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Gender, Wages, and Social Security in China's Industrial Sector

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This study compares average earnings and productivities for men and women employed in roughly 200,000 Chinese industrial enterprises. Women's average wages lag behind men's wages by 11%, and this result is robust to the inclusion of non-wage income in the form of social insurance payments. The gender-wage gap is wider among workers with more than 12 years of education (28%), mainly because of the higher relative wages received by skilled men in foreign-invested firms. Women's average productivity falls behind men's productivity by a larger margin than the gap in earnings, and the null-hypothesis of earnings discrimination is thereby rejected. Equal average wages between men and women are found among firms located in China's Special Economic Zones, and also among some light industrial sectors with high shares of female employees. Market reform hence appears to have improved women's relative incomes.

Keywords: China, gender wage gap, non-wage compensation
JEL classification code: I30; J16; J71; O10

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1. Introduction

Investigating gender-earnings discrimination in China is an urgent issue. Not only is the question of great economic and social importance to the female half of the labor force, reaching 640 million in 2004. It is also of wider economic importance as discrimination discourages worker-groups from participating in employment and investing in skill development and education. As a consequence, human capital becomes underdeveloped and underutilized, and long-term growth is negatively affected. Before 1978, the Chinese industrial employee was assigned to a state-owned workplace where he or she received welfare and wages according to a pre-determined and egalitarian grading system. After thirty years of market reform, today's industrial workers can be hired and fired by firms under various forms of ownership. Once employed, they now receive work compensation that is largely determined by the firm. Researchers have argued that this dramatic increase in employer discretion when determining the employee's work compensation has led to a polarization of economic power across gender lines (Ngo, 2002; Razavi, 2007; Wang, 2006).

In this paper I assess the gender-wage gap in the Chinese industrial sector using firm-level data. The purpose is to examine how women fare compared to men in firms under various forms of ownership, and if the gender wage-gap differs between low- and high-educated employees. By testing if women's average wages correspond to their productivity contributions, I then test if women are subject to wage-discrimination. In an extended analysis, the effect of non-wage compensation on the gender-polarization of earnings is investigated by adding firm contributions to social insurances to the wage-measure.

The paper addresses a number of limitations in the existing literature, the first of which concerns the standard methodology. A vast majority of previous empirical studies of gender-wage discrimination in China uses individual- or household-level, where a residual

gap in wages is interpreted as discrimination (see Shen and Deng, 2008 for a survey). As pointed out by e.g. Altonji and Blank (1999), the observable individual-level characteristics in the wage-equation are however unlikely to capture all gender-related differences in productivity. Relying on this method therefore implies a risk of overestimating the degree of discrimination[2]. By instead employing the method proposed by Hellerstein and Neumark (1999), this paper uses firm-level data to retrieve direct measures of the productivities of men and women from the production function. Discrimination can then be assessed by comparing the parameter capturing women's relative productivity with their relative wages.

A second contribution stems from the quality of the data used. In this respect, the paper provides substantial improvements on Dong and Zhang's (2009) unique firm-level study of gender-wage discrimination in China, a study that uses a methodology similar to the one in this paper. Compared to their study, data coverage is expanded from a fraction of the economy – 856 firms located in a few large cities – to a sample of 199,840 firms, including all large and medium-sized industrial enterprises as well as the majority of those designated as "small". This reduces the risk of sample bias[3] and strengthens the statistical precision. Moreover, the availability of gender-disaggregated information on the education levels of firm employees allows the computation of skill-weighted wage- and productivity gaps between men and women.

This is the first study that examines the role of non-wage compensation to the gender-polarization of total earnings in Chinese industry. Providing employees with mainstream social insurances has been shown to carry a cost that amounts to over 50% of the total wage compensation paid by firms (Banister, 2005)[4], and revious research has argued that

[2] The part of the wage-gap not explained by proxies for individual productivity is indeed large in previous studies, for example 53-63% found by Gustafsson and Li (2000), 89-92% by Liu et al (2000) and 85% by Wang and Cai (2008).
[3] this is particularly important in a vast economy such like the Chinese where development levels, market reform intensity and social norms vary greatly across geographical regions.
[4] Banister (2005) draws upon a survey conducted by China's Ministry of Labor, and 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.

insurance coverage has become increasingly gender-biased in the transition period (Razavi, 2007; Wang, 2006).

The results show an average skill-weighted wage-gap of 11% in the nation-wide sample, and a somewhat wider gap (28%) among men and women with above-high school education. Highly skilled men have benefitted more from the internationalization of the industrial sector. Their wage-advantages over skilled women are larger in firms with investments from abroad or from Hong Kong, Taiwan, or Macao. Another finding is that industrial sector matters greatly for the average male-female wage-gap. Zero wage-differences are found in sectors with large shares of female employees such as the Tailoring, Leather, and Textile sectors. Equal wages between women and men are also found among firms located in China's Special Economic Zones. Market reform and the increasing importance of light industry hence appear to have improved the relative incomes of female industrial employees.

Women's productivity lags behind men's productivity by a larger margin (41%) than their wages lag behind men's wages (11%). Although the null-hypothesis of wage-discrimination is thereby rejected, women's productivity disadvantage may reflect other forms of discriminatory treatment on the labor market (Bergmann, 1974)[5]. Some sectors have however been more successful in harnessing female productivity, especially foreign-invested enterprises and firms in light industrial sectors.

Non-wage compensation measured by firm contributions to social insurances is not found to increase men's earnings advantage. If anything, their distribution favors skilled workers in general and skilled women in particular, yielding a slightly narrower gender-wage gap among skilled workers than when only wages are considered.

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 presents previous research on

[5] Systematically lower productivities among women could result from gender-differences in firm's hiring practices and in occupational mobility, which in turn affect men's and women's efforts on their jobs.

gender-wage discrimination in China. Section 3 explains the basic econometric framework and section 4 discusses the dataset and variable computations. Estimation results are presented in section 5 and section 6 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 welfare benefits (health care, pensions, education) which were distributed via state-owned work units. The "emancipation of women" constituted an ethical commitment of the socialist state, and entailed their juridical equality with men, entry into paid work, and access to social rights. Under this system, women's incomes improved radically. The gender wage differential narrowed and became small in an international comparison, particularly in urban areas (Croll, 1995). With an industrial policy that emphasized heavy and capital-intensive industry, many women came to fill positions for which they were biologically disadvantaged compared to men, such as blue collar jobs requiring physical strength. The resulting skill mismatch was however not reflected in the centrally determined and egalitarian remuneration system (Korzec, 1992).

In the late 1970s, a series of radical reforms were enacted on the industrial labor market. Transformation of the wage-setting system started in the early 1980s when firms were given autonomy over their remuneration systems within government guidelines. By the 1990s, those guidelines had evolved into abiding by minimum wages (Shen, 2007). Another centerpiece of reform was the transfer of the labor allocation decision from the state and to the 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, 2005)[6].

Reform aimed at streamlining SOE organizations came as a response to the increasing competition from the private sector, which was growing rapidly. This private sector, composed by both domestic and foreign-invested actors, also represented a problem from a social insurance perspective. A growing number of employees working in the private firms did not have access to the enterprise-provided benefits granted by the State-owned work units. In fact, as market-reform progressed, even state employees were increasingly facing social insecurity. Many SOEs were having difficulties meeting their welfare obligations, partly because of the rising competition from the private sector, and partly because of a massive welfare burden stemming from a system setup where each SOE retained substantial financial responsibilities for its laid-off and retired workers. To free the SOEs from this welfare burden and to provide social security for private sector workers became two main objectives for a social system overhaul in the 1990s.

Put simply, welfare reform consisted in breaking up the enterprise-based entitlement model, known as the Labor Insurance Scheme (LIS), into separate social insurances. Instead of the self-insurance of each firm under the LIS, the new programs aimed to share risk across firms by pooling worker accounts on the provincial- and, in some cases, the city-level. State-owned firms were encouraged to switch from the LIS to the separate insurances, and private firms were mandated to join. In this way, the 90s saw the birth of a two-tiered pension system in 1997 and the Urban Employee's Basic Health Care Insurance System in 1998. In 1999, China instituted an unemployment insurance system with properties similar to those found in industrialized countries[7]. Concerning the provision of housing, the direct allocation by work

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

[7] Under this program, an individual is eligible for benefits if he or she i) has contributed to the Unemployment Insurance for at least one year, ii) has been involuntarily laid-off, and iii) is registered as unemployed and willing to work. The most recent alteration in to the Unemployment Insurance system is the *binggui* policy under which previously laid-off SOE workers are detached from their old workplaces, where they had remained despite being formally out of work and merged with the pooled insurance system.

units visa the LIS was replaced by a savings system where accumulated funds can be used for housing purchase or repairs[8]. As with the LIS, these new insurances applied to urban industrial firms, while rural industry was excluded, although with the ambition of a later extension of coverage. Rural areas are also excluded from formal medical insurance, and retirement protection is scarce (Banister, 2005; Jackson et al., 2009).

The new insurance programs had to make up for a legacy of unmet obligations in the SOE sector. Although subject to some discretion at the administrative level (provincial and sometimes sub-provincial), contribution levels were therefore set at a generally high level. Guidelines call for a total of 24% of payroll directed toward pensions accounts (Jackson et al, 2009), 16% toward the housing accumulation funds (by year 2003, Wang et al., 2005), between 2-6% toward medical insurance (Xu et al, 2007), and 2% toward the unemployment insurance (Vodopivec and Tong, 2008).

Similar to the ambition for mobile accounts in the new insurance systems, the ambition of complete coverage of the urban industrial sector remains largely unmet. Although participation in the programs is mandatory for firms, lack of enforcement has effectively given them the option of non-compliance. In 2005, the pension scheme covered 17% of the workforce, and the unemployment insurance covered 14% (NBS, National Bureau of Statistics of China, 2006, pp. 43 and 201). Overall health insurance coverage actually decreased between 1998 and 2003, as mainstream coverage fell more sharply than the increase in commercial and other non-commercial insurances (Xu et al., 2007). Qualitative research has indicated an emerging pattern of gender-polarization in insurance coverage in the export-oriented sectors of the economy (Razavi, 2007), and that in particular women dismissed from SOEs have been pushed into ownership sectors where social security protection is low (Cooke, 2001; Stockman, 1994). It has also been pointed out that the

[8] In addition to participating in these housing accumulation funds, firms may also provide their employees with loosely regulated subsidies. These may cover a range of residential services, rent payments as well as cash hand outs to purchase state-owned housing which was previously allocated by the work units (Wang et al., 2005).

principle of proportionally tying contributions to the employee's wage may compound the wage-differential between men and women (Razavi, 2007; Wang, 2006). These claims however remain without quantitative verification.

