm individually under the LIS, the new programs aimed to share risk across firms by regional pooling of worker accounts. In this way, the 1990s saw the birth of a number of programs: a two-tiered pension system in 1997, the Urban Employee's Basic Health Care Insurance System in 1998, an unemployment insurance scheme in 1999, and a system of workers' savings accounts for housing.

Although firms outside the state economy were obliged to join the new programs, compliance grew only modestly.[5] One reason was the high payment levels required to compensate for the pension arrears accumulated in state-owned firms.[6] Another important issue was the lack of a legal foundation, making enforcement difficult and evasion easy. Only very recently was this issue addressed, and China's new social insurance law has collected and formalized the previous sets of regulations.

Qualitative research has indicated an emerging pattern of gender-polarization in insurance cover, in particular in the export-oriented sectors of the economy (Wang, 2006; Razavi, 2007). It has also argued that women dismissed from SOEs were pushed into ownership sectors where social security protection was low (Stockman, 1994; Cooke, 2001).

In contrast to non-wage compensation, there are a large number of studies dedicated to earnings gaps and discrimination. Most studies use some of the cross-sectional household datasets collected by the Chinese Academy of Social Sciences in 1988, 1995, and 2002 under a project known as CHIP (China Household Income Project). The common finding in these papers is a gender wage gap of

[4]Women were over-represented among the employees that were laid-off (Appleton *et al*., 2002; Giles *et al*., 2006) but simultaneously the demand for them increased in the export-oriented, and highly labor intensive, industries.

[5]In 2005, the pension scheme covered 17 percent of the urban workforce, and unemployment insurance covered 14 percent (NBS, 2006, pp. 43, 201). Overall health insurance coverage actually decreased between 1998 and 2003, as mainstream cover fell more sharply than the increase in commercial and other non-commercial insurances (Xu *et al*., 2007).

[6]Guidelines call for a total of 24 percent of the payroll to be directed to pensions accounts (Jackson *et al*., 2009), 16 percent to the housing accumulation funds (by 2003; Wang *et al*., 2005), 2–6 percent to medical insurance (Xu *et al*., 2007), and 2 percent to unemployment insurance (Vodopivec and Tong, 2008).

slightly less than 20 percent, which was fairly constant over this period (Gustafsson and Li, 2000; Shu and Bian, 2003; Bishop *et al*., 2005; Démurger *et al*., 2007). This result is corroborated by the findings of researchers using data from the Urban Household Survey between 1988 and 1999 (Ng, 2004). Xu *et al*. (2006) report a slightly larger gap, 32 percent, in two recently urbanized towns in Zhejiang Province between 1999 and 2000. This is similar to Dong and Zhang's (2009) finding based on late 1990s firm-level data.

With respect to the size of the wage gap across educational categories, a number of studies report a smaller gender difference among highly educated employees (Gustafsson and Li, 2000; Hughes and Maurer-Fazio, 2002; Xu *et al*., 2006). Many studies have also focused on differences in the gender wage gap across ownership sectors, as motivated by the ongoing market transition of the Chinese economy. Xu *et al*. (2006) find the widest wage gap in privately owned enterprises, while Maurer-Fazio and Hughes (2002) and Maurer-Fazio *et al*. (1999) obtain the same result for firms registered as joint ventures. The studies by Liu *et al*. (2000) and Hughes and Maurer-Fazio (2002) add evidence that the widest wage gaps exist in the most marketized ownership sectors. However, their results show that a larger proportion of the wage gaps in these sectors are unexplained by observed worker characteristics. Rozelle *et al*. (2002) do not find any systematic association between the level of wage discrimination and the degree of market orientation by industry or ownership. Finally, the firm-level study by Dong and Zhang (2009) demonstrates that women are rewarded in accordance with their productivity in private firms but over-compensated compared to their productivity in the state-owned sector.

The share of the gender wage gap that is not explained by gender-related productivity proxies in the wage equation is generally large in the previous studies: over 50 percent in some cases (Gustafsson and Li, 2000; Shu and Bian, 2003; Bishop *et al*., 2005), and above 75 percent of the gap in others (Liu *et al*., 2000; Rozelle *et al*., 2002; Wang and Cai, 2008). This evidence for substantial gender-based wage discrimination is contested by Dong and Zhang's (2009) study of firms. They show that women's estimated wages, although lower than men's, are not statistically different from their estimated productivity.

## 3. Analysis of Earnings Discrimination with Firm-Level Data

Following Hellerstein and Neumark (1999), I use firm-level data to analyze the difference between women's and men's marginal wages and productivities. First, the production of firms, in value added terms, is expressed using a Cobb–Douglas production function in capital ($K$) and labor ($L$).[7] The labor input is represented by a quality of labor index

[7]As discussed by Griliches and Ringstad (1971), the value added specification of the production function improves comparability of data across industries and across establishments within industries. It also allows greater comparability when industries or establishments differ in the degree of vertical integration, and can be derived from quite polar production function specifications: one in which the elasticity of substitution between materials and value added is infinite (i.e., $Y = f(K, QL) + M$); and one in which this elasticity of substitution is zero (so that materials have to be used in a fixed proportion to output).

$$QL = M_U + \phi_{FU} F_U + \phi_{MS} M_S + \phi_{MS} F_S, \tag{1}$$

where $F_j$ and $M_j$ are the number of skilled, $j = S$, or unskilled, $j = U$, female or male employees. Hence, using natural logarithms, the full production function is expressed as

$$\ln(VA) = \ln(A) + \alpha_K \ln(K) + \alpha_L \ln[M_U + \phi_{FU} F_U + \phi_{MU} M_S + \phi_{FS} F_S]. \tag{2}$$

The specification of the quality of labor index implies that members of the four gender–skill groups are perfectly substitutable inputs, but that the marginal productivities of the groups may differ. The $\phi_{ij}$ parameters denote the average marginal productivity compared to male unskilled workers for the three other demographic groups: unskilled females, skilled females, and skilled males. In this setting, $\phi_{FU} = \phi_{MS} = \phi_{FS} = 1$ would indicate that all four gender–skill groups contribute equally to the firm's output. Alternatively, $\phi_{FU} = 0.75$ would imply that the average marginal productivity of female unskilled employees is 75 percent of that of their male unskilled co-workers. Letting $L$ represent total firm employment such that $M_U = L - F_U - M_S - F_S$, we can rewrite (2) as

$$\ln(VA) = \ln(A) + \alpha_K \ln(K) + \alpha_L \ln[L + (\phi_{FU} - 1) F_U + (\phi_{MS} - 1) M_S + (\phi_{FS} - 1) F_S]. \tag{3}$$

