Competition and Gender-skill-differentials in Earnings and Productivity: Evidence from China's Industrial Sector

Abstract

This paper compares wages and welfare benefits of gender-skill groups of employees with the productivity they generate to assess earnings discrimination in the Chinese industrial sector. Using firm-level data for 2004 and 2005, I find that unskilled women receive wages that exceed their productivity contributions, while the opposite is found for skilled women. Larger gaps between earnings and productivities of employee groups within SOEs and COEs than within HKMT- and foreign-invested firms is interpreted as support for a negative correlation between competition and discrimination. Finally, enterprise-provided welfare is found not to contribute to polarization of industrial earnings along gender-skill lines.

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1. Introduction

Before 1978, the Chinese industrial employee was assigned to a state-owned workplace and 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 by firms under various forms of ownership. Once employed, he or she receives a wage that is largely determined by the employer. They also receive welfare if the firm complies with regulation and participates in the newly created social insurance schemes. Researchers have argued that the dramatic increase of employer discretion in remuneration decisions brought by these reforms has led to a polarization of economic power across gender lines by triggering discrimination in wages (Ngo, 2002) and uneven coverage and provision of enterprise-provided welfare (Razavi, 2007; Wang 2006). Theoretically, market reforms may have unleashed two opposing forces. Increased employer autonomy in wage- and welfare decisions may have allowed a resurgence of China's traditional patriarchal culture which disfavours women. However, increasing competition in the product and labor market may have worked to economically punish discriminatory behaviour (Becker, 1957).

This paper compares the wages and welfare benefits that men and women receive with the productivity they generate to assess gender-related earnings discrimination in the Chinese industrial sector. The central question posed is whether competition in labor and product markets affects the extent to which the productivity-contributions of gender-skill demographic groups are matched by the work compensation they receive. To answer this question, firms are divided into sub-samples according to their ownership, size and location. It is hypothesized that state- or collectively-owned firms face softer budget constraints and less competition than private or foreign-funded firms. Likewise, small firms with less market power, and firms that are located in the Special Economic Zones (SEZs) are expected to face more competition than others.

I follow Hellerstein et al. (1999a, 1999b) and use firm-level data to directly compare estimates of relative productivities and wages of employee groups with different demographic characteristics. If labor markets function as spot labor markets with minimal frictions and perfect competition we would expect differences between remunerations and productivities to be arbitraged away by profit maximizing or cost minimizing firms. If there is a deviation, this

can be interpreted as long-term contracts or, as in this paper, discrimination. As pointed out by numerous researchers, a direct comparison of estimated marginal wages and productivities offers a major advantage compared to the standard approach of investigating discrimination by using individual-level data. In such research, to which the vast majority of previous studies of gender-related income inequality in China belongs (see Shen and Deng, 2008, for a survey of this literature), a residual wage differential between women and men is interpreted as discrimination. This methodology has been questioned on the grounds that control variables may not fully capture gender-related differences in productivity (see e.g. Altonji and Blank, 1999).

Previous studies show that enterprise-based welfare provisions may account for as much as 53 percent of the total labor compensation per worker paid by urban industrial enterprises[1]. This paper is the first to investigate the role of these benefits for earnings inequalities in China. In addition to this contribution, the data used in this paper provides considerable improvements to previous studies (Dong and Zhang, 2009[2]). It is collected by the NBS and covers all industrial firms owned by the state, and all other firms with annual sales above 5 million RMB. Adjusted for measurement errors and availability of gender-disaggregated human capital variables, the final analysis draws on a sample of 163,743 firms observed in the years 2004 and 2005. The unique comprehensiveness of this dataset allows the distinction of a variety of ownership sectors and geographical locations of firms. Moreover, the size of the dataset provides unique precision in the parameter estimation and permits numerous robustness checks of the results.