Contrary to the case of non-wage compensation, a considerably large literature has investigated the wage-aspect of earnings discrimination in the reform period. Most previous studies use individual-level data from the China Household Income Project, carried out by the Chinese Academy of social sciences in 1988 and 1995. They find that the gender wage gap is slightly below 20%, and fairly constant over this period (Gustafsson and Li, 2000, Bishop et al. 2005, Démurger et al., 2007, Shu and Bian, 2003). This result is corroborated by earlier findings from a Tianjin sample collected in 1993 (Bian et al., 2000), as well as the findings of researchers using data from the Urban Household Survey between 1988 and 1999 (Ng, 2004; Liu et al, 2004). Xu et al. (2006) find a slightly larger gap, 32%, in two recently urbanized towns in Zhejiang Province between 1999 and 2000. This is similar to Dong and Zhang's (2009) finding when using firm-level data from the late 1990s. Regarding the size of the wage-gap across educational categories, a number of studies find that the gap is narrower among highly educated employees (Xu et al., 2006; Hughes and Maurer-Fazio, 2002; Gustafsson and Li, 2000).

The share of the gender-wage gap that is not explained by gender-related productivity proxies in the wage equation is generally large in previous studies. Over 50% of the wage gap is found to be unexplained by some studies (Bishop et al. 2005, Shu and Bian, 2003, Gustafsson and Li, 2000), and over 75% by many others (Liu et al. 2000; Rozelle et al. 2002; Wang and Cai, 2008). On the contrary, Dong and Zhang's (2009) study does not find evidence of discrimination. Women's estimated wages are not statistically different from their estimated productivity.

In a transition economy, the wage-setting practices of employers may differ widely

between the large ownership fractions on the labor market. Xu et al. (2006) record the largest wage gap in privately owned enterprises, while Maurer-Fazio and Hughes (2002) and Maurer-Fazio et al. (1999) find the largest gaps in firms registered as joint ventures. Liu et al. (2000), and Hughes and Maurer-Fazio (2002), also find the widest wage-gaps in the most marketized ownership sectors. Their results however also show that these sectors have the largest shares of their wage-gaps remaining unexplained by observed worker characteristics. Rozelle et al. (2003) 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 of 856 firms conducted by Dong and Zhang (2009) yields the result that women are rewarded in accordance with their productivity in private firms, but that women are over-compensated in the state-owned sector.

3. Empirical methodology

We begin by expressing firm value added as a Cobb Douglas production function with the inputs capital (K) and labor (L) [9]. The labor input is interpreted as a quality of labor index

$$QL=M_U + \phi_{FU} F_U + \phi_{MS} M_S + \phi_{FS} F_S \qquad (1)$$

where F_j and M_j are the number of female or male employees who are skilled, $j = S$, or unskilled, $j = U$. In logs, our production function can be written

$$\ln(VA) = \ln(A) + \alpha_C \ln(K) + \alpha_L \ln\left[M_U + \phi_{FU} F_U + \phi_{MS} M_S + \phi_{FS} F_S\right]. \qquad (2)$$

[9] 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).

The specification of the quality of labor index implies that members of the four gender-skill groups are assumed to be perfectly substitutable inputs, but that the marginal productivities of the groups are allowed to differ. The parameters ϕ_{ij} denote the average marginal productivity of employees with male or female gender $i = (M, F)$ that are considered to be either skilled or unskilled $j = (S, U)$ as compared to male unskilled workers. In this setting, the empirical observation that $\phi_{FU} = \phi_{MS} = \phi_{FS} = 1$ would indicate that all four gender-skill groups contribute equally to firm output. Alternatively, the interpretation of a finding that $\phi_{FU} = 0.5$ would be that the average marginal productivity of female unskilled employees is 50% lower than the average productivity of their male unskilled co-workers. Letting L represent total firm employment so that $M_U = L - F_U - M_S - F_S$ we can rewrite (2) as

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

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

$$\ln(W_T) = \lambda_0 + \ln(QL) = \lambda_0 + \ln\left[L + (\lambda_{FU} - 1)F_U + (\lambda_{MS} - 1)M_S + (\lambda_{FS} - 1)F\right] \quad (4)$$

where the dependent variable is the total wage bill, or the total amount of worker compensation, paid by the firm[10]. Analogous to the production function specification, the

[10] 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 firm we get that the total wage bill is $W = w_M (L - F) + w_F F$, which can be expressed as $W = w_M \left[L + (\lambda_F - 1)F\right]$ where λ_F is the average relative wages of women compared to men, $\frac{w_F}{w_M}$. Taking logs gives

parameters λ_{ij} denote the relative average wages of the three gender-skill groups compared to the wages of unskilled male workers.

By comparing the estimated results of the production function (3), and the wage equation (4) we can now specify a test of whether or not gender-skill groups of employees are paid in accordance with their contribution to firm output. This test amounts to comparing the relative wage parameters λ_{ij} with the relative productivity parameters ϕ_{ij} for each group. If the estimated marginal work compensation falls short of the marginal productivity so that $\lambda_{ij} < \phi_{ij}$, this is interpreted as under-compensation of that specific gender-skill group. To produce the parameters necessary to test whether women, as an aggregated group, are discriminated against, we compute skill-weighted productivity and earnings differentials as

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

where P_{ij} is the proportion of employees with gender *i* and skill level *j* in their respective gender group[11], where ϕ_{ij} is replaced by λ_{ij} to produce the earnings differential.

A major limitation of using firm-level data is the inability of distinguishing whether estimated differences in wages and productivities between worker groups stem from within or across-firm variation. The interpretation of a negative gap between average wage and productivity of a socioeconomic group ($\lambda_{ij} - \phi_{ij} < 0$), as discrimination, hence hinges on the assumption that this group has not been systematically hired by lower paying or less productive firms. Regarding unobservables, their effect on the test of equal relative productivities and earnings should be limited if the direction of the bias is the same for both

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the simplified equivalent of equation (4), in which the constant corresponds to the average wage of men $\lambda_0 = \ln w_M$.

[11] so that $P_{FU} + P_{FS} = 1$, and $P_{MU} + P_{MS} = 1$.

variables. Robustness checks carried out below aim to assess potential bias in the point estimates stemming from, among other thing, gender-differences in the number of hours worked, selection of women into labor-intensive industries, and the degree of market exposure facing the firm.

Estimation of equations (3) and (4) is done simultaneously using the Non-Linear Seemingly Unrelated Regressions (NLSUR) method which takes account of cross-equation correlation in the shocks to wages and output. A vector of controls is added to each of the estimated production and wage equations. The measures of work compensation and output of firms are thereby allowed to vary systematically with the firms' age, size, geographical location and industrial sector[12].

4. Data, variables and summary statistics

This study uses survey data on industrial firms collected by China's National Bureau of Statistics (NBS) in 2005[13]. The dataset covers all state-owned firms and all non-state firms with annual sales above 5 million RMB (about 750,000 US dollar) and includes all firms formally designated as large or medium size, as well as the bulk of those designated as "small-scale." Dividing the total value added in the dataset by the industrial GDP reported in China's Statistical Yearbook indicates that the dataset accounts for 94% of total industrial output.

The dataset contains information on sales, capital stock, the total number of workers and the share of women, the total wage bill, and also annual firm expenditures on four categories of social insurance items: (1) housing accumulation funds and housing subsidies,

[12] Adding these controls corresponds to assuming that firms are price takers in labor market specific to these characteristics (i.e. geographical location, industry etc). Moreover, as long as segmentation of markets along these dimensions leads to proportional variation in wages across gender, then the equations can be augmented by adding these variables linearly.
[13] 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.

(2) pensions and medical insurance, and (3) labor insurance and unemployment insurance. In order to attain a more accurate measure of labor quality, the 2005 dataset is complemented with information on the gender-disaggregated human capital distribution of firms from the expanded census data from 2004. A worker is considered to be skilled if he or she has completed junior college or more, and unskilled otherwise. Merging data for these two years requires the assumption that the share of skilled persons within the female and male employee groups has not changed between the years. It also necessitates the removal of 61,384 firms which are not in operation in both years. The final sample size after following the data cleaning procedure of Jefferson et al. (2008) is 199,840[14].

Variables are created as follows. The dependent variable of the production function is value added, which is calculated by subtracting material costs from total sales. The capital measure is the net value of fixed assets. Wages is the total wage bill, which includes social insurance payments deducted from employee earnings, but not the payments made by the employer (Table A1 lists the components of the wage variable). A more comprehensive measure of total work compensation is created by adding the sum of the employer's expenditures on social insurance payments to the wage bill. R&D intensity is the logarithm of the firm's expenditure on research and development, and a unionization dummy takes the value one if the firm the firm has a trade union in the year 2004, and zero otherwise.

Ownership categories are created by aggregating 23 ownership registration types into five broader categories, closely tracking the formal classification system currently used for reporting data on all industrial firms in China's Statistical Yearbook. Enterprises are defined as State-owned (SOE), Collective owned (COE)[15], Private (PRI), funded by entities in Hong

[14] Enterprises with less than eight employees, and those that are in the upper and lower tails of productivity, are excluded to correct for improbable values. The latter is done in two steps. First, ratios of value added to labor and capital, and ratios of labor and capital to value added are computed. Then, those firms that lay more than four standard deviations above the mean of each of those four variables are deleted. Firms are also dropped if the ratio of value added to sales is either negative or larger than one, and if they report negative values of capital or labor. The procedure removes 17,868 firms, whereof the majority report zero employment.

[15] Collective-owned firms are economic entities that are registered in accordance with the *Regulation of the People's*

Kong, Macao or Taiwan (HKMT), Foreign-invested (FIE), and "Other" (see Table A2 for details). Also included in the empirical analysis are two measures of the asset ownership composition of firms: the shares of paid-in capital supplied by the state and the combined shares for capital from entities in foreign countries or from HKMT. Incorporating these measures may yield improved predictions of firm performance, in particular if ownership registration is an unreliable measure of actual firm control (Sabin, 1994; Jefferson and Su, 2006). Additional control variables are industrial categories on the two-digit level, province, size, age, and a proxy for rural location taking the value one if a firm is under the administrative control of the county, small town, street, village, resident- or village committee.