We next turn to the estimation of relative differentials for work compensation. A firm-level wage equation is set up in the form of a Mincer-type earnings equation:

$$\ln(W_T) = \lambda_0 + \ln(QL) = \lambda_0 + \ln[L + (\lambda_{FU} - 1) F_U + (\lambda_{MS} - 1) M_S + (\lambda_{FS} - 1) F_S], \tag{4}$$

where the dependent variable is the total wage bill, or the total amount of worker compensation, paid by the firm.[8] Analogous to the specification of the production function, the parameters $\lambda_{ij}$ denote the relative average wages of the three gender–skill groups compared to the wages of unskilled male workers. A vector comprising control variables is included in both equations. It incorporates measures of geographical location, industry, size, age, ownership, unionization, and township-and-village enterprise status.

Whether worker groups are compensated in accordance with their productivity is tested by comparing the estimated results of the production function (3) and of the wage equation (4). In practice, this means that the size of the relative average wage parameters $\lambda_{ij}$ are compared to the relative average productivity parameters $\phi_{ij}$ for each gender–skill group. Given the specification of the production function, is would be inconsistent with profit-maximizing or cost-minimizing behavior for firms to employ workers if their wage cost surpasses their productive value to the

[8]To see how this firm-level function can be understood as an aggregation of individual-level wage equations over workers in the firm, consider the individual level wage equation $w_i = w_M M_i + w_F F_i$ where $w_i$ is the wage of an individual worker with gender $i$, $w_M$ and $w_F$ are average wages, and $M_i$ and $F_i$ are dummy variables for females and males, respectively. Aggregating this function over the entire firm, the total wage bill is $W = w_M(L - F) + w_F F$, which can be expressed as $W = w_M [L + (\lambda_F - 1)F]$ where $\lambda_F$ is the average relative wage of women compared to men, $w_F / w_M$. Taking logs gives a simplified equivalent of equation (4), in which the constant corresponds to the average wage of men $\lambda_0 = \ln w_M$.

firm. Hence, such deviations could imply that firms sacrifice some profits to indulge in discriminatory preferences across worker groups (Becker, 1971). The deviations could also imply a legacy of misallocation of labor during the planned economy (Dong and Zhang, 2009), imperfect competition for labor, or that distortions within the product or labor markets have prevented firms from achieving their profit-maximizing size (Hellerstein *et al.*, 1999; Hellerstein and Neumark, 2005; Fleisher *et al.*, 2011).

We are also interested in the wage and productivity gaps between all women, skilled and unskilled, compared to all men. These are calculated by weighting the estimated wage and productivity gaps for the groups of skilled and unskilled workers by the proportion of the workforce they represent in the sample of firms. Using the productivity gap as an example, the calculation becomes

$$\phi_F = \frac{\phi_{FU} P_{FU} + \phi_{FS} P_{FS}}{P_{MU} + \phi_{MS} P_{MS}}, \tag{5}$$

where $P_{ij}$ is the proportion of employees with gender $i$ and skill level $j$ in their respective gender group.[9]

One limitation of the cross-sectional data is that we cannot distinguish between wage and productivity differences originating within or between firms. A major concern is that women may be sorted into lower paying and less productive firms, resulting in a downward bias in the estimated gender differences in wages and productivity. The latter part of this paper addresses this issue by re-estimating the model after separating firms into groups along the lines of three potential dimensions: sorting by industry, ownership, and location.

There is also a concern that the gender–skill division of the firms' labor force may be correlated with unobserved firm or worker characteristics. Besides the estimation of fixed effects, robustness is assessed by controlling for unobserved and time varying productivity shocks (Olley and Pakes, 1996; Levinsohn and Petrin, 2003). The influence of unobserved worker effects when testing for equal relative productivities and earnings should, however, be limited if the bias that they introduce in the estimated differentials in earnings and productivities run in the same direction.[10]

Estimation of equations (3) and (4) is conducted simultaneously using the non-linear seemingly unrelated regressions (NLSUR) method, which takes account of cross-equation correlation in the shocks to wages and output.

## 4. Data, Variables, and Summary Statistics

The data on industrial firms was collected by China's National Bureau of Statistics (NBS) in 2004.[11] It covers all state-owned firms and all non-state firms with annual sales above 5 million RMB (about US$750,000). Dividing the total

[9]So that $P_{FU} + P_{FU} = 1$ and $P_{MU} + P_{MS} = 1$.

[10]For example, if the unobserved characteristic of tenure is likely to result in an upward bias in both productivity and wages. These biases are then cancelled out when we compare one with the other.

[11]This dataset is used by the NBS to compile the Industry section of the *China Statistical Yearbook* and industry specific reports in the *China Markets Yearbook*.

value added of the firms in the dataset by the total industrial value added reported in *China's Statistical Yearbook* indicates that the dataset accounts for more than 90 percent of the total.

To ensure high data quality, I follow the cleaning procedure of Jefferson *et al.* (2008) and omit firms that report zero employment, firms with fewer than eight workers, firms in the upper and lower tails of productivity,[12] and those with a ratio of value added to productivity that is above one or below zero. This procedure removes 11,807 firms and leaves 257,721.

Summary statistics are reported in Table 1. They show that the average firm has 248 employees, of whom 40 percent are female. Defining a skilled worker as having completed more than 12 years of education, the average share of skilled male employees (8 percent) is twice the share of female skilled employees (4 percent). The bottom row of Table 1 shows the proportion of firms reporting non-zero expenditures on three non-salary items: (i) pensions and medical insurance; (ii) unemployment and labor insurance, and (iii) housing accumulation fund. Using this definition of social insurance participation, 12 percent of all firms are found to participate.