Properly identifying the existence and extent of discrimination in work compensation is of great economic importance. Discriminated employee-groups are discouraged from participating in employment and from investing in skill development and education. As a consequence, human capital is underdeveloped and underutilized, which in turn has a negative effect on long-term growth. In China, earnings discrimination may also bear directly upon the current efforts of to increase social harmony by reversing the trend of steadily increasing income inequality. The empirical findings of this paper are that female unskilled workers

[1] 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.
[2] Dong and Zhang (2009, 2008) use data on firms operating in five large Chinese cities. Pooling data for 1998 and 2000, their total sample size is 1,335.

receive wage premiums that exceed their contributions to firm productivity, while the earnings of skilled women fall short of reflecting their productivity. Adding firm-provided welfare to the wage measure of earnings only marginally changes these results. Regarding Becker's hypothesized negative correlation between competition and discrimination, the empirical evidence is mixed. On one hand, the earnings-productivity gaps are generally found to be higher in SOEs and COEs than in HKMT and FIEs, which supports Becker's argument. On the other hand, gaps are not smaller than average in firms located in China's Special Economic Zones. In addition, they are found to be bigger, rather than smaller, in small firms which arguably have less market power.

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 gender-related inequalities stemming competition-enhancing reform in the industrial sector. Section 3 explains the basic econometric framework while section 4 discusses the dataset and variable computations. Estimation results are presented in section 5 and section 6 concludes.

2. Work, wages, and employment-based welfare in transitional China

In pre-reform socialist China, urban industrial workers enjoyed a system of guaranteed occupational and income security. This "Iron Rice Bowl" also included access to welfare benefits (health care, pensions, education) which were distributed via the state-owned work unit. State socialism made an ethical commitment to the "emancipation of women" entailing their juridical equality with men, their 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). Under the industrial policy which emphasized heavy and capital-intensive industry, many women filled positions for which they were biologically disadvantaged compared to men, for example blue collar jobs requiring physical strength. This skill mismatch was however not reflected in the centrally determined and egalitarian remuneration system (Korzec, 1992).

Following Mao's death in the late 1970s, radical labor market reforms were carried out in the Chinese industrial sector. 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). The labor allocation decision was transferred from the state to the enterprises and firms were given the right to dismiss workers in 1994. These new authorities were put to extensive use during the massive SOE retrenchment program implemented in 1997-2002. This program resulted in the lay-offs of 28 million state workers (Dong and Xu, 2005)[3].

The re-orientation of the socialist economy towards a market-based system included the diversification of firm ownership, allowing the private and foreign-invested sectors to grow. From a welfare perspective, this process meant that a growing number of urban industrial workers no longer had access to the enterprise-provided benefits granted by State-owned firms. Moreover, these SOEs were increasingly finding themselves in unsustainable financial positions as welfare costs stemming from lay-offs were weighing heavily on their budgets and hampering their abilities to compete in the new marketized economy. In light of these difficulties, social security reform focused on replacing the enterprise self-insurance system with cost sharing across firms and on extending the social benefit systems to the private and foreign funded industrial sectors.

In pre-reform China, urban industrial workers were provided with health, pension and injured worker benefits through the Labor Insurance Scheme (LIS). In the reform period, the LIS was disaggregated into separate insurances. SOEs were encouraged to switch to the new systems, and other urban industrial firms were encouraged to join. Health care reform was initiated in 1997 and included the creation of the new Urban Employee Basic Health Insurance Scheme (BHIS). This scheme is employment-based and administered by management agencies located within local governments. Employees contribute 6% of their wage and enterprises between 2 to 6% of total payroll. Joining the BHIS is required, but not mandatory, and extending its coverage has proved difficult. Overall health insurance coverage 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).

Pension reform started in the early 1990s when local security bureaus were established to collect and pool SOE contributions. In 1997, a new two-tiered system was created and opened

[3] Women were over-represented among the laid-off SOE employees (Appleton et al., 2002; Giles et al., 2006). However, the demand for women grew rapidly in the export-oriented, and highly labor intensive, sectors of the economy. On the industrial labor market as a whole, female employment hence decreased in the state-owned sector while increasing in the foreign-owned.

to private-sector firms. It comprised both a social pooling account as well as personal accounts. Contributions were however set at a high level and coverage failed to rise[4]. In many locations, personal accounts were emptied to make up for deficiencies in the social pooling account. A new round of reform currently aims at saving the personal accounts by separating their management from the pooled funds. Total enterprise contributions are however remaining high at 20% of payroll.

An Unemployment Insurance (UI) system was introduced in 1986 and evolved during the 1990s to become more similar to those found in other countries. It is currently financed by employers who supply 2% of their total payroll, and employees who supply 1% of their wages. Funds are pooled at the municipal level and provinces are allowed to determine benefit levels, duration and other aspects of the program. The most recent reform is the binggui system under which laid-off SOE workers are detached from their old workplaces, where they had remained despite being formally out of work[5] are merged with the UI system.