Summary statistics are reported in Table 1. They show that the average firm has 373 employees, among which women make up 42%. Of these women, 10.6% have a junior college degree or higher (>12 years of education). The corresponding percentage for men is 15.5%, illustrating the gender division in human capital in the industrial sector as evidenced in the national census conducted in 2000[16]. Examining the ownership-based sub-samples, the share of female employees is the lowest in the state-owned sector (29%), somewhat higher in firms that are private (43%) or collective owned (40%), and the highest in foreign- (52%) and HKMT-funded firms (54%).[17] The state-owned firms have a larger average size (803) than the other sectors, and we find the smallest average workforce size in the collective and private sectors, close to 150 workers. Average wages are the lowest in the state-owned and collective owned enterprises.

Republic of China on the Management of Registration of Legal Enterprises, where assets are owned collectively. They include urban and rural enterprises invested by collectives, and some enterprises registered with industrial and commercial administration agency as collective units, where funds are pulled together by individuals who voluntarily give up their right of ownership (China Statistical Yearbook 2006, chapter 13).

[16] In urban China, men had on average 0.93 more years of schooling than women.

[17] Previous studies suggest that the workforces of export-oriented and foreign-invested enterprises may be up to eighty percent female (Tan, 2000). In the dataset used in this paper this is true for 12% of the HKMT-funded firms, and for 14% of the foreign-funded firms.

The ownership distribution of the dataset is such that 44.4% of the firms are domestic and privately owned, 7.9% are state-owned, 8.4% are collective owned, while 11.2% and 11.6% are funded by entities based in Hong Kong, Macao or Taiwan and in foreign countries respectively. Finally, 16.4% of the firms fall into the category "Other"[18]. Examining the average asset shares held by the Chinese state and by foreign and HKMT entities in the different ownership categories does not provide evidence for sizeable deviations between the registration-based ownership categorization and the asset holding structure of firms. Summary statistics of the geographical and industrial composition of the dataset are placed in Appendix, Tables A3 and A4.

Table 2 displays descriptive statistics of the three non-wage compensation expenditure items. The top half of the table shows the share of firms reporting positive expenditures on each variable, which is interpreted as participation in the program, and the bottom half details the cost of the insurance item as a share of the total wage cost in those participating firms. We first note that 16% of the firms report non-zero expenditures on all three non-salary items. Looking at the disaggregated figures, the highest participation rate is recorded for the Pensions and Medical care programs (66%), while a lowest is associated with the Labor and/or Unemployment insurances (44%) and the Housing funds and subsidies programs (18%). There is substantial variation in participation rates across ownership sectors. Coverage is higher than average among state-owned firms and foreign-invested firm[19].

Turning to the bottom half of Table 2, we see that payments amount to, on average, 39% of the total wage cost in firms that report non-zero expenditures on all three items. For the housing variable, and the combined expenditures on health and pension insurance, we may moreover note that expenditure levels as a share of wages is markedly below the payment guidelines set up by the central government.

[18] See Table A2 for a list of the registration categories included under this definition.
[19] Because of the presence of rural firms with lower welfare obligations in the sample, the figures in Table 2 should not be interpreted as the precise share of urban firms that comply with social insurance requirements.

5. Are women discriminated against in Chinese industry?

5.1 Baseline estimation results

The first main results of this paper are found in Table 3. Columns 1 and 2 present estimates from jointly estimating equations (3) and (4) for the full sample and using the total wage bill as the dependent variable in the wage equation. We first note that that the estimated coefficients on capital and labor in the production function are 0.62 and 0.22, both of which are highly significant and of plausible magnitudes. Row one of the table contains the skill-weighted productivity and wage differentials between women and men. These parameters indicate that women earn 11% less than men (λ_F = 0.89) and that they are 41% less productive (ϕ_F = 0.59). Comparing the sizes of the estimates to the results found by authors using similar empirical strategies for other economies, the narrow wage gap is particularly noteworthy. Hellerstein et al. (1999) report a 45% gender-wage difference for the US, Bartolucci (2008) finds a 34% gap in the case of Germany, and Asano and Kawaguchi (2007) a 70% gap in Japan. The comparatively narrow wage gap in China indicates that Maoist gender equality ideology has been maintained in the economic transition. Regarding the productivity

Table 1
Summary Statistics

	All firms	SOE	COE	PRI	HKMT	FIE	Other
No. of firms (share of total sample)	199,840 (100)	15,788 (7.9)	16,821 (8.4)	88,791 (44.4)	22,373 (11.2)	23,282 (11.6)	32,785 (16.4)
Log value added	8.96	9.08	8.72	8.65	9.24	9.59	9.20
Log capital	8.40	9.43	7.95	7.93	8.69	8.99	8.79
Log wages	7.33	7.84	7.04	6.93	7.88	7.98	7.51
Log wages and benefits	7.44	8.08	7.14	7.01	7.97	8.10	7.64
Employment	283	806	185	146	370	361	340
Female employees (share)	0.42	0.29	0.40	0.43	0.54	0.52	0.38
Share of male unskilled employees	0.49	0.55	0.56	0.52	0.41	0.40	0.51
Share of male skilled employees	0.09	0.15	0.05	0.05	0.05	0.08	0.11
Share of female unskilled employees	0.38	0.23	0.39	0.41	0.51	0.47	0.33
Share of female skilled employees	0.05	0.07	0.02	0.03	0.03	0.05	0.05
Log R&D expenditure	0.58	1.05	0.26	0.38	0.48	0.74	1.00
Firm size (share)							
8-50	0.22	0.20	0.26	0.28	0.11	0.15	0.17
51-100	0.25	0.17	0.27	0.30	0.19	0.20	0.23
101-500	0.43	0.40	0.41	0.39	0.53	0.50	0.46
501-1000	0.06	0.11	0.04	0.03	0.11	0.09	0.08
1001-	0.04	0.13	0.02	0.01	0.07	0.07	0.06
Firm age (share)							
< 3 years	0.26	0.10	0.12	0.31	0.24	0.27	0.27
4-7 years	0.26	0.15	0.25	0.23	0.28	0.31	0.24
8-12 years	0.24	0.68	0.56	0.13	0.25	0.15	0.22
> 12 years	0.24	0.39	0.68	0.04	0.11	0.13	0.36
Rural administrative subordination	0.19	0.07	0.08	0.33	0.24	0.27	0.27
FIE and HKMT asset share	0.18	0.01	0.01	0.01	0.77	0.74	0.01
State asset share	0.07	0.81	0.01	0.00	0.01	0.01	0.01
Unionization	0.47	0.85	0.53	0.37	0.14	0.44	0.57

Notes: Value added, capital, wages, non-wage compensation, and R&D expenditures are in logs of thousands of Yuan.

Table 2
Coverage and economic importance of enterprise-based social insurance programs

	All three non-salary items	Pensions and health insurance	Housing funds	Labor and unemployment insurance
Share of participating firms (expenditure > 0)				
All firms	0.16	0.66	0.18	0.44
SOE	0.45	0.77	0.52	0.67
COE	0.11	0.60	0.13	0.36
PRI	0.06	0.56	0.34	0.32
HKMT	0.13	0.81	0.15	0.58
FIE	0.30	0.80	0.34	0.61
Other	0.21	0.67	0.24	0.50
Ratio of insurance payments to total wage costs in participating firms				
All firms	0.39	0.14	0.11	0.06
SOE	0.44	0.24	0.11	0.09
COE	0.37	0.16	0.09	0.06
PRI	0.42	0.11	0.13	0.06
HKMT	0.28	0.09	0.08	0.03
FIE	0.29	0.13	0.08	0.03
Other	0.37	0.17	0.13	0.06

difference, it is larger than those found for the non-Asian economies (16% for both the US and Germany), but smaller than the one for Japan (66%). Testing the hypothesis of no discrimination by comparing the size of the two gaps shows that women in Chinese industry on average receive wages that exceed their productivity contributions.We hence reject the null-hypothesis of wage-discrimination against female employees in the nation-wide sample.

A productivity disadvantage of women is a common result in empirical studies that use firm-level data to estimate gender-differences in productivity from production functions. It should be noted that this disadvantage could in itself reflect gender-related discrimination in the allocation of labor within and between firms (i.e. Bergmann, 1974). A systematic difference in productivity between men and women with similar education levels may reflect that women are systematically matched with jobs that do not fit their preferences, skills and abilities. Previous studies of the Chinese labor market have found discriminatory treatment of women in the hiring process (Cooke, 2001), and in upward mobility within and between firms (Cao and Hu, 2007; Song and Dong, 2009). Such gender-stereotyping and discrimination may

in turn have affected Chinese women's motivations and efforts on their jobs (Korabik, 1994; Peng et al. 2009) and thereby led to further widening of the productivity gap.

We now compare the relative marginal wages and productivities of men and women with similar skill levels. Row three in Table 3 shows estimation results for workers with less than 12 years of education. Because unskilled workers make up the majority of the workforce in the industrial sector, these coefficients are very similar those in row one: women are 45% less productive and earn 11% less. Results for workers with more than 12 years of education are shown in rows 3 and 4. For both women and men, their wages and productivities are substantially larger than for unskilled males, as indicated by the parameters exceeding one. Investing in education is rewarded by a 93% education premium for men (λ_{MS} = 1.93), and a 65% (λ_{FS} =1.65) premium for women. Calculating the difference between these two premiums returns a 28% gender-wage gap among skilled workers (1.93-1.63).[20] The divergence of this gender-wage gap from that found among unskilled workers (11%) is statistically different at the one percent level. Contrary to the results from some previous studies using individual data (Millimet and Wang, 2006; Hughes and Maurer-Fazio, 2002; Xu et al., 2006; Gustafsson and Li, 2000), the empirical analysis in this paper therefore indicates that the gender-wage gap is narrower in the lower part of the skill-distribution than in the upper part.

Next, we test the null of matching productivities and wages of skilled male and female workers. The results in rows seven and eight are both negative, suggesting that the wage premiums received by persons of both genders who invest in education fail to reflect the value of those investments to firm productivity. This result echoes previous findings

[20] Within the groups "skilled" and "unskilled", men and women have roughly the same average number of years of schooling.

regarding inefficiencies in the compensation of skilled employees in China's rural industry (see Fleisher and Wang, 2004)[21].