Detailed information on firms' registered ownership is used to aggregate them into six larger ownership sectors (as detailed in Table A1 in the Appendix). According to this categorization, 8.3 percent of the firms are state-owned, 9.6 percent collective owned, 44.1 percent private domestically owned, 10.5 percent funded by entities based in Hong Kong, Macao, or Taiwan (HKMT), and an additional 10.5 percent funded by entities in foreign countries. The remaining 17 percent are classified as having "mixed" ownership.[13]

The lowest share of female employees is found in the state-owned sector (33 percent). Somewhat higher shares are noted for the collective (35 percent) or private (40 percent) sectors, and the highest shares in firms with investment from foreign (48 percent) or HKMT-based entities (49 percent). Not surprisingly, state-owned firms are on average larger, older, and more likely to participate in the social insurance programs. It is also noteworthy that the highest average wage is paid in the foreign and HKMT-owned sectors, while the lowest wages are found amongst private domestic and collective owned firms.[14]

Summary statistics for industrial sub-sectors are given in the Appendix, Table A2. They are calculated after first grouping firms according to the 14 industry ex-factory price index categories used in China's statistical publications. The percentage of female workers differs radically across sectors, ranging from 9 percent in the coal industry to 73 percent in the tailoring sector.

[12]After computing ratios of value added to labor and capital, and ratios of labor and capital to value added, I delete firms for which the computed values for each of these four variables is more than four standard deviations above the mean of each measure.

[13]Jefferson and Su (2006) argue that formal ownership registration is an unreliable measure of actual firm control. Examining the share of firm assets held by the Chinese state and by non-mainland entities in the different ownership categories however shows that an alternative ownership categorization based on this variation would only differ slightly from the one based on registration.

[14]The standard measure of China's urban wage (*gongzi*) includes a range of subsidies such as: for meals, transport, dormitory living expenses, bonus payments, overtime pay, and danger or hardship pay (for a complete list of items, see Banister, 2005).

TABLE 1

SUMMARY STATISTICS

| | All Firms | State Owned | Collective Owned | Private Domestic | HKMT-Financed | Foreign Owned | Mixed Ownership |
|---|---|---|---|---|---|---|---|
| Number of firms | 257,721 | 21,477 | 24,732 | 113,498 | 26,963 | 27,139 | 43,912 |
| (share of total sample) | (100) | (8.3) | (9.6) | (44,1) | (10.5) | (10.5) | (17.0) |
| Log value added (¥ 1000) | 8.75 | 8.67 | 8.62 | 8.42 | 9.13 | 9.38 | 9.10 |
| Log capital (¥ 1000) | 8.16 | 8.95 | 7.81 | 7.65 | 8.54 | 8.77 | 8.65 |
| Monthly per worker (¥) | 1,073 | 1,192 | 945 | 917 | 1,252 | 1,559 | 1,057 |
| Employment | 248 | 601 | 171 | 129 | 322 | 310 | 344 |
| Proportion of female employees | 0.40 | 0.33 | 0.35 | 0.40 | 0.49 | 0.48 | 0.36 |
| Proportion of male unskilled employees | 0.52 | 0.53 | 0.59 | 0.53 | 0.43 | 0.40 | 0.53 |
| Proportion of male skilled employees | 0.08 | 0.13 | 0.06 | 0.07 | 0.08 | 0.12 | 0.11 |
| Proportion of female unskilled employees | 0.36 | 0.27 | 0.33 | 0.37 | 0.45 | 0.42 | 0.31 |
| Proportion of female skilled employees | 0.04 | 0.06 | 0.02 | 0.03 | 0.04 | 0.06 | 0.05 |
| Firm age (years) | 8.5 | 22.9 | 13.7 | 5.6 | 6.7 | 5.8 | 8.3 |
| Township or village enterprise | 0.17 | 0.38 | 0.66 | 0.00 | 0.08 | 0.08 | 0.35 |
| Proportion of unionized firms | 0.46 | 0.83 | 0.53 | 0.36 | 0.41 | 0.43 | 0.58 |
| Social insurance participation (proportion) | 0.12 | 0.39 | 0.09 | 0.03 | 0.12 | 0.26 | 0.18 |
| Proportion of social insurance in total wage cost | 0.11 | 0.31 | 0.11 | 0.05 | 0.09 | 0.13 | 0.13 |

*Notes*: Social insurance participation is defined as the firm reporting non-zero yearly expenditures for: (i) unemployment or labor insurance; (ii) pension and medical insurance; and (iii) housing funds. Employees with more than 12 years of education are defined as "skilled."

## 5. Wages, Productivity and Discrimination of Female Employees

### 5.1. *Baseline Results*

The benchmark results are presented in Table 2. Columns 1 and 2 contain estimates derived by jointly estimating the production function (3) and the wage equation (4) for the full sample, with the total wage bill being the dependent variable in the wage equation. Row 5 contains the gender wage gap weighted by educational attainment. It is calculated to be 12 percent, which is narrow from an international perspective. Using similar data and methodologies, Hellerstein and Neumark (2005) report that women earn 38 percent less than men in the U.S.; Bartolucci and Alberto (2010) find a 34 percent gender wage gap in the case of Germany; and Asano and Kawaguchi (2007) find a 70 percent gap in the case of Japan. The narrow gap in the Chinese case may suggest that, at least on average, the Maoist ideology of equal pay has been maintained during the economic transition.

Dividing employees by skill level reveals a stark difference in women's relative wages. The estimate in Row 1 shows that women with less than 12 years of education earn on average 20 percent lower wages than their male counterparts. For women with 12 years of education or below, the situation is reversed. In Rows 2 and 3 we see that workers of both genders are rewarded for their educational attainments, but that the reward is 14 percent larger for women (Row 4).[15] This result mirrors some previous studies on Chinese individual level data which have found greater education premiums for women than men (Maurer-Fazio, 1999; Li, 2003).

The wage estimates for highly educated workers can be used to approximate the wage premium of one additional year of schooling. This is done by simply dividing the premium of being "skilled" with the average number of additional years of schooling attained by the workers in this group.[16] The calculation suggests an education premium for men of 12–16 percent for men, and 16.5–22 percent for women. These numbers are slightly higher than those reported using the 2002 CHIP household data (Zhang *et al*., 2005), but similar in size to the findings in Qian and Smyth's (2005) analysis of data from China's Institute of Labor Studies. The latter study finds an average return to one additional year of schooling of 12.06 percent in the full sample, and 17.16 percent for employees aged below 35.

Arguably, comparing the return to schooling for the employees to the return to schooling for the firm (in terms of productivity) gives an indication of whether the social gains of an educated workforce match the employee's payoffs for investments in education. Fleisher *et al*. (2011) conduct this comparison for 998 manufacturing firms for the years 1998–2000. Similar to the results produced by these

[15]This result is not the consequence of skilled women receiving more on-the-job training than skilled men. The benchmark results are robust to estimation in a sub-sample including only the 144,666 firms with zero expenditure on worker education.