A key component of the socialist work unit consisted in the provision of housing. In this area, reforms have created a new, firm-based, household savings system. Employers and employees contribute with funds to portable worker accounts which are managed by local committees and entrusted in local banks. The initial rate of contribution was set at 10% of the employee's salary, but had been increased to 16% by the year 2003 (Wang et al 2005). If approved, such funds can be retrieved for housing purchases or repairs. In parallel to part-taking in these housing accumulation funds, firms may also provide their employees with loosely regulated subsidies which may cover a range 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).

The reformed welfare system remains fundamentally different between rural and urban industrial areas. Rural manufacturing workers (TVE) are excluded from the unemployment

[4] The previous self-insurance system had created large unfunded liabilities in many SOEs. The passing on of these liabilities to the new system necessitated high levels of contributions. While guidelines called for a total rate of no more than 24% of the taxable payroll, the actual contribution rates were higher in many provinces Jackson et al (2009).

[5] Laid-off SOE workers had continued to be the financial responsibility of their previous employers. These firms were required to establish Re-employment Service Centers though which continued financial support was to be channeled to the laid-off workers for a three year period. By the end of 2005, the binggui system – closing the centers and merging the unemployed workers with the UI system - was completed in 20 provinces, and the number of laid-off SOE workers remaining in the centers had decreased from 7,01 million in 1991to 200 000.

insurance system, the housing accumulation fund and housing subsidy systems. Regarding pensions, formal retirement protection is virtually nonexistent, and existing personal accounts are scarce and benefits small (Jackson et al., 2009). An enterprise-financed medical insurance system essentially does not exist outside of the cities (Bannister, 2005).[6]

Chinese labor market and welfare reforms since in the post-1978 period has drastically increased employers' discretion concerning wages and benefit provisions. In the case of welfare, the gender-related effects of reforms have not been investigated empirically. Researchers have however pointed to the emerging pattern of gender-related unevenness of insurance coverage (Razavi, 2007) and to the inability of some firms to pay their contribution (Lee, 2005). Moreover, they have pointed out that the principle of proportionally tying contributions are to individual incomes may compound the already existing wage differential between men and women (Razavi, 2007; Wang, 2006).

Contrary to the case of enterprise-provided welfare, a considerably large literature investigates the existence of gender-wage discrimination in wages in the reform period, the vast majority of which use individual-level wage data. For urban industry, the general conclusions from this literature are that the gender-gap in wages has widened (Mauer-Fazio et al, 1999). This increase is however generally found to be the consequence of an increase in the rewards for human capital characteristics on the labor market. Meanwhile, inequality caused by discrimination is generally found to have decreased (Bishop et al, 2005; Shu and Bian, 2003; Liu et al, 2000). In a unique study using firm-level data, Dong and Zhang (2009) find that women in SOEs receive wage subsidies rather than being discriminated against. This result is discussed in terms of industrial policy under central planning which was characterized by being heavily skewed industrial investments toward capital-intensive industry while neglecting labor intensive light industry and commercial services. Under those circumstances, women were chosen to fill positions for which they were biologically disadvantaged to men, such as blue collar jobs requiring physical strength, a skill mis-match that was not accounted for by the egalitarian wage-grading system. As a result, the productivity contribution of women was smaller than their wages, meaning that female workers received favorable rather than discriminatory treatment with regards to their work compensation.

[6] The New Cooperative Medical Scheme (NCMS), instituted in 2003, is a subsidized but voluntary program where payments are split between the household, local and central governments.

Previous research of gender aspects of income inequality and industrial reform in China is inconclusive regarding Becker's (1971) hypothesis discrimination is less common in firms that face more competition in the labor and product markets. Ng (2007) finds that the spatial pattern of discriminatory wage setting during 1988-1997 changed in parallel with regional levels of reform intensity; discrimination against female workers increased more sharply in the most reformed eastern provinces, less in the central provinces and the least in the western ones. In another study contradicting Becker's hypothesis, Mauer-Fazio and Hughes (2002) use a cross-section of income data for 9,397 individuals for 1992 to show that the gender wage gap left unexplained by observed characteristics is largest in the most liberalized joint-venture sector and smallest in the least liberalized state sector. Providing instead some support for Becker, Shu and Bian (2002) use individual income data for 1988 and 1995 from the Chinese Household Income Project to show that the part of the gender wage gap which is explained by productive factors is larger in cities where foreign investment is higher and where a larger proportion of total output and employment is derived from non-state and collective enterprises.