Table 3
Joint production function and earnings equation estimates:
Cobb-Douglas production function, all firms

Wages and productivities relative to unskilled male workers for…	Log (Value Added) (1)	Log (Wages) (2)	Log (Value Added) (3)	Log (Total Comp.) (4)
...female workers	0.59 (.01)	0.89 (.01)	0.59 (.01)	0.90 (.01)
…female unskilled workers	0.55 (.01)	0.89 (.01)	0.55 (.01)	0.89 (.01)
…female skilled workers	2.43 (.11)	1.65 (.03)	2.42 (.10)	1.82 (.03)
…male skilled workers	3.92 (.11)	1.93 (.02)	3.88 (.11)	2.01 (.02)
Wage-productivity gap for…				
...female workers	**0.31**		**0.31**	
…female unskilled workers	**0.34**		**0.34**	
…female skilled workers	**-0.80**		**-0.60**	
…male skilled workers	**-1.99**		**-1.87**	
Log labor	0.62 (.01)		0.63 (.00)	
Log capital	0.22 (.00)		0.21 (.00)	
Log R&D expenditure	0.05 (.00)	0.03 (.00)	-0.06 (.01)	-0.15 (.00)
Rural administrative subordination	-0.06 (.01)	0.12 (.00)	-0.22 (.01)	-0.05 (.01)
R-squared	0.56	0.84	0.56	0.83
Correlation between equations	0.13		0.13	
N	194,942		194,950	

Notes: All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions and 4 municipalities, Beijing = reference), industry (38 categories, textile = reference), size (five categories, < 51 employees = reference), age (four categories, established earlier than 1994 = reference), unionization (1 if the firm has a union), ownership (six categories, private Chinese firms = reference), the share of state capital in total capital, and the share of foreign and HKMT capital in total capital. Bold letters indicate that the null-hypothesis of equal wages and productivities for workers of gender *i* and skill-group *j*, $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$, is rejected at the five percent level. Standard errors are reported in parenthesis.

[21] The authors find that monopsony power and inadequate possibilities to exploit returns to scale among firms do not satisfactorily explain the failure of wages of skilled workers to reflect their productivity. Persistant deviations of wages from productivity, they argue, could be the result of segmentation of the labor market caused the hukou-system's restrictions on worker mobility.

5.2 Does ownership matter?

Many studies of gender-wage discrimination in China have confirmed the importance of firm ownership. Table 4 presents results from jointly estimating equations (3) and (4) for six ownership sectors: 1) state-owned enterprises (SOE), 2) collective owned enterprises (COE), 3) privately owned enterprises (PRI), 4) firms funded by entities based in Hong Kong, Macao or Taiwan (HKMT), 5) foreign-invested firms (FIE), and 6) firms with mixed ownership (Other). We first focus on the gap in skill-weighted average wages between men and women, reported in row 1. We see that this gap is somewhat smaller in COEs (3%) and PRI (10%) firms than in FIEs (16%). The estimated gap among State-owned (12%) firms is however not statistically significant from any of the other ownership sectors. If we consider Collective firms as "state-controlled", these results are somewhat in line with previous studies showing larger wage-gaps in foreign-invested sectors than in state-controlled ones (Maurer-Fazio et al. 1999; Hughes and Maurer-Fazio, 2002; Liu et al., 2000; Xu et al., 2006).

By examining the gender wage-gaps between workers with similar education levels we can gain further insights into the importance of ownership sector to the wage dynamics between women and men. Looking first at the reward pattern between women and men with less than 12 years of education, and who comprise on average 87% of the firms' workforces, we note that unskilled women earn less than unskilled men in all sectors. In contrast to the combined skill-weighted measure of the total gender-wage gap discussed above, the point-estimates of the gap between unskilled men and women is the smallest in foreign-invested firms (5%) and the largest in state-owned enterprises (18%).

Next, we calculate the wage-gap among men and women with more than 12 years of education. This is done by subtracting the coefficient which captures the education premium of women compared to unskilled males (λ_{FS}) from the coefficient of the male education premium (λ_{MS}), reported in rows 3 and 4 respectively. For all ownership sectors, these

relative wage- parameters exceed zero, meaning that that human capital investments of both women and men are reflected in higher wages.

Market reform appears to have favored the wage growth of skilled men. The gender-wage gap between skilled men and women is not statistically different form zero among SOEs, and skilled women are found to earn more than skilled men (by 59%) in COEs. In contrast, there is a significantly larger wage advantage of men in foreign-invested firms (117%) and in firms with investments from HKMT (75%). These results indicate that skilled men have been able to take advantage of the internationalization of ownership in the industrial sector to larger extent than skilled women.

Row 5 in Table 4 tests the hypotheses of equal wages and productivities of men and women by ownership sector. The results do not alter our conclusions from the overall firm sample. Women's productivities fall further behind men's productivities than their wages do. Put differently, women appear to receive wages that exceed their productivity in all the six ownership sectors under consideration. The largest disparity is found among collective owned enterprises and the smallest in workplaces funded by foreign entities or entities in Hong Kong, Macao, or Taiwan. Driving this result are the smaller productivity lags of women within the ownership sectors enjoying non-mainland investment. As such, the results suggest that female labor has been more efficiently allocated in the most internationalized sectors.

Increasing the share of skilled employees of both genders is associated with productivity gains for firms in all sectors. Rows 7 and 8 in Table 4 show the difference between the size of these productivity gains for the firms, and the size of the education premiums received by the employees. Echoing the result from the overall sample, we see that wage premiums fall short of reflecting the productivity contributions in all ownership sectors.

Table 4
Joint production function and wage equation estimates: Cobb-Douglas production function, ownership-based sub-samples

	SOE		COE		PRI		HKMT		FIE		Other	
Wages and productivities relative to unskilled male workers for…	Log (Value Added)	Log (Wage)	Log (Value Added)	Log (Wage)	Log (Value Added)	Log (Wage)	Log (Value Added)	Log (Wage)	Log (Value Added)	Log (Wage)	Log (Value Added)	Log (Wage)
...female workers	0.57 (.06)	0.88 (.03)	0.54 (.06)	0.97 (.02)	0.53 (.02)	0.90 (.01)	0.65 (.03)	0.87 (.01)	0.72 (.04)	0.84 (.02)	0.57 (.04)	0.93 (.02)
…female unskilled workers	0.70 (.08)	0.82 (.06)	0.41 (.05)	0.92 (.02)	0.48 (.02)	0.91 (.01)	0.69 (.04)	0.92 (.02)	0.72 (.04)	0.95 (.02)	0.51 (.04)	0.91 (.02)
…female skilled workers	2.25 (.37)	1.81 (.11)	3.13 (.62)	1.95 (.13)	2.00 (.17)	1.27 (.04)	2.62 (.27)	1.67 (.08)	3.87 (.32)	2.01 (.08)	2.24 (.25)	1.61 (.07)
…male skilled workers	4.97 (.43)	1.86 (.08)	3.14 (.47)	1.36 (.08)	2.95 (.15)	1.46 (.03)	4.70 (.35)	2.42 (.08)	5.93 (.43)	3.18 (.09)	3.64 (.24)	1.79 (.05)
Wage-productivity gap for…												
...female workers	**0.31**		**0.43**		**0.37**		**0.22**		**0.12**		**0.36**	
…female unskilled workers	**0.12**		**0.50**		**0.42**		**0.23**		**0.23**		**0.40**	
…female skilled workers	**-0.44**		**-1.17**		**-0.73**		**-0.96**		**-1.86**		**-0.44**	
…male skilled workers	**-3.11**		**-1.78**		**-1.49**		**-2.30**		**-2.75**		**-1.85**	
Log capital	0.20 (.01)		0.20 (.01)		0.21 (.00)		0.70 (.02)		0.22 (.00)		0.22 (.00)	
Log labor	0.77 (.02)		0.49 (.02)		0.52 (.01)		0.19 (.00)		0.70 (.02)		0.65 (.01)	
Log R&D expenditure	0.05 (.00)	0.04 (.00)	0.05 (.00)	0.02 (.00)	0.05 (.02)	0.03 (.00)	0.05 (.00)	0.03 (.01)	0.03 (.00)	0.03 (.00)	-0.03 (.02)	0.03 (.00)
Rural administrative subordination	-0.12 (.02)	-0.23 (.01)	0.07 (.02)	-0.08 (.01)	-0.07 (.02)	-0.06 (.01)	-0.04 (.02)	-0.07 (.01)	-0.03 (.02)	-0.13 (.01)	0.04 (.01)	-0.10 (.01)
R-squared	0.76	0.90	0.42	0.80	0.41	0.78	0.84	0.56	0.62	0.83	0.57	0.84
Correlation between equations	0.22		0.13		0.09		0.12		0.13		0.13	
N	14,803		16,046		86,587		22,192		23,062		32,253	

Notes: All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions and 4 municipalities, Beijing = reference), industry (38 categories, textile = reference), size (five categories, < 51 employees = reference), age (four categories, established earlier than 1994 = reference), unionization (1 if the firm has a union), the share of state capital in total capital, and the share of foreign and HKMT capital in total capital. Bold letters indicate that the null-hypothesis of equal wages and productivities for workers of gender *i* and skill-group *j*, $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$, is rejected at the five percent level. Standard errors are reported in parenthesis.

5.3 Does non-wage compensation widen the gender-gap in earnings?

We now examine how non-wage compensation is distributed among male and female employees in the Chinese industrial sector. The sum of the firm's expenditures on social insurances is added to the wage measure in equation (4) before joint estimation with the production function (3). Results are placed in Table 3, columns (3) and (4). In particular, we are interested in comparing the parameters of the altered wage equation in column (4) to the benchmark salary-only estimates in column (1). This exercise shows that the distributions are highly similar. The earnings difference among unskilled workers remains unaffected, showing that non-wage benefits are not disproportionally allocated between men and women with less than 12 years of education.

Non-wage compensation is distributed to the advantage of skilled workers. It raises the average earnings received by skilled women by 17% (1.82-1.65), and those of skilled men by 8% (2.01-1.93). This result could reflect the incentives of firms to retain skilled workers by providing them with social insurances which are not easily transferred from one workplace to another. It could also be the consequence of a higher demand for tax exempt insurances among workers subjected to higher than average income tax levels. The result that skilled women are more likely than skilled men to be covered by social insurances means that the gender-gap in total earnings between skilled workers is narrower than the gap in wages. The male advantage in compensation is reduced from 29% to 19%.