[16]The composition of educational attainment levels among skilled men and women is as follows. Among skilled men: graduate studies (18 years, 2 percent); undergraduate university (16 years, 25 percent); professional school "*Dazhuan*" (15 years, 73 percent). Among unskilled men: high school (12 years, 44 percent); junior high school or below (5 or 8 years, 56 percent). Among skilled women: graduate studies (18 years, 1 percent); undergraduate university (16 years, 18 percent); professional school "*Dazhuan*" (15 years, 81 percent). Among unskilled women: high school (12 years, 41 percent); junior high school or below (5 or 8 years, 59 percent). The higher and lower "bound" for the calculation is determined by the average years of schooling assumed for workers having attained "junior high school or below," set to lie in the interval 5 to 8 years.

TABLE 2

JOINT PRODUCTION FUNCTION AND EARNINGS EQUATION ESTIMATES: COBB–DOUGLAS PRODUCTION FUNCTION, ALL FIRMS

| | Production Function and Wage Equation Estimates | | | Production Function and Total Earnings Equation Estimates | | |
|---|---|---|---|---|---|---|
| | Log (Wages) (1) | Log (Value Added) (2) | Col. 1 = Col. 2 (p-value) | Log (Total Comp.) (3) | Log (Value Added) (4) | Col. 3 = Col. 4 (p-value) |
| Unskilled female | 0.80 | 0.39 | 0.42 | 0.79 | 0.38 | 0.41 |
| | (0.00) | (0.01) | (0.000) | (0.01) | (0.01) | (0.000) |
| Skilled female | 2.22 | 3.64 | −1.41 | 2.53 | 3.64 | −1.12 |
| | (0.03) | (0.09) | (0.000) | (0.03) | (0.09) | (0.000) |
| Skilled male | 1.88 | 3.50 | −1.61 | 1.96 | 3.48 | −1.53 |
| | (0.02) | (0.06) | (0.000) | (0.02) | (0.06) | (0.000) |
| Skilled female–skilled male[a] | 1.18 | 1.04 | 0.14 | 1.29 | 1.05 | 0.25 |
| | (0.02) | (0.03) | (0.03) | (0.02) | (0.03) | (0.03) |
| Female–male[b] | 0.88 | 0.57 | 0.28 | 0.89 | 0.57 | 0.32 |
| | (0.01) | (0.01) | (0.000) | (0.01) | (0.01) | (0.000) |
| Log labor | | 0.64 | | | 0.64 | |
| | | (0.00) | | | (0.00) | |
| Log capital | | 0.20 | | | 0.19 | |
| | | (0.00) | | | (0.00) | |
| Township or village enterprise | –0.13 | –0.11 | | –0.16 | –0.11 | |
| | (0.00) | (0.01) | | (0.00) | (0.01) | |
| R-squared | 0.84 | 0.60 | | 0.84 | 0.60 | |
| R-squared between equations | 0.12 | | | 0.13 | | |
| N | 255,568 | | | 255,733 | | |

*Notes*: All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions, and 4 municipalities), industry (38), size (5), age (4), ownership (6), unionization, and township-and-village enterprise status.

[a]Wage and productivity differentials for skilled women vs. skilled men.

[b]Skill-weighted wage and productivity differentials for all women vs. all men.

authors, the estimates in Table 2 shows that the marginal products of the highly educated are much larger than their wages. Although this result is common to all previous studies using the statistical method applied in this paper (e.g. Hellerstein and Neumark, 1999, 2005; Hellerstein *et al*., 1999; Dong and Zhang, 2009), it remains puzzling. A likely explanation in the Chinese case lies in the substantial restrictions the labor mobility that stem from an underdeveloped labor market coupled with the institutional barriers of the Hukou system, which together prohibit workers from efficient wage bargaining. Fleisher *et al*. (2011) also argue that state-controlled firms in particular hold monopsony power that allows them to under compensate skilled workers. For non-state firms, constraints on borrowing, land-use, and electricity (power) may prevent them from reaching their profit-maximizing size, thus depressing the demand for skilled labor.[17]

To address the question of wage discrimination, I compare the relative wages and productivities of female workers. The estimates suggest that women are not discriminated against. Similar to the results found by Dong and Zhang (2009), women's average productivity falls behind their marginal wage. As noted above, skilled women are under-compensated compared to their wages. The "over-payment" of women thus stems from employees with high school education or below. Interpreting this result using Becker's (1971) framework would suggest that the average manager prefers to hire female unskilled workers over male unskilled workers. Such a preference is a well-established feature of globalizing and developing industrial labor markets, and the phenomenon has been coined the "feminization of labor" (Standing, 1989, 1999). In China, it has been documented qualitatively as a result of managers' striving for workforce control (Lee, 1995; Pun, 2005; Xue, 2008).

Importantly, great caution is merited when interpreting the wage and productivity differentials as stemming from differences within firms. Key aspects of the workforce composition, such as occupations, are not available in the present dataset. There are however insights to be had from dividing the sample along the main dimensions of firm heterogeneity–ownership, industry, and region–to further explore how Chinese women are faring in different areas of the transitional labor market.

### 5.2. *Robustness Checks*

Some robustness checks of the baseline results are in order. Although the coefficients for capital and labor are both highly significant and of magnitudes that seem plausible, I apply the Olley and Pakes (1996) and Levinsohn and Petrin (2003) methods to control for bias stemming from unobserved productivity shocks being correlated with the firms' input choices. In particular, if female labor adjusts more speedily than male labor to unobserved productivity shocks, there could be an upward bias in the relative wage and productivity estimates for women. The results show that the Olley–Pakes and Levinsohn–Petrin estimates of the relative female wages and productivity are almost identical to the results without proxy variables

[17]Evidence abounds on the issue of borrowing constraints; see, for example, Poncet *et al*. (2010).

when using the limited sub-samples required by the data demands of these methods (not reported).

The lack of information about work hours could be a potential source of error in the quality of the labor index. Relying on a count variable of male and female workers when measuring labor input will yield misleading results if the number of hours worked differs by gender. I use individual-level data on work hours from the 2002 China Household Income Project (CHIP) to calculate labor input weights for each gender–skill group and for each ownership sector.[18] These weights confirm that employees with higher levels of education work fewer hours per week, and that in foreign-owned firms, female unskilled employees work longer hours than their male colleagues (see Table A3). Panel A in Table A4 presents the results of the robustness check, showing that the main results remain unaltered.