3. Research methodology

3.1 Basic approach

Following Hellerstein and Neumark (1999), I test for gender wage discrimination by jointly estimating wage and production functions using a firm-level dataset.[1] This approach allows the identification and comparison of marginal wages and marginal products for men and women at the plant level. It also provides several advantages over the widely used method of estimating wage regressions on individual-level data, where the unexplained residual wage difference is interpreted as gender-wage discrimination. The usual wage regression controls may not fully capture productivity differentials (e.g. Becker, 1985). It is therefore questionable if the estimated residual wage gap reflects discriminatory wage-setting practices on part of the employer or other unobservable sex-related differences in productivity.

We begin by assuming that firm output can be expressed as a Cobb Douglas production function with the inputs capital (K), materials (M), and labor (L). The latter is expressed as a quality of labor index (QL) in which skilled and unskilled male and female workers are

assumed to be perfectly substitutable inputs, but with potentially different marginal products. In logs, this production function can be expressed as

$$\ln(Q) = \ln(A) + \alpha_L \ln[M_U + \phi_F F_U + \phi_S M_S + \phi_F \phi_S \phi_{FS} F_S] + \alpha_K \ln(K) + \alpha_M \ln(M) \quad (1)$$

Where F_i and M_i is the number of women and men in the plant who are either skilled, $i = S$, or unskilled, $i = U$. The productivity parameters ϕ_i are expressed relative to the productivity of male unskilled workers, and represent the additional marginal productivity associated with being female ϕ_F, and with being skilled ϕ_S. The difference in productivity associated with being female *and* skilled (ϕ_{FS}) is set to 1. We hence assume that the relative marginal product of skilled women to unskilled men is equal to the relative marginal product of skilled men to unskilled men. Similarly, this formulation of the labor index implies that the relative marginal product of being female, compared to being male, does not vary with skill level. By making the additional assumption that the share of skilled workers is equally large among women and men, and letting L represent total employment in the firm so that $M_U = L - M_S - F_U - F_S$ we can rewrite (1) as

$$\ln(Q) = \ln(A) + \alpha_L \ln\left[(L + (\phi_F - 1)F)\left(1 + (\phi_S - 1)\frac{S}{L}\right)\right] + \alpha_K \ln(K) + \alpha_M \ln(M) \quad (2)$$

where S is the number of skilled workers in the plant[27]. From the definition of QL we note that $\phi_F = \phi_S = 1$ indicates no productivity differentials. Meanwhile, a finding that $\phi_F = 0.5$ would imply that the average marginal productivity of females is 50% lower than that of males.

We next turn to the estimation of relative differentials in work compensation. Dependent variables in the firm-level regressions are either the total wage bill or the sum of the total wage bill and firm expenditure on welfare. For simplicity, only the wage measurement is used in the description of the methodology below. A firm-level wage equation is derived under assumptions paralleling those made for the production function above, namely equal relative marginal productivities and equiproportionate distribution of workers. The relative wages of skilled to unskilled workers are assumed to be the same for men and women. Also, male and female workers within the unskilled and skilled groups are assumed to be paid the same

[7] Assuming that the proportion of women and men in an establishment to be constant across both skill levels allows us to express $F_S = S\left(\frac{F}{L}\right)$ and ,$M_S = S\left(1 - \frac{F}{L}\right)$, $F_U = F\left(1 - \frac{S}{L}\right)$. Substitution into the labor index gives $QL = L + (\phi_F - 1)F\left[1 - SL + \phi S - 1S1 - FL + \phi F \phi S - 1SSL\right.$ which reduces to the expression inserted in equation (2).