Summing up the results for the role of social insurance payments in gender-distribution of earnings, we can conclude that such payments do not widen wage-disparities between unskilled men and women. Among workers with more than 12 years of education, payments are skewed slightly in favor of women, causing the gender-wage gap to become somewhat narrower than when we consider wages alone. The result that social insurance contributions are largely unimportant to the gender-distribution of work compensation is

robust to removing all firms that do not contribute to all the insurances considered[22] (Table B1). Findings for the six ownership sectors are also robust to the inclusion of non-wage compensation in the earnings measure, as evidenced by comparing Table 4 to Table B2.

5.4 Robustness checks

A number of robustness checks carried out to assess the sensitivity of the main results presented above. We first replace the Cobb-Douglas production function with a translog version. Results placed in Table B3, Appendix B, show only slight alterations in the estimated earnings and productivity differentials in the full sample. Next, we consider if industrial segregation by gender is an important factor in gender-wage inequality, as suggested by some previous studies (Maurer-Fazio et al., 1999; Gustafsson and Li, 2000; Hughes and Maurer-Fazio, 2002). If women are crowded into low-paying industries, the female-to-male wage differential λ_F should rise if we remove the industrial dummies from the vector of control variables[23]. Estimation results (not reported) however show no change in the parameter, meaning that industrial segregation does not substantially contribute to the gender-wage gap.

The use of cross-sectional data in this paper does not allow us to distinguish whether the lower productivity of females stem from their weaker performance within firms, or from a gender-productivity variation across firms. The latter could be the consequence of women being compelled to self-select into joining less productive enterprises. If women take jobs in firms that are more labor intensive, and labor has a decreasing return in the firm's production function, the share of women would be negatively correlated to firm productivity. We test this hypothesis by dividing the full sample according to the median capital-to-labor ratio. The estimation results do not provide support for the idea that women are sorted into more labor

[22] this leaves 30,995 firms where total non-wage compensation make up on average 39% of the firms' total wage costs.
[23] The descriptive statistics in Table A3 indeed indicate substantial gender-segregation between industries. The share of female employees ranges from 12% in the 1,204 firms engaged in mining and processing of ferrous metal ores, to 70% in the 9,416 firms that manufacture apparel, footwear and caps.

intensive firms with lower labor productivity. The productivity differential between men and women (row one, Table B4) remains largely unchanged despite the sample division.

It has been argued that technological change that improves on firm productivity and conserves on labor leads 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 in our analysis, due to the positive correlation between the share of women and the productivity enhancing technological change. Table B5 examines this hypothesis by dividing the data into two sub-samples along the median share of women in the firm's workforce. Controlling for the share of females by splitting the sample in this way should yield larger gender differences in productivity if the hypothesis is true. Comparing the estimation results within the two sub-samples to the baseline in Table 3 shows that the skill-weighted average gender-difference in productivity remains constant.

If female employees work fewer hours than males, measuring labor input by the average number of female and male workers per year can lead to a negative bias in the estimated productivity of women. Using individual-level data, we can calculate labor input weights and attempt to correct this potential bias. The widely used China Household Income Project (CHIP) data for year 2002 includes information on the yearly, monthly and weekly work hours for employed men and women with different educational levels working for firms under different ownership. Average work-years for skilled and unskilled men and women are calculated by multiplying the usual number of hours worked in a week with the number of weeks worked in a month and the number of months worked in a year. Weights are calculated by normalizing the work-year measure for each group with respect to unskilled male workers.

The calculated labor input weights, presented in Table B6, are consistent with the expected gender and skill patterns. Employees with higher education work fewer hours per week than those with lower education. Female unskilled employees supply less labor than

their male unskilled colleagues in SOEs, but more in foreign-invested firms. Unambiguous ownership information in the CHIP data is not available for HKMT invested firms, or firms with the mixed ownership structures included in the category "Other" in this paper. Table B7 contains the estimation results with and without labor input weights after the exclusion of these two ownership sectors. The general conclusions of the paper concerning the productivity disadvantage of women remain unchanged. We however note that for skilled women and men, taking account of their on average shorter work-weeks compared to unskilled workers decreases the estimated under-payment of these groups by about 10 percentage points.

Labor unions are the bylaw designated monitors of firm compliance with anti-discriminatory laws and regulations and may therefore provide gender-specific wage protection (Cooke, 2001). Empirical research has provided evidence of more narrow gender-earnings gaps in unionized organizations (i.e. Elvira and Saporta, 2001), and Ge (2007) showed that Chinese firms with established unions had higher levels of wages, non-wage benefits, and productivity. We examine the effect of unionization by estimating our wage- and production function in the sub-sample of 92,174 firms with unions, and that of 102,768 firms without unions, separately. The results in Table B8 show no effect of unionization on the average male-female wage or productivity gaps. For unskilled women, their productivity disadvantage is however slightly smaller (38% compared to 50%) in the unionized firms.

Dong and Zhang (2009) find that women are paid in excess of their productivity in the state-owned sector, but not in the private sector. They argue that the legacy from the planned economy is important to understanding this result: while the state assigned women to positions within heavy industry for which they were physically disadvantages, they were rewarded the same wages as men (Korzec, 1992). Results found in this paper do not provide support to Dong and Zhang's claim in the sense that the over-payment of women should be

restricted to the state-sector. In fact, the magnitude of the productivity disadvantage of women in SOEs is not statistically different from that in collective, private or HKMT-funded firms (see Table 4). However, the ownership-segregated results may be misinterpreted if privatized firms retain the legacy of mis-matched productivities and wages. Running the empirical analysis on a sub-sample of firms established more than 20 years ago (17,573 observations) however does not change the size of the gender-gap in productivity.

Regardless of the role of state planners in assigning women to specific jobs, female workers may still be "biologically" less productive than men in industries where a larger share of the jobs requires physical strength. Dividing the full sample into 14 aggregated industrial sectors[24] provides some support to this more general claim. Examining Table B9 we find that women's productivity disadvantages are larger than average in heavy industries such as the Power (75%), Petroleum (76%), and Chemical (57%) sectors.

China's special economic zones were set up to attract foreign investment and are the geographical locations where market reform has advanced the furthest. Table B10 contains the estimation results for a sample of 13,041 firms located in the six SEZs: Zhuhai and Shantou in Guangdong Province, Xiamen in Fujian Province, the entire province of Hainan, and Pudong New Area in the city of Shanghai. We first note that the estimated wage-gap between unskilled men and women drops from 11% in the full sample to 0%, while the wage gap among skilled workers remains constant. Examining the industry-specific wage-gaps in Table B9, we note that this result could stem from small gender-wage gaps among unskilled workers in light industrial sectors such as Tailoring (0%), Leather products (0%), and Textiles (6%). Recalling that these sectors are those with the largest shares of female workers, the conclusion is that market reform appears to have improved the prospects of gainful employment and the relative incomes of unskilled women[25].

[24] in accordance with the ex-factory price index categories used in China's official statistical publications.
[25] A note of caution when interpreting the positive effects on women's lives from the new employment opportunities is

From Table B10 also see that the productivity gap between unskilled men and women is not significantly different from zero in the Special Economic Zones. As a consequence, the hypothesis of equal wages and productivities for unskilled women cannot be rejected. One interpretation of this result is that firms in the Zones operate on more competitive product and labor markets, which pushes firms to organize labor more efficiently. Another interpretation is that expanded work opportunities in the light industrial sectors that dominate the SEZs have improved women's relative productivity.

6. Conclusions

Properly identifying the existence and extent of discrimination in work compensation is of great economic importance. Discriminated worker-groups are discouraged from participating in employment and from investing in skill development and education. As a consequence, human capital is underdeveloped and under-utilized, and long-term growth is negatively affected. This paper has used firm-level data for Chinese industrial enterprises to investigate if women face discriminatory behavior in the hands of employers.

The estimated gender-wage gap of 11% is narrower than those found for other large economies by researchers using firm-level data and similar methodologies. This result suggests that the Maoist ideology of gender equality has carried over in the market transition. Contradicting this hypothesis is the result that the narrowest gaps exist in the most liberalized sectors. Among firms that are located Special Economic Zones, and in certain light industrial sectors, women and men are estimated to earn on average equal wages. In light of these results, market reforms do not appear to have triggered greater wage inequality between men and women. Rather, the results suggest that a shift from heavy to light industry, combined

however merited by the numerous studies arguing that these opportunities consist largely of precarious jobs with inferior job security (Razavi, 2007; Cooke, 2005), and under exploitative working conditions (Burda, 2007; Pun, 2007; Berik et al., 2007).

with labor market reforms, may have improved women's access to gainful employment. In line with this observation is the result that equal wages are observed in the industrial sectors with the highest shares of women, namely in Tailoring firms, and in firms producing Textile or Leather products. If women would be crowded into these sectors, then, in accordance with Bergmann's (1974) crowding-in model, we would expect relative wages to fall. In contrast, their expansion in the transition period appears to have improved women's relative incomes.

I find no empirical evidence of earnings discrimination against female industrial workers. On the contrary, the results suggest that women's wages exceed their contributions to firm productivity. However, a lower average productivity among female industrial workers could imply that female labor is less efficiently allocated than male labor. Comparing the size of the productivity disadvantage of women across the numerous sub-samples used in this paper shows that foreign-invested firms, and firms with HKMT-investments, have been more successful in harnessing women's productivity. Smaller productivity disadvantages of women are also found for firm located in China's Special Economic Zones. Female labor hence appears to have been more efficiently allocated in sectors that operate on product and labor markets where the competitive pressure is higher.

The results show a narrower gender-wage gap among workers with less than 12 years of education than among workers with higher educational attainments. A main contributor to this observation is that skilled men appear to have benefitted from the internationalization of industrial ownership to a greater extent than women.

Implementation of China's reformed social insurance system has been slow, and researchers have suggested the existence of a gender-bias in the distribution of the non-salary provisions. The findings in this paper do not support this conjecture. Estimation of a total earnings equation where each firm's expenditures on non-wage compensation are added to its total wage bill does not alter the estimated degree of overall gender polarization in earnings.

The under-representation of women in the generous State-owned firms hence appears to be balanced out by their over-representation in foreign-invested enterprises that are highly compliant with social insurance regulations.