It has been argued that technological change is gender-biased due to improvements in firm productivity leading to the dismissal of (generally male) production labor (Berman *et al*., 1994; Dunne *et al*., 1997). Under such circumstances, the productivity of females would be overestimated due to the positive correlation between the proportion of women and productivity enhancing technological change. Panel B in Table A4 examines this hypothesis by dividing the data into two sub-samples based on the median proportion of women. If the hypothesis is true, controlling for the proportion of females, by splitting the sample in this way, should yield larger gender differences in productivity. Comparing the estimation results within the two sub-samples to the baseline in Table 2, however, shows that the skill-weighted average gender-difference in productivity remains roughly constant.

A final robustness check is carried out to examine differential gender wage effects of unionization. In China, labor unions are responsible, by law, for monitoring firms' compliance with anti-discriminatory laws and regulations. If unionization is correlated with the proportion of male workers, men's wages could receive a higher degree of protection than women's. Empirical research has provided evidence of higher wages and social insurance coverage in unionized firms (Yao and Zhong, 2011). However, dividing firms according to unionization shows no statistically significant differences in the estimates for the 119,788 unionized and the 137,933 non-unionized firms (results not reported).

### 5.3. *Does Social Insurance Coverage Contribute to a Wider Gender Gap in Earnings?*

To examine whether non-wage compensation provided by firms contributes to a wider gap in gender earnings, the sum of the firms' expenditures on social insurance payments is added to the wage measure in equation (4) before joint estimation with the production function. Using the entire sample of firms, of which a large proportion evade program participation, I first examine the combined effect of women receiving fewer benefits within firms, and the potential over-representation of women within non-participating units. The results are shown in the three rightmost columns in Table 2. Comparing the estimated gender gap in

[18]The HKMT and mixed ownership sectors are excluded due to a lack of unambiguous ownership information for these sectors in the CHIP data.

total earnings (Column 3) to the gender gap in wages, contained in Column 1, yields no statistically significant difference.

Examining the earnings gaps for unskilled and skilled workers separately shows no evidence of gender polarization of non-wage earnings for unskilled workers. For skilled workers, the estimates in Rows 2 and 3 of Column 3 show that non-wage compensation appears to be distributed in favor of workers with higher levels of education. This observation is in accordance with incentives for firms to reduce turnover costs by providing skilled workers with social insurances which were, at least in 2004, generally not transferable between workplaces. Skilled women are more likely to receive social insurance than skilled men. Their earnings advantage over their male counterparts grows from 18 to 29 percent when taking account of non-wage compensation.

I next exclude firms that do not participate in the social insurance programs from the sample, leaving 31,554 firms. This implies an analysis of whether women receive fewer benefits within firms, while excluding the effect of firm non-participation. Among these participating firms, the average ratio of non-wage benefits to wages is quite high: 0.37. But, as shown in Panel A, Table A5, the baseline estimates remain largely unaltered in this sample. Including social insurance payments in the earnings measure does not yield a wider gender gap in work compensation. For skilled workers, there is however an added insight. In this smaller sample there is not a statistically significant difference between the gender gap with respect to wages or total earnings for the skilled worker group. Hence, rather than receiving more non-wage compensation within firms, skilled women appear to gain a social insurance advantage by being more likely to work in participating firms.

China's social insurance system is highly fragmented. In many regions, workers with temporary contracts (often migrants) lack rights to insurance cover or are only entitled to inferior insurance packages. Several robustness checks are carried out to ascertain whether the small effect of social insurances on the baseline gender gap in wages is not caused by an understating of the total earnings bill. In Table A5, Panel B, I first use data from Guangdong province only (32,545 observations). Since the late 1990s, this province has taken the lead in requiring firms to provide equal insurance cover for temporary and permanent contract workers (Zhang *et al.*, 2010). Next, in Panel C, I exclude the most likely employers of migrant labor, namely private domestic firms, from the sample of participating firms used in Panel A. Results from both these sub-samples corroborate previous findings of a statistically non-significant insignificant difference between the gender gap in wages and total earnings.[19]

It is worthwhile to provide some descriptive statistics as a backdrop to the econometric findings in this section. Industrial sector and firm ownership are two important dimensions of both female employment and social insurance participation. As described above, women—and especially skilled women—are

[19]The same result is found when instead excluding: (i) all rural firms, i.e. firms under the administrative subordination of a township or village council, or that of a street committee; (ii) firms with a below-median ratio of insurance expenditures to wages plus all firms with zero social insurance costs; (iii) firms in the Eastern region (Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Fujian, Shandong, Guangdong, and Hainan); and (iv) firms with an above-median share of unskilled workers.

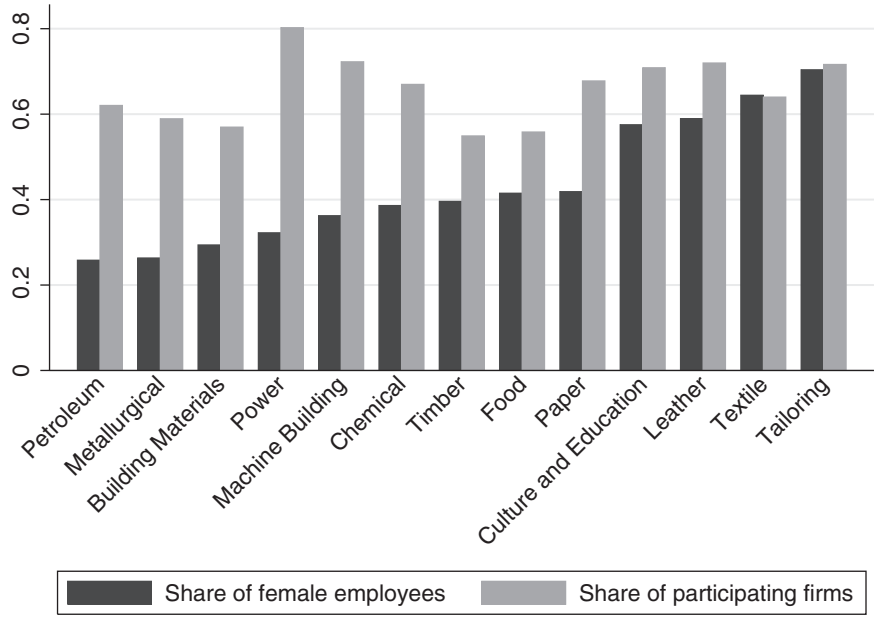


Figure 1. Share of Female Employees and the Share of Firms Participating in the Medical and/or Pension Programs by Industrial Sector in Order of Female Share

over-represented in foreign and HKMT-owned firms, and these sectors also show above-average levels of social insurance participation. In Figure 1, I plot the share of females and the share of firms participating in the pension and medical insurance programs for each of 13 industrial sectors ordered by labor intensity. The figure illustrates a heavy over-representation of female workers in light industry, but these sectors are not less likely to participate in social insurance programs. We should however remember that the data used here contains only firms with annual sales above 5 million RMB and which are included in the formal work unit reporting system while excluding small and informal industrial workplaces.