amount, up to a firm-specific multiplicative random error. A Mincer-type earnings equation can hence be expressed as

$$\ln(W_T) = \lambda_0 + \ln(QL)$$

$$\ln(W_T) = \lambda_0 + \ln\left[(L + (\lambda_F - 1)\left(1 + (\lambda_S - 1)\frac{S}{L}\right)\right] \quad (3)$$

where, as noted, the dependent variable is the total wage bill of the firm[38]. Paralleling equation (2), λ_F is the relative wage differential of women to men, and λ_S is the relative wage differential of skilled to unskilled workers. Comparisons between the estimated productivity differentials ϕ_i from equation (2) and the wage differentials $\lambda_i$from equation (3) can now be made. For simplicity, this restricted model will henceforth be referred to as Model 1. A test for positive or negative wage discrimination corresponds to testing whether or not marginal wages correspond marginal productivities so that $\phi_i = \lambda_i$. A marginal wage that exceeds the marginal productivity, $\phi_i < \lambda_i$, is interpreted as a wage subsidy, while wage discrimination is inferred if the test shows that workers are not compensated in accordance with their marginal productivity so that $\phi_i > \lambda_i$ Estimation of (?) and (?) is done simultaneously using the non-linear seemingly unrelated regressions (NLSUR), which takes account of potential cross-equation correlation of error terms added to both equations.

3.2 Relaxing the assumptions of the basic model

Relaxing the assumptions of equal relative marginal productivities of worker sub-groups and the assumption of equiproportionate distributions of skilled and unskilled among men and women implies that we can rewrite the labor quality index as

$$QL = M_U + \phi_{MS}M_S + \phi_{FU}F_U + \phi_{FS}F_S$$

where the parameters ϕ_{ij} now denote the average marginal productivity of workers with gender *i* = *F*, *M* and skill level *j* = *U*, *S* relative to the productivity of unskilled male workers. Inserting this labor index into the Cobb-Douglas production function in logs, and again

[8] To see how this firm-level function can be understood as an aggregating individual-level wage equations over workers in the firm, consider the individual level 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 F_i and M_i are dummy variables for females and males respectively. Aggregating this function over the firm we get $w = w_M(L - F) + w_F F$, which can be expressed as $w = w_M[L + (\lambda_F - 1)F]$ where λ_F is the average relative wages of women to men, $\frac{w_F}{w_M}$. Taking logs gives the simplified equivalent of equation (3), where the constant corresponds to the average wage of men, $\lambda_0 = \ln w_M$.

substituting $M_{US} = L - M_S - F_U - F_S$ gives the following equations for production and wages of the firm:

$$\ln(Q) = \ln(A) + \alpha_L \ln[L + (\phi_{MS} - 1)M_S + (\phi_{FU} - 1)F_U + (\phi_{FS} - 1)F_S] + \alpha_K \ln(K) + \alpha_M \ln(M) \quad (4)$$

and

$$\ln(W_T) = \ln w_{MU} + \ln[L + (\lambda_{MS} - 1)M_S + (\lambda_{FU} - 1)F_U + (\lambda_{FS} - 1)F_S] \quad (5)$$

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 industry[49]. Equations (4) and (5) are referred to as model 2, or the unrestricted model.

3.3 Measurement issues and robustness analysis

To address the potential endogeneity of materials in the production function estimation, a value-added version is used. Robustness of C-D estimates is further assessed by estimation of a Translog production function.

It is likely that there exist unobserved characteristics at the firm-level which correlate with the productivity, or wages, of firms. As long as these unobservables introduce similar bias in both equations, their effect on the difference between the marginal productivity and marginal wage parameters should be reduced. If they, on the other hand, are correlated with the composition of the workforce, the estimated relative productivity and wage parameters will be biased. To get a sense of the magnitude of the bias resulting from unobserved firm-level differences, the sample is divided into subsamples using first the median of the share of women in the total firm workforce. This robustness check is used to assess whether or not discrimination is more severe in plants where women make up a larger share of the labor force. Moreover, the female share of the labor force may be correlated with the type of technology used by the firm, which also impacts production and wages. As evidenced by Berman et al. (1994) and Dunne et al.

[9] 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.

(1997), technological change could reduce the demand for production (male) workers in the firm, which would result in an upward bias of the female productivity parameter.

This paper uses cross-sectional data on production and wages at the firm level. Differences in relative wages and productivity associated with gender and skill level are hence estimated based on covariation across firms in those demographic characteristics. In this setting, it is not possible to assess whether empirical results suggesting lower wages and productivities for female workers from women is the consequence of women receiving lower wages and being less productivity within plants, or women being disproportionately employed in firms that pay lower wages and have lower productivity. One reason that women could work in firms that have lower productivity is if they are disproportionately hired into labor intensive-industries where the ratio of capital to labor is relatively low. Assuming diminishing returns to labor and capital, the marginal product of labor may be smaller in these firms than in others, which would induce a negative bias on the female productivity parameters in the estimations performed in this paper. To test for this potential bias, estimation is carried out in sub-samples based on the quartile distribution of the ratio of capital to labor within firms.