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Appendix A: Additional descriptive statistics

Table A1
Components of Chinese urban earnings statistics

The statistical concept of wage (*gongzi*) or earnings for on-post urban "staff and workers" includes the following components, whether the employees receive the earnings or benefits in money or in kind and whether the earnings or benefits are or are not taxable items:	
Monthly or annual salary income (including base earnings and additions based on position, seniority, wage scale, and so on)	Transport subsidy (car or shuttle bus provided, cash for bus or taxi, and so on)
Earnings during on-the-job training, probationary period	Housing subsidy (dormitory provided, or directly Subsidized rent or purchase of housing)
Employee income paid on an irregular basis	Individual income tax deducted from earnings and paid directly by enterprise to government
Hourly payment for work performed	Social insurance funds (pension, medical,
Piecework payment for work performed	unemployment insurance funds, and housing
Bonus payments	purchase fund) deducted from the employee's
Incentive, performance-based payments	wage and paid by the work unit to government
Overtime pay	on behalf of the employee
Hardship, danger pay	Money for rent, and utilities (electricity, water)
All kinds of subsidies in cash or in kind	Money given for fixed line or mobile phone
Festival, holiday subsidy	Clothing subsidy
Travel money, food allowance while traveling	Subsidy compensating workers for lack of vacation
Transport subsidy (car or shuttle bus provided, cash	time
for bus or taxi, and so on)	Earnings during approved leaves of absence, pay for
Personal services such as baths, haircuts	time not worked (regular vacation, compassionate
Books, newspapers, magazines provided for	leave, to visit relatives, family-planning operation,
employees	national or societal duty, study leave, leave due to
Meals provided, food allowance	sickness or injury)
Earnings during on-the-job training, probationary	Anything that has the nature or spirit of labor
period	earnings, even if it is not spelled out in the
Earnings during on-the-job training, probationary	regulations
period	

Source: *Laodong gongzi; tongji taizhang* [*Labor wages; statistical accounts*] (Beijing, Beijing Municipality Statistical Bureau, 2004), pp. 2–1 to 2–5, cited in Banister (2005)

Table A2
Aggregation of registration-based classification of firms into ownership categories

Registration-based classification (since 1998)	Categories under which data on all industrial enterprises are reported in the Statistical Yearbook
Domestic enterprises	
SOEs	State
COEs	Collective
Employee shareholding company	Collective
Joint operation enterprises	
State-owned	State (1)
Collective owned	Other
State- and collective owned	Other (2)
Other joint operation enterprises	Other (2)
Limited liability companies	
Solely state-owned	State
Others	State or Other (3)
Stock companies	State or Other (3)
Private enterprises	
Private sole proprietorships	Private
Private partnerships	Private
Private limited liability company	Private
Private stock companies	Private
Other enterprises	Other
HKMT-invested enterprises	
Joint equity ventures (JVEs)	HKMT or State (2)
Contractual joint ventures (CJVs)	HKMT or State (2)
Wholly HKMT-owned	HKMT
HKMT stock companies	HKMT or State (2)
Foreign-invested enterprises	
Chinese-foreign JEVs	Foreign or State (2)
Chinese-foreign CJVs	Foreign or State (2)
Wholly foreign-owned	Foreign
Foreign-invested stock company	Foreign or State (2)

Notes: The table details the ownership aggregation of registration-based firm classification system into six broader categories when reporting data on all industrial firms in the China Statistical Yearbook. Departures from the CSY aggregation method are reported in footnotes (1)-(3) below. Information about the CSY aggregation methodology is contained in Holz and Lin (2001).

(1) Unlike in the Statistical Yearbook, this category is not double-counted as "Other".

(2) When ownership-disaggregated statistics are reported per ownership in the Statistical Yearbook, a proportion of the statistic is double-counted in the "State" category. This proportion corresponds to the aggregate share of the sum of state capital to the sum of total paid-in capital minus individual capital in the registration-based classification category. I instead count an individual firm as State-owned if the state's share in total capital is greater than 50%.

(3) This category is counted as "State" in the Statistical Yearbook for firms that are under absolute state control (guoyou juedui konggu) or relative state control (guoyou xiahgdui konggu). The first implies that the state account for more than 50% of total capital. The second that the state holds less than 50% of total capital but that i) its share is relatively large compared to the shares of other ownership categories, or ii) even though one or more other ownership categories have a larger capital share, the state in effect holds the control right s by agreement (Xiyi kongzhi). In this paper, only absolute state-controlled firms may be identified, and these are moved from the "Other" to the "State" category.

Table A3
Number of firms and share of female employees by 2-digit industrial sector

2-digit Industry	Number of Firms	Share of Female Employees
Manufacturing Industry		
Mfg. of Apparel, Footwear and Caps	9,416	0.70
Mfg. of Articles for Culture, Education and Sports	2,754	0.58
Mfg. of Artwork and Other Manufacturing	272	0.27
Mfg. of Beverages	2,265	0.42
Mfg. of Chemical Fiber	1,040	0.46
Mfg. of Comm. Equip., Computers, and Electronic Equipment	2,884	0.44
Mfg. of Electrical Machinery and Equipment	7,136	0.53
Mfg. of Foods	3,809	0.49
Mfg. of Furniture	2,236	0.33
Mfg. of General Purpose Machinery	14,772	0.28
Mfg. of Articles for culture, education and Sports	3,920	0.57
Mfg. of Leather, Fur, Feather and Related Products	4,846	0.59
Mfg. of Medicines	3,316	0.46
Mfg. of Metal Products	10,552	0.33
Mfg. of Non-metallic Mineral Products	14,064	0.29
Mfg. of Paper and Paper Products	5,443	0.39
Mfg. of Plastics	9,198	0.45
Mfg. of Rubber	2,254	0.44
Mfg. of Special Purpose Machinery	7,245	0.27
Mfg. of Tobacco	140	0.40
Mfg. of Transport Equipment	8,569	0.31
Mfg. of Weapons and Ammunition	11,898	0.43
Mfg. of raw Chemical Mat'ls and Chem. Products	13,718	0.30
Textile Industry	17,484	0.64
Mining and Utilities		
Extraction of Petroleum and Natural Gas	142	0.19
Mining and Processing of Ferrous Metal Ores	1,204	0.12
Mining and Processing of Non-Ferrous Metal Ores	950	0.17
Mining and Processing of Non-metal Ores	1,500	0.17
Mining and Washing of Coal	3,406	0.10
Mining and Processing of Other Ores	10	0.15
Printing, Reproduction and Recording Media	3,772	0.45
Food Processing	9,384	0.38
Processing of Petroleum and Nuclear Fuel	1,357	0.24
Processing of Timber, Mfg. of Wood, etc. Products	3,618	0.43
Production and Distrib. of Water	2,183	0.40
Production and Distrib. of Electric Power and Heat Power	4,348	0.28
Production and Distrib. of Gas	369	0.32
Smelting and Pressing of Ferrous Metals	4,722	0.19
Smelting and Pressing of Non-ferrous Metals	3,644	0.25

Table A4
Number of firms and share of female employees by geographical region

Province, Municipality or Autonomous Region	Number of Firms	Share of Female Employees
Municipalities		
Beijing	4,619	0.35
Chongqing	2,089	0.35
Shanghai	12,870	0.42
Tianjin	3,931	0.37
Autonomous Regions		
Guanxi	2,558	0.37
Inner Mongolia	1,824	0.31
Ningxia	432	0.32
Xinjiang	989	0.33
Tibet	136	0.26
Provinces		
Anhui	3,812	0.39
Fujian	10,091	0.46
Gansu	1,121	0.30
Guangdong	28,419	0.44
Guizhou	1,533	0.29
Hainan	431	0.37
Hebei	7,11	0.33
Heilongjiang	1,901	0.34
Henan	114	0.36
Hubei	4,461	0.38
Hunan	6,001	0.33
Jiangsu	28,842	0.45
Jiangxi	2,872	0.41
Jilin	1,92	0.33
Liaoning	7,681	0.34
Qinghai	256	0.29
Shaanxi	2,042	0.32
Shandong	18,957	0.40
Shanxi	3,043	0.20
Sishuan	5,577	0.31
Yunnan	1,644	0.31
Zhejiang	32,564	0.43

Appendix B: Robustness checks

Table B1
Joint production function and earnings equation estimates: Cobb-Douglas production function, firms with non-zero expenditures on all three non-wage compensation items

Wages, total compensation, and productivities relative to unskilled male workers for…	Log (Value Added) (1)	Log (Wage) (2)	Log (Value Added) (3)	Log (Total Comp.) (4)
...female workers	0.62 (.04)	0.89 (.02)	0.62 (.04)	0.90 (.02)
…female unskilled workers	0.71 (.05)	0.88 (.05)	0.71 (.05)	0.88 (.02)
…female skilled workers	2.30 (.24)	1.80 (.07)	2.28 (.23)	1.86 (.07)
…male skilled workers	4.51 (.27)	2.14 (.05)	4.45 (.27)	2.07 (.05)
Wage-productivity gap for…				
...female workers	**0.26**		**0.28**	
…female unskilled workers	**0.15**		**0.17**	
…female skilled workers	**-0.50**		**-0.42**	
…male skilled workers	**-2.38**		**-2.37**	
Log capital	0.23 (.00)		0.27 (.00)	
Log labor	0.70 (.01)		0.71 (.05)	
Log R&D expenditure	0.04 (.00)	0.02 (.00)	0.04 (.00)	0.02 (.00)
Rural administrative subordination	0.01 (.01)	-0.14 (.01)	0.01 (.02)	-0.16 (.01)
R-squared	0.66	0.87	0.86	0.67
Correlation between equations	0.15		0.15	
N	30,995		30,995	

Notes: All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions and 4 municipalities, Beijing = reference), industry (38 categories, textile = reference), size (five categories, < 51 employees = reference), age (four categories, established earlier than 1994 = reference), unionization (1 if the firm has a union), ownership (six categories, private Chinese firms = reference), the share of state capital in total capital, and the share of foreign and HKMT capital in total capital. Bold letters indicate that the null-hypothesis of equal wages and productivities for workers of gender *i* and skill-group *j*, $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$, is rejected at the five percent level. Standard errors are reported in parenthesis.