## 6. Industry and Ownership Specific Results

### 6.1. *Ownership*

Table 3 presents results obtained by jointly estimating equations (3) and (4) by ownership sector. The estimates of the skill-weighted average gender wage gaps (Row 5) show the widest gap in the foreign (16 percent) and HKMT-owned firms (21 percent), while narrower gaps are found among state-owned firms (12 percent), private firms (10 percent), and collective-owned firms (8 percent). This variation corroborates the findings of previous studies which have documented wider than average wage differences between men and women employed in the foreign-owned sector (Maurer-Fazio *et al.*, 1999; Liu *et al.*, 2000; Hughes and Maurer-Fazio, 2002; Xu *et al.*, 2006).

TABLE 3

JOINT PRODUCTION FUNCTION AND WAGE EQUATION ESTIMATES: COBB–DOUGLAS PRODUCTION FUNCTION, BY OWNERSHIP

| | Log (Wages) (1) | Log (Value Added) (2) | Column 1 = Column 2 (p-value) | Log (Wages) (3) | Log (Value Added) (4) | Column 3 = Column 4 (p-value) |
|---|---|---|---|---|---|---|
| | *State Owned* | | | *Collective Owned* | | |
| Unskilled female | 0.72 | 0.48 | 0.24 | 0.86 | 0.30 | 0.56 |
| | (0.03) | (0.05) | (0.000) | (0.01) | (0.03) | (0.000) |
| Skilled female | 2.44 | 3.46 | –1.02 | 1.99 | 3.48 | –1.51 |
| | (0.11) | (0.28) | (0.000) | (0.10) | (0.38) | (0.000) |
| Skilled male | 2.18 | 3.95 | –1.81 | 1.42 | 2.71 | –1.32 |
| | (0.07) | (0.21) | (0.000) | (0.05) | (0.21) | (0.000) |
| Skilled female–skilled male[a] | 1.12 | 0.87 | 0.25 | 1.40 | 1.28 | 0.12 |
| | (0.05) | (0.08) | (0.002) | (0.10) | (0.19) | (0.530) |
| Female–male[b] | 0.88 | 0.70 | 0.18 | 0.92 | 0.49 | 0.43 |
| | (0.03) | (0.05) | (0.000) | (0.02) | (0.04) | (0.000) |
| N | 20,830 | | | 24,532 | | |
| | *Foreign Owned* | | | *HKMT Financed* | | |
| Unskilled female | 0.78 | 0.42 | 0.36 | 0.75 | 0.43 | 0.32 |
| | (0.02) | (0.02) | (0.000) | (0.01) | (0.02) | (0.000) |
| Skilled female | 2.65 | 4.47 | –1.82 | 2.10 | 3.57 | –1.47 |
| | (0.09) | (0.27) | (0.000) | (0.08) | (0.24) | (0.000) |
| Skilled male | 2.77 | 5.00 | –2.21 | 2.15 | 3.96 | –1.81 |
| | (0.07) | (0.25) | (0.000) | (0.06) | (0.21) | (0.000) |
| Skilled female–skilled male[a] | 0.95 | 0.90 | 0.05 | 0.98 | 0.90 | 0.07 |
| | (0.04) | (0.04) | (0.348) | (0.05) | (0.05) | (0.336) |
| Female–male[b] | 0.84 | 0.67 | 0.17 | 0.79 | 0.57 | 0.21 |
| | (0.02) | (0.03) | (0.000) | (0.01) | (0.03) | (0.000) |
| N | 27,024 | | | 26,893 | | |
| | *Private Owned* | | | *Mixed Ownership* | | |
| Unskilled female | 0.87 | 0.39 | 0.48 | 0.79 | 0.35 | 0.44 |
| | (0.01) | (0.01) | (0.000) | (0.01) | (0.02) | (0.000) |
| Skilled female | 1.70 | 3.50 | –1.80 | 2.30 | 3.54 | –1.23 |
| | (0.04) | (0.17) | (0.000) | (0.07) | (0.23) | (0.000) |
| Skilled male | 1.45 | 2.89 | –1.44 | 1.89 | 3.43 | –1.51 |
| | (0.02) | (0.09) | (0.000) | (0.04) | (0.14) | (0.000) |
| Skilled female–skilled male[a] | 1.17 | 1.21 | –0.04 | 1.21 | 1.03 | 0.18 |
| | (0.04) | (0.08) | (0.616) | (0.05) | (0.08) | (0.029) |
| Female–male[b] | 0.90 | 0.57 | 0.37 | 0.90 | 0.61 | 0.28 |
| | (0.01) | (0.02) | (0.000) | (0.02) | (0.03) | (0.03) |
| N | 112,859 | | | 43,547 | | |

*Notes*: All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions, and 4 municipalities), industry (38), size (5), age (4), unionization, R&D expenditure per worker, township-and-village enterprise status.

[a]Wage and productivity differentials for skilled women vs. skilled men.

[b]Skill-weighted wage and productivity differentials for all women vs. all men.

Further insights are gathered by analyzing the results of the two education groups separately. It is noteworthy that women with less than 12 years of education face the largest wage disadvantage in the state-owned sector (28 percent) and smaller disadvantages in foreign-owned (22 percent) and private domestic firms (13 percent). For this group of workers, who make up the vast majority of the industrial workforce, the aggregate result of narrow wage gaps in the state-owned sector is thus misleading. This narrow gap is the result of a wage *advantage* of

female skilled employees in this sector rather than a more equal wage structure for less educated workers. As such, the results point out the importance of skill disaggregation in analyzing the impact of Chinese industry's ownership transition on gender wages. For unskilled women, the results thus suggest that the state-sector was not an efficient advocate for equal pay.