Using the total number of workers in the firm as a measurement of labor input is a potential source of bias in the estimated productivity and wage differentials if women and men systematically supply different amounts of work hours to the firm. This could be the case if, for example, women are over-represented among part-time workers in some sectors or, as pointed out by Wang (2004), if women on average work more hours per day than men in the foreign-owned and export-oriented industry. An attempt to correct the labor input data for this measurement error is carried out by adjusting the labor input variable using information on the average work years, months, and weeks among industrial workers with different demographic characteristics.

4. Data, variables and summary statistics

This study is based on enterprise-level data for 2004 and 2005 collected by China's National Bureau of Statistics (NBS). It covers all state-owned firms and all non-state firms with annual sales above 5 million RMB and includes all firms formally designated as large or medium size, as well as the bulk of those designated as "small-scale." The vast majority of the

excluded industrial firms are those registered as individual household (i.e. geithu) enterprises. This dataset is used by the NBS to compile the "industry" section of the China Statistical Yearbook as well as industry specific reports in the China Markets Yearbook.

The empirical analysis of this paper is performed on data from 2005. The survey for this year contains information typically used in production function estimation, such as output, sales, materials expenditure, capital stock, and the total number of workers. It also includes information on the total wage bill and annual firm expenditure on four categories of social insurance items, namely: (1) housing accumulation fund and housing subsidies; (2) pensions and medical insurances, and (3) labor insurance and unemployment insurance. Moreover, it contains information on the share of female workers in the firms' workforce. In order to attain a more accurate measure of labor quality, the 2005 dataset is complemented with information on the gender-disaggregates human capital distribution of firms from the previous year. This requires the assumption that the shares of skilled and unskilled among the female and male workers are constant over the two years. A worker is considered to be skilled if he or she has completed junior college, undergraduate studies, graduate studies and above, and unskilled otherwise.

Requiring that firms are operating in both 2004 and 2005 removes 39,838 observations from the dataset, leaving 217,082 firms. To correct this data for improbable values, I follow Jefferson et al (2008) and exclude enterprises with less than eight employees and those that are in the upper and lower tails of productivity[10]. Firms are also dropped if the ratio of value added to sales is either negative or larger than one, and if negative values are reported for capital or labor. This data cleaning procedure removes 17,242 observations. The NLSUR estimation procedure further requires non-missing values for all included variables. Excluding such observations results in a final sample size of 163,743 firms (henceforth called sample 1) for estimation of the restricted model, equations (2) and (3), and 124,292 firms for the unrestricted model (sample 2), equations (4) and (5).

Variables are created as follows. Value added is calculated by subtracting material costs and the value of inventory of finished products in end of the previous year from total sales. The

[10] The latter is done in two steps. First, ratios of value added to labor and capital as well as 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. This method is designed to remove observations containing improbable data values assumed to be the result of misplaced digits.

capital measure is the net value of fixed assets. Wages is the total wage bill. This measure includes social insurance payments deducted from employee earnings (see Table A1 for a comprehensive explanation of the components of the wage variable). A more comprehensive measure of work compensation is created by also adding the sum of employer welfare payments, deriving from the four social benefit items listed above, to the wage measure. R&D intensity is the logarithm of one plus the firm's expenses on research and development. The share of workers with vocational training draws on information for the 2004 survey and consists in the share of employers with a certificate of technical training.[11] The ownership variable aggregates data for 23 ownership types into five broader categories to closely track the formal classification system currently used in the China Statistical Yearbook. Firms are defined as State-owned (SOE); Collectively-owned (COE)[12]; Private (PRI); funded by entities in Hong Kong, Macao or Taiwan (HKMT); Foreign-invested enterprises (FIE), and "Other" enterprises. Details on this aggregation are provided in Table A1 in this paper's Appendix A. The full-sample regression also includes two measures of the asset ownership composition of firms, namely the shares of firm paid-in capital held by the state and the combined shares for FIE and HMT. Incorporating these measures may yield improved predictions of firm performance, as suggested by Jefferson and Su (2006), in particular if firm registrations are unreliable as a measure of actual firm control (Sabin, 1994). Additional control variables are industrial categories, on the two-digit level, and geographical location on the provincial level. Dummy-variables for firm size specify if the number of employees amount to 1) 8-50; 2) 51-100; 3) 101-500; 4) 501-1000 or 5) > 1000 workers. Due to the sharply skewed distribution of the age variable, quartiles are used to divide the sample according to whether the year of establishment or reconstruction is either 1) > 2002; 2) 1999-2002; 3) 1994-1998 or; 4) < 1994.