Table B2
Joint production function and total compensation equation estimates: Cobb-Douglas production function, ownership-based sub-samples

	SOE		COE		PRI		HKMT		FIE		Other	
Total compensation and productivities relative to unskilled male workers for…	Log (Value Added)	Log (Total Comp.)	Log (Value Added))	Log (Total Comp.)	Log (Value Added)	Log (Total Comp.)	Log (Value Added)	Log (Total Comp.)	Log (Value Added)	Log (Total Comp.)	Log (Value Added)	Log (Total Comp.)
...female workers	0.58 (.06)	0.92 (.03)	0.54 (.06)	1.02 (.02)	0.53 (.02)	0.90 (.01)	0.65 (.03)	0.86 (.01)	0.71 (.03)	0.83 (.02)	0.57 (.04)	0.93 (.02)
…female unskilled workers	0.70 (.08)	0.82 (.04)	0.42 (.05)	0.93 (.02)	0.49 (.02)	0.90 (.01)	0.69 (.04)	0.92 (.02)	0.71 (.04)	0.96 (.02)	0.52 (.04)	0.91 (.02)
…female skilled workers	2.30 (.38)	2.00 (.11)	3.10 (.61)	2.40 (.14)	1.98 (.17)	1.37 (.04)	2.61 (.26)	1.77 (.08)	3.81 (.31)	2.17 (.09)	2.24 (.25)	1.80 (.07)
…male skilled workers	4.98 (.44)	1.82 (.08)	3.10 (.46)	1.37 (.08)	2.91 (.15)	1.50 (.03)	4.65 (.34)	2.59 (.08)	5.85 (.42)	3.52 (.10)	3.62 (.24)	1.79 (.04)
Wage-productivity gap for…												
...female workers	**0.23**		**0.47**		**0.36**		**0.22**		**0.12**		**0.37**	
…female unskilled workers	**0.12**		**0.51**		**0.41**		**0.23**		**0.24**		**0.39**	
…female skilled workers	**-0.29**		**-0.49**		**-0.61**		**-0.85**		**-1.64**		**-0.44**	
…male skilled workers	**-3.15**		**-1.72**		**-1.41**		**-2.06**		**-2.33**		**-1.83**	
Log capital	0.20 (.01)		0.20 (.01)		0.21 (.00)		0.19 (.00)		0.21 (.00)		0.22 (.00)	
Log labor	0.77 (.02)		0.50 (.02)		0.53 (.01)		0.71 (.02)		0.71 (.04)		0.65 (.01)	
Log R&D expenditure	0.05 (.00)	0.05 (.02)	0.05 (.01)	0.03 (.00)	0.05 (.00)	0.04 (.00)	0.05 (.00)	0.03 (.00)	0.03 (.00)	0.03 (.00)	0.04 (.00)	0.04 (.00)
Rural administrative subordination	-0.13 (.02)	-0.29 (.01)	0.07 (.01)	-0.13 (.01)	-0.07 (.02)	-0.07 (.01)	-0.04 (.02)	-0.08 (.31)	-0,03 (.02)	-0.14 (.01)	-0.04 (.01)	-0.11 (.01)
R-squared	0.76	0.89	0.42	0.78	0.41	0.76	0.56	0.83	0.90	0.53	0.57	0.83
Correlation between equations			0.13		0.10		0.12		0.13		0.13	
N	14,805		16,046		86,591		22,192		20,063		32,253	

Notes: All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions and 4 municipalities, Beijing = reference), industry (38 categories, textile = reference), size (five categories, < 51 employees = reference), age (four categories, established earlier than 1994 = reference), unionization (1 if the firm has a union), the share of state capital in total capital, and the share of foreign and HKMT capital in total capital. Bold letters indicate that the null-hypothesis of equal wages and productivities for workers of gender *i* and skill-group *j*, $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$, is rejected at the five percent level. Standard errors are reported in parenthesis.

Table B3
Joint production function and earnings equation estimates:
Translog production function, all firms

Wages, total compensation, and productivities relative to unskilled male workers for…	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Total Comp.)
...female workers	0.54 (.01)	0.90 (.01)	0.54 (.01)	0.89 (.01)
…female unskilled workers	2.57 (.12)	1.66 (.03)	2.56 (.12)	1.83 (.03)
…female skilled workers	3.98 (.12)	1.93 (.02)	3.95 (.12)	2.02 (.02)
…male skilled workers				
Wage-productivity gap for…	**0.30**		**0.31**	
...female workers	**0.36**		**0.35**	
…female unskilled workers	**-0.91**		**-0.73**	
…female skilled workers	**-2.04**		**-1.93**	
...female workers	0.39 (.02)		0.40 (.02)	
…female unskilled workers	-0.17 (.01)		-0.17 (.01)	
…female skilled workers	-0.02 (.00)		-0.02 (.00)	
…male skilled workers	0.04 (.00)		0.04 (.00)	
Wage-productivity gap for…	0.03 (.00)		0.03 (.00)	
...female workers	0.04 (.00)	0.03 (.00)	0.04 (.00)	0.04 (.00)
…female unskilled workers	-0.04 (.01)	-0.12 (.00)	-0.04 (.01)	-0.15 (.00)
…female skilled workers	0.57	0.84	0.57	0.83
…male skilled workers	0.12		0.13	
N	194,942		194,950	

Notes: All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions and 4 municipalities, Beijing = reference), industry (38 categories, textile = reference), size (five categories, < 51 employees = reference), age (four categories, established earlier than 1994 = reference), unionization (1 if the firm has a union), ownership (six categories, private Chinese firms = reference), the share of state capital in total capital, and the share of foreign and HKMT capital in total capital. Bold letters indicate that the null-hypothesis of equal wages and productivities for workers of gender *i* and skill-group *j*, $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$, is rejected at the five percent level. Standard errors are reported in parenthesis.

Table B4
Joint production function and earnings equation estimates: Cobb-Douglas production function, firm sub-samples based on the median capital-to-labor ratio

	High capital-to-labor ratio, above or equal to median (1.76)		Low capital-to-labor ratio, below median (1.76)	
Wages and productivities relative to unskilled male workers for…	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)
...female workers	0.59 (.03)	0.92 (.01)	0.64 (.01)	0.93 (.01)
…female unskilled workers	0.55 (.03)	0.93 (.03)	0.61 (.02)	0.93 (.01)
…female skilled workers	2.31 (.17)	1.61 (.04)	2.46 (.14)	1.55 (.04)
…male skilled workers	3.86 (.17)	1.88 (.03)	3.47 (.13)	1.73 (.03)
Wage-productivity gap for…				
...female workers	**0.33**		**0.29**	
…female unskilled workers	**0.38**		**0.32**	
…female skilled workers	**-0.70**		**-0.90**	
…male skilled workers	**-1.98**		**-1.74**	
Log capital	0.28 (.00)		0.16 (.00)	
Log labor	0.53 (.01)		0.73 (.01)	
Log R&D expenditure	0.04 (.00)	0.03 (.00)	0.0 (.00)	0.03 (.00)
Rural administrative subordination	-0.08 (.01)	-0.13 (.01)	-0.02 (.01)	-0.11 (.00)
R-squared	0.52	0.79	0.60	0.86
Correlation between equations	0.13		0.12	
N	97,122		97,820	

Notes: All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions and 4 municipalities, Beijing = reference), industry (38 categories, textile = reference), size (five categories, < 51 employees = reference), age (four categories, established earlier than 1994 = reference), unionization (1 if the firm has a union), ownership (six categories, private Chinese firms = reference), the share of state capital in total capital, and the share of foreign and HKMT capital in total capital. Bold letters indicate that the null-hypothesis of equal wages and productivities for workers of gender *i* and skill-group *j*, $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$, is rejected at the five percent level. Standard errors are reported in parenthesis.

Table B5

Joint production function and earnings equation estimates: Cobb-Douglas production function, firm sub-samples based on the median share of female employees

	High share of females, above median (0.37)		Low share of females, below or equal to median (0.37)	
Wages and productivities relative to unskilled male workers for…	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)
...female workers	0.59 (.02)	0.86 (.01)	0.61 (.05)	1.06 (.02)
…female unskilled workers	0.67 (.03)	0.94 (.01)	0.42 (.05)	0.89 (.02)
…female skilled workers	2.51 (.15)	1.41 (.04)	2.68 (.24)	2.42 (.06)
…male skilled workers	5.01 (.27)	2.36 (.06)	3.35 (.13)	1.61 (.03)
Wage-productivity gap for…				
...female workers	**0.25**		**0.45**	
…female unskilled workers	**0.26**		**0.47**	
…female skilled workers	**-1.11**		**-0.27**	
…male skilled workers	**-2.66**		**-1.73**	
Log capital	0.20 (.00)		0.23 (.00)	
Log labor	0.63 (.01)		0.62 (.01)	
Log R&D expenditure	0.05 (.00)	0.03 (.00)	0.04 (.00)	0.03 (.00)
Rural administrative subordination	-0.05 (.01)	-0.12 (.00)	-0.07 (.02)	-0.13 (.00)
R-squared	0.54	0.84	0.57	0.84
Correlation between equations	0.12		0.14	
N	97,598		97,344	

Notes: All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions and 4 municipalities, Beijing = reference), industry (38 categories, textile = reference), size (five categories, < 51 employees = reference), age (four categories, established earlier than 1994 = reference), unionization (1 if the firm has a union), ownership (six categories, private Chinese firms = reference), the share of state capital in total capital, and the share of foreign and HKMT capital in total capital. Bold letters indicate that the null-hypothesis of equal wages and productivities for workers of gender *i* and skill-group *j*, $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$, is rejected at the five percent level. Standard errors are reported in parenthesis.

Table B6
Labor input weights for gender-skill groups by firm ownership

Ownership Sector	Gender-Skill Group	Labor Input Weight	Ownership Sector	Gender-Skill Group	Labor Input Weight
SOE	Unskilled males	1.000	PRI	Unskilled males	1.000
	Unskilled females	0.959		Unskilled females	0.955
	Skilled males	0.992		Skilled males	0.918
	Skilled females	0.945		Skilled females	0.738
COE	Unskilled males	1.000	FIE	Unskilled males	1.000
	Unskilled females	0.951		Unskilled females	1.103
	Skilled males	0.999		Skilled males	0.945
	Skilled females	0.861		Skilled females	0.964

Table B7
Joint production function and earnings equation estimates:
Cobb-Douglas production function, gender-skill weighted labor inputs

	No weights		Weights	
Wages and productivities relative to unskilled male workers for…	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)
...female workers	0.58 (.02)	0.91 (.01)	0.58 (.02)	0.91 (.01)
…female unskilled workers	0.55 (.02)	0.90 (.01)	0.55 (.02)	0.89 (.01)
…female skilled workers	2.15 (.13)	1.53 (.03)	2.15 (.13)	1.71 (.03)
…male skilled workers	3.51 (.12)	1.70 (.02)	3.48 (.12)	1.77 (.02)
Wage-productivity gap for…				
...female workers	**0.33**		**0.33**	
…female unskilled workers	**0.35**		**0.34**	
…female skilled workers	**-0.61**		**-0.44**	
…male skilled workers	**-1.81**		**-1.70**	
Log capital	0.21 (.00)		0.21 (.00)	
Log labor	0.60 (.01)		0.60 (.01)	
Log R&D expenditure	0.05 (.00)	0.03 (.00)	0.05 (.00)	0.04 (.00)
Rural administrative subordination	-0.08 (.01)	-0.13 (.00)	-0.08 (.01)	-0.16 (.00)
R-squared	0.94	0.49	0.94	0.51
Correlation between equations	0.12		0.13	

Notes: N = 139,634. All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions and 4 municipalities, Beijing = reference), industry (38 categories, textile = reference), size (five categories, < 51 employees = reference), age (four categories, established earlier than 1994 = reference), unionization (1 if the firm has a union), ownership (six categories, private Chinese firms = reference), the share of state capital in total capital, and the share of foreign and HKMT capital in total capital. Bold letters indicate that the null-hypothesis of equal wages and productivities for workers of gender *i* and skill-group *j*, $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$, is rejected at the five percent level. Standard errors are reported in parenthesis.