I next compare how the relative wages of skilled and unskilled women match their average productivity across sectors. For women with limited education, the results show that wages exceed productivity in all six ownership groups. For highly educated women, average wages match average productivity in all sectors except state-owned and mixed ownership firms. In the case of the state-owned firms, this result is consistent with the reasoning of Dong and Zhang (2009). They argue that the legacy of the planned economy, which involved disregarding the average lower physical capacity of female workers while maintaining gender-equal wages, resulted in a systematic overcompensation of women in comparison to their productivity contributions.

The finding that firms in the private and foreign-owned sectors also pay unskilled women wages that exceed their contributions to firm productivity is in accordance with the abovementioned employer preference. Production of light manufacturing goods for the global market is often gender-segregated, with women occupying the seats along the assembly lines. Qualitative research has shown that workforce control constitutes a major motivation for this organization. In the eyes of the employers, women are perceived as more docile, obedient, and easily controlled (Lee, 1995; Pun, 2005; Xue, 2008). The gender preference is further enforced by the use of single-sex dormitories, which provide added control and form part of the workforce organization of many workplaces (Pun and Smith, 2006).

### 6.2. *Industrial Sector*

Figure 1 illustrated that the female labor is highly segregated across industries. Women make up less than a third of the workforce in the metallurgical, petroleum, power, timber, and coal industries, but more than two thirds in the tailoring and textile sectors. By estimating the production and wage equations by industry, I can conduct a basic examination of whether some industrial sector(s) is(are) driving the benchmark. Effects of this type have been hypothesized by previous research, for example as a downward push on women's relative wages from the "feminization" of industries in developing and globalizing economies (e.g. Seguino, 2000).

The results give little evidence in this regard. Instead, quite the opposite trend emerges when plotting the estimates for women with less than 12 years of education (Figure 2).[20] The gender wage gap is narrower in more labor intensive industries, and in several female dominated industries such as tailoring and textiles, no statistically significant gender wage gap is found.[21] Although this result could be

[20]For skilled workers, the figure shows no consistent pattern, and the estimates are imprecise because of the smaller sample sizes. These results are therefore left out to preserve space.

[21]The results for the coal industry are however probably spurious. Firms in this industry are outliers with respect to the dominance of state ownership, firm age, and the low average proportion of female workers (9 percent) and skilled workers (4 percent).

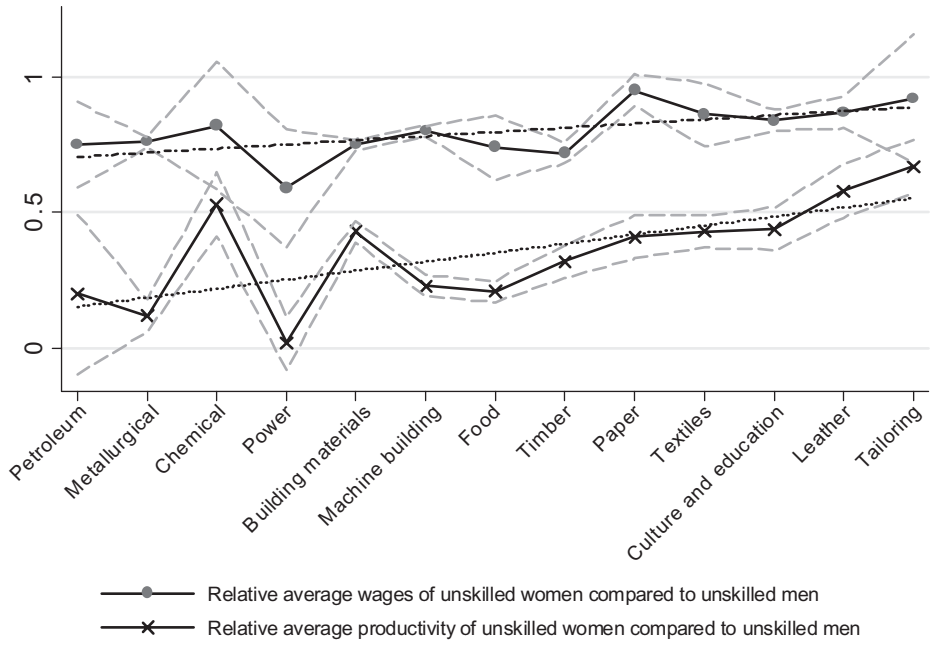


Figure 2. Estimates of Average Wages and Productivities of Unskilled Women Relative to Unskilled Men by Industrial Sector, Ranked by Labor Intensity

interpreted as women faring relatively better in these sectors, it is worth remembering that wages are only one of many aspects associated with a job. As argued in previous studies, women in the "new" industrial economy may be systematically hired to fill the more precarious jobs with poor job security (Cooke, 2001; Razavi, 2007), and may face exploitative working conditions (Berik *et al.*, 2007; Burda, 2007; Pun, 2007). Another caveat lies in potentially relevant, but missing, variables. If firms in the light industrial sectors hire younger workers of both genders, this could explain narrower productivity and wage gaps if women's productivity is differentially affected by family responsibilities later in life.

There is a clear productivity disadvantage associated with unskilled women across all 14 industrial sectors. In addition, unskilled women consistently have average wages that exceed their average productivity. It is noteworthy that the latter result applies not only to heavy industrial sectors, but also to light manufacturing. As such, it yields further support for the hypothesis that there is an employer preference for unskilled women in light and labor intensive industries. For the heavy industrial sectors, the "preference" for female workers, both unskilled, and in some sectors also for skilled,[22] adds support to Dong and Zhang's (2009) conjecture regarding the legacy of a mismatch between female workers and jobs.

[22]Over-compensation of skilled women compared to their average productivity is observed in the timber, power, and food sectors, all of which are sectors with firms that are older than average and more likely to be state-controlled.

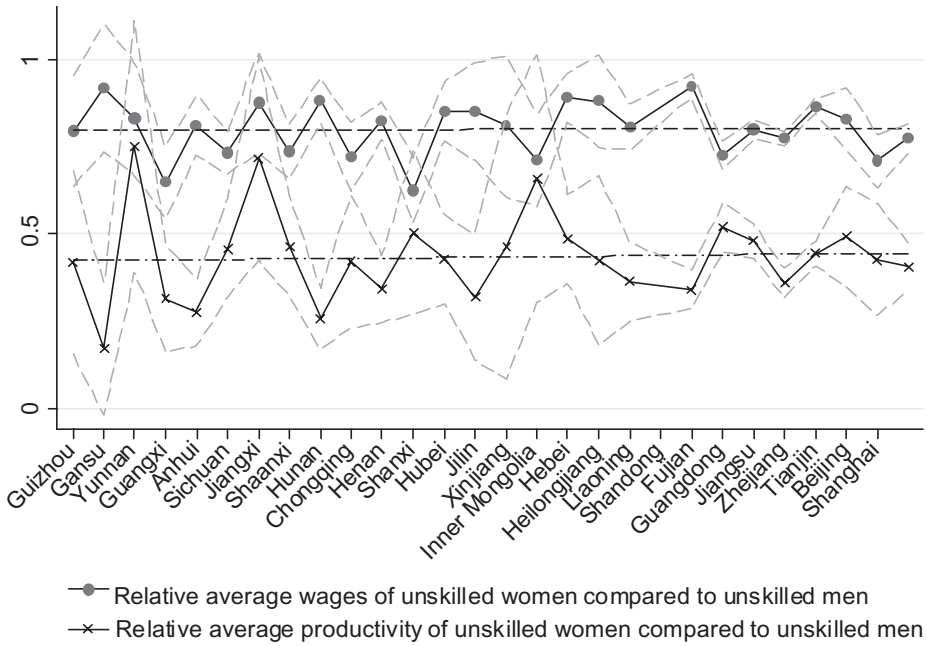


Figure 3. Estimates of Average Wages and Productivities of Unskilled Women Relative to Unskilled Men by Region, Ranked According to Regional GDP Per Capita

### 6.3. *Region*

China's strategy of market reform has been geographically uneven. Starting with a few select special economic zones on the east coast, the liberalization of labor and product markets was gradually extended first to wider coastal areas, and then to inland and western locations. Numerous studies provide empirical support for a strong effect of the spatially diverse liberalization policy on economic growth (Chen and Feng, 2000), even when accounting for geography (Démurger *et al*., 2002), domestic investment (Jones *et al*., 2003), and agglomeration (Chen, 2009).

In an attempt to assess the effect of reform intensity on women's relative wages and productivities, I estimate the wage and production functions for each of China's regions (22 provinces, 4 self-governing municipalities, and 5 autonomous regions). To limit space I only report the results for workers with 12 years of education or below. Figure 3 shows the estimated gaps in wages and productivity by region, with the regions ranked according to their GDP per capita in 2004 as a proxy for market reform intensity. Four regions with less than 1,000 observations are excluded from the analysis.[23]

The horizontal fitted lines do not indicate a correlation between reform intensity and women's relative wages or productivity. This result mirrors the finding of Xie and Hannum (1996) who found that the size of the gender wage gap is unrelated to city-level variation in industrial output growth.

[23]Qinghai (391), Ningxia Automonous Region (597), Tibet Autonomous Region (158), and the island of Hainan (513).

## 7. Conclusions

In this paper I used firm-level data from Chinese industrial firms to assess differences between men's and women's work compensation relating to education level, firm ownership, industrial sector, and geographical location. By jointly estimating wage and productivity functions, I also compared women's relative wage to their relative contributions to firms' value added.

The estimate of the nationwide gender wage gap showed that the average wages of women employed in industrial firms were 12 percent lower than those of men. This gap is narrower than those found for other large economies in studies using firm-level data and similar methodologies, which could suggest that the Maoist ideology of gender equality has carried over into the period of market transition. Adding social insurance payments to the wage bill was found not to yield further gender polarization in earnings. Descriptive evidence provided further understanding of this result by showing that women were not over-represented in industries with low compliance to social insurance regulations. As such, the results indicated that the fears of a female disadvantage in social insurance coverage could be exaggerated, at least among women in informal industrial employment.

The estimates of the wage gaps by education level showed the overall disadvantage of women stemmed from wage differences between employees with an education level of high school or below. By contrast, the education premium for women with above high school education was found to be larger than for their skilled male colleagues. Interestingly, this result was driven by state-controlled and private domestic firms, while no gender wage gap among skilled workers was found in the foreign-owned sector. This sector difference illustrates the importance of representative data with respect to ownership when investigating gender-related earnings in the Chinese transitional labor market.

Ownership specific results for the relative wages of unskilled female workers showed greater wage disadvantages in state-owned and foreign invested firms, thus contradicting the notion of the state sector as the protector of women's rights. The narrowest wage gap was instead found in the private sector. Further understanding of this result was derived from a disaggregation by industry. The wage gap was shown to be narrower in more labor intensive industries where firms are also more recently established. This indicates that the relative wages for women with lower levels of education did not fall with the expansion of the consumer goods manufacturing industry.

While the results showed that both men and women with above high school education received wages that fell short of their productivity contributions, women with lower levels of education were found to be paid in excess of their contributions. This result was consistent across industrial, regional, and ownership groups. For state controlled and heavy industrial firms, this result could be ascribed to a legacy of mismatching women with jobs, i.e. firms taking on more female "surplus workers," during the planned economy, as argued by Dong and Zhang (2009). For more recently established light industrial and foreign-owned sectors, the persistence of a smaller, but nevertheless positive wage-premium can be understood as a reflection of the gender segregated production processes observed by qualitative

researchers. Firms prefer to hire young female labor because of their perceived obedience, flexibility, and suitability for assembly line work.

Although the surplus labor and feminization explanations of the results are appealing, it is important to be cautious in the interpretation of estimates based on cross-sectional data. In particular, the contribution to the productivity differential from the sorting of women into more labor intensive production structures, and into certain occupations, should be thoroughly examined by future studies.

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## Supporting Information

Additional Supporting Information may be found in the online version of this article:

**Table A1.** Aggregation of the Registration-Based Ownership Categories
**Table A2.** Summary Statistics by Industrial Sector
**Table A3.** Labor Input Weights for Gender-Skill Groups by Firm Ownership
**Table A4.** Joint Production Function and Earnings Equation Estimates: Cobb–Douglas Production Function, Robustness Checks
**Table A5.** Joint Production Function and Total Compensation Equation Estimates: Cobb–Douglas Production Function

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