Table B8
Joint production function and earnings equation estimates
Cobb-Douglas production function, firms with and without labor union

	Union		No union	
Wages and productivities relative to unskilled male workers for…	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)
...female workers	0.59 (.02)	0.87 (.01)	0.58 (.02)	0.90 (.01)
…female unskilled workers	0.62 (.02)	0.90 (.01)	0.50 (.02)	0.90 (.01)
…female skilled workers	2.49 (.17)	1.76 (.05)	5.52 (.15)	1.59 (.03)
…male skilled workers	4.63 (.17)	2.24 (.04)	3.48 (.14)	1.75 (.03)
Wage-productivity gap for…				
...female workers	**0.28**		**0.32**	
…female unskilled workers	**0.28**		**0.40**	
…female skilled workers	**-0.73**		**-0.93**	
…male skilled workers	**-2.39**		**-1.72**	
Log capital	0.24 (.00)		0.20 (.00)	
Log labor	0.69 (.01)		0.55 (.01)	
Log R&D expenditure	0.05 (.01)	0.03 (.00)	0.04 (.00)	0.03 (.00)
Rural administrative subordination	-0.06 (.01)	-0.14 (.00)	-0.04 (.01)	-0.08 (.01)
R-squared	0.62	0.86	0.46	0.80
Correlation between equations	0.14		0.11	
N	92,174		102,768	

Notes: All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions and 4 municipalities, Beijing = reference), industry (38 categories, textile = reference), size (five categories, < 51 employees = reference), age (four categories, established earlier than 1994 = reference), unionization (1 if the firm has a union), ownership (six categories, private Chinese firms = reference), the share of state capital in total capital, and the share of foreign and HKMT capital in total capital. Bold letters indicate that the null-hypothesis of equal wages and productivities for workers of gender *i* and skill-group *j*, $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$, is rejected at the five percent level. Standard errors are reported in parenthesis.

Table B9

Joint production function and earnings equation estimates: Industrial categories

	Metallurgical		**Power**		**Coal**		**Petroleum**	
Wages and productivities relative to unskilled male workers for…	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)
...female workers	0.45 (.05)	0.85 (.02)	0.25 (.06)	0.73 (.04)	2.43 (.57)	0.87 (.11)	0.24 (.15)	0.89 (.09)
…female unskilled workers	0.28 (.04)	0.79 (.02)	0.30 (.09)	0.69 (.06)	1.71 (.54)	0.83 (.11)	0.33 (.21)	0.90 (.11)
…female skilled workers	2.15 (.36)	1.63 (.10)	1.14 (.39)	2.00 (.18)	15.37 (4.93)	1.46 (.50)	0.14 (.57)	2.35 (.27)
…male skilled workers	2.49 (.25)	1.57 (.06)	5.38 (.56)	2.66 (.15)	4.23 (1.43)	1.07 (.19)	2.00 (.58)	1.68 (.19)
Wage-prod. gap for…	**0.41**		**0.48**		**-1.55**		**0.65**	
...female workers	**0.52**		**0.39**		**-0.91**		**0.57**	
…female unskilled workers	**-0.51**		**0.86**		**-13.91**		**1.21**	
…female skilled workers	**-0.91**		**-2.73**		**-3.16**		-0.32	
R-squared	0.12		0.16		0.17		0.17	
N	22,028		6,283		2,859		1,768	
	Machine Building		**Building Materials**		**Timber**		**Chemical**	
Wages and productivities relative to unskilled male workers for…	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)
...female workers	0.69 (.03)	0.86 (.01)	0.52 (.06)	0.87 (.02)	0.80 (.09)	0.94 (.03)	0.47 (.03)	0.88 (.01)
…female unskilled workers	0.59 (.03)	0.83 (.01)	0.45 (.05)	0.79 (.02)	0.76 (.09)	0.94 (.03)	0.34 (.03)	0.83 (.01)
…female skilled workers	2.98 (.20)	1.71 (.05)	2.23 (.51)	2.03 (.15)	2.91 (.74)	1.49 (.19)	1.76 (.22)	1.74 (.06)
…male skilled workers	3.74 (.18)	1.82 (.03)	3.66 (.38)	1.69 (.08)	3.31 (.64)	1.69 (.16)	3.14 (.02)	1.71 (.05)
Wage-prod. gap for…	**0.17**		**0.35**		0.08		**0.45**	
...female workers	**0.24**		**0.33**		**0.18**		**0.49**	
…female unskilled workers	**-1.27**		-0.20		**-1.42**		-0.02	
…female skilled workers	**-1.91**		**-1.97**		**-1.62**		**-1.42**	
R-Squared	0.12		0.14		0.13		0.12	
N	51,565		13,658		5,728		28,869	

Notes: All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions and 4 municipalities, Beijing = reference), size (five categories, < 51 employees = reference), age (four categories, established earlier than 1994 = reference), unionization (1 if the firm has a union), ownership (six categories, private Chinese firms = reference), the share of state capital in total capital, and the share of foreign and HKMT capital in total capital. Bold letters indicate that the null-hypothesis of equal wages and productivities for workers of gender *i* and skill-group *j*, $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$, is rejected at the five percent level. Standard errors are reported in parenthesis.

Table B9 contd.
Joint production function and earnings equation estimates: Industrial categories

	Food		**Textile**		**Tailoring**	
Wages and productivities relative to unskilled male workers for…	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)
...female workers	0.28 (.03)	0.88 (.02)	1.11 (.15)	0.99 (.04)	0.79 (.05)	1.04 (.03)
…female unskilled workers	0.30 (.03)	0.84 (.02)	0.50 (.04)	0.94 (.02)	0.81 (.07)	1.00 (.03)
…female skilled workers	0.88 (.22)	1.49 (.09)	2.27 (.37)	1.14 (.08)	3.69 (.50)	1.88 (.12)
…male skilled workers	3.32 (.31)	1.98 (.08)	3.39 (.57)	1.75 (.12)	4.44 (.84)	1.08 (.14)
Wage-productivity gap for…						
...female workers	**0.53**		-0.12		**0.25**	
…female unskilled workers	**0.54**		**0.44**		**0.19**	
…female skilled workers	**0.61**		**-1.12**		**-1.80**	
…male skilled workers	**-1.33**		**-1.65**		**-3.35**	
R-squared	0.16		0.08		0.10	
N	15,095		17,328		9,323	
	Paper		**Culture and Education**		**Leather**	
Wages and productivities relative to unskilled male workers for…	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)	Log (Value Added)	Log (Wages)
...female workers	0.66 (.05)	0.89 (.03)	0.76 (.06)	0.88 (.02)	0.67 (.06)	0.98 (.03)
…female unskilled workers	0.66 (.06)	0.94 (.03)	0.72 (.07)	0.95 (.03)	0.63 (.07)	1.01 (.04)
…female skilled workers	2.02 (.39)	1.38 (.13)	3.12 (.61)	1.10 (.14)	2.14 (.76)	1.20 (.22)
…male skilled workers	3.03 (.40)	1.97 (.12)	3.11 (.70)	2.29 (.19)	5.26 (1.14)	1.83 (.26)
Wage-productivity gap for…						
...female workers	**0.23**		0.11		**0.41**	
…female unskilled workers	**0.28**		**0.23**		**0.38**	
…female skilled workers	-0.64		**-2.02**		-0.94	
…male skilled workers	**-1.06**		-0.82		**-3.43**	
R-Squared	0.12		0.10		0.11	
N	9,062		6,588		4,788	

Notes: All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions and 4 municipalities, Beijing = reference), size (five categories, < 51 employees = reference), age (four categories, established earlier than 1994 = reference), unionization (1 if the firm has a union), ownership (six categories, private Chinese firms = reference), the share of state capital in total capital, and the share of foreign and HKMT capital in total capital. Bold letters indicate that the null-hypothesis of equal wages and productivities for workers of gender *i* and skill-group *j*, $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$, is rejected at the five percent level. Standard errors are reported in parenthesis.

Table B10
Joint production function and earnings equation estimates: firms located in China's Special Economic Zones

Wages and productivities relative to unskilled male workers for…	Log (Value Added)	Log (Wages)
...female workers	0.79 (.05)	0.01 (.03)
…female unskilled workers	1.01 (.08)	1.03 (.03)
…female skilled workers	3.97 (.50)	2.51 (.12)
…male skilled workers	7.01 (.72)	2.99 (.13)
Wage-productivity gap for…		
...female workers	**0.18**	
…female unskilled workers	0.03	
…female skilled workers	**-1.46**	
…male skilled workers	**-4.00**	
Log capital	0.20 (.01)	
Log labor	0.73 (.02)	
Log R&D expenditure	0.04 (.00)	0.04 (.00)
Rural administrative subordination	0.04 (.03)	-0.08 (.02)
R-squared	0.61	0.85
Correlation between equations	0.15	

Notes: N=10,230. All equations include a constant term and dummy variables for geographical location (22 provinces, 5 administrative regions and 4 municipalities, Beijing = reference), industry (38 categories, textile = reference), size (five categories, < 51 employees = reference), age (four categories, established earlier than 1994 = reference), unionization (1 if the firm has a union), ownership (six categories, private Chinese firms = reference), the share of state capital in total capital, and the share of foreign and HKMT capital in total capital. Bold letters indicate that the null-hypothesis of equal wages and productivities for workers of gender *i* and skill-group *j*, $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$, is rejected at the five percent level. Standard errors are reported in parenthesis.