Summary statistics for the sample used to estimate the restricted model are reported in Table 2. For comparison, corresponding statistics for the somewhat smaller sample, used to estimate the unrestricted model, are placed in Appendix, Table A3. They show that the average firm has 314 employees in the larger sample, and 373 in the smaller one. Among these employees, the average share of women is close to 42 % for both samples. Examining the ownership-

[11] This includes holders of junior, intermediate and senior titles for technical personnel, certifies technicians, and those holding intermediate or senior grades of skilled worker certificates.

[12] Collective-owned firms are economic entities that are registered in accordance with the *Regulation of the People's Republic of China on the Management of Registration of Legal Enterprises*, where assets are owned by 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).

based sup-samples, this figure corresponds to average percent of females in private domestic firms and in collectively-owned firms. Meanwhile, the share is somewhat higher in foreign- (52 %) and HKMT-funded firms (54 %), and somewhat lower in firmed under state ownership (29 %)[13]. For the larger sample, ownership of firms is distributed in such a way that 41,0 % of the firms are domestic and privately owned, 8,1 % are state-owned, 6.9% are collectively owned while 12.3 % and 13.2 % are owned by entities based in Hong Kong, Macao or Taiwan and in foreign countries respectively. Finally, 17.2 % of the firms fall into the category "Other". This ownership-distribution differs only slightly when compared to sample 2. Examining the asset shares held by the Chinese state and by foreign and HKMT entities in the different ownership categories does not provide evidence for any sizeable deviation between the registration-based ownership categorization and the asset holding structure of firms. Summary statistics of the geographical and industrial composition of the two main samples are placed in Appendix, Tables A5 and A6.

Table 2 display descriptive statistics the three social insurance variables for sample 1. For comparison, corresponding statistics for sample 2 are presented in Appendix, Table A4. The top halves of these tables show the share of firms with positive expenditures on each variable. For sample 1 (Table 2), we see that 18% have nonzero expenditures on all three items. The highest coverage is associated with the Pensions and Medical care programs (69 %), while 47 % of firms participate in the Labor and Unemployment insurances and 20 % in the Housing funds. State-owned firms have the highest total participation rate (49 %), and foreign-invested firms the second highest (19%). Among private Chinese firms, only 7 % report non-zero expenditures for all three items. Comparing the upper halves of Tables 2 and A4 we see that the participation rates of all welfare programs, in all ownership groups, rise by between 1-5 percentage points when firms that do not have both skilled males and skilled females among their workforces are dropped from sample 1 to create sample 2. We should however note that the dataset used in this paper contains both urban and rural firms, where the latter are not required to provide social insurance coverage. Figures in the upper halves of Tables 2 and A4 may therefore not be interpreted as the share of urban firms that comply with coverage requirements.

[13] 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, prior to the removal of firms without female workers, this is true for 13% of the HKMT-funded firms, and 15% of the foreign-funded firms.

Table 1
Summary statistics, sample 1

Variables	All firms	SOE	COE	PRI	HKMT	FIE	Other
No. of firms	163,743	13,310	12,325	66,994	20,262	21,647	29,205
Log output	10.32	10.19	10.08	10.08	10.54	10.78	10.55
Log value added	9.06	9.21	8.79	8.74	9.28	9.62	9.27
Log capital	8.57	9.59	8.11	8.09	8.77	9.05	8.90
Log materials	9.72	9.23	9.47	9.55	9.97	10.14	9.92
Log wages	7.46	8.01	7.14	7.04	7.92	8.01	7.59
Log wages and benefits	7.58	8.25	7.25	7.12	8.01	8.14	7.73
Log employment	315.8	899.9	203.6	163.2	377.5	367.2	366.0
Female employees (share)	131.3 (41.6)	263.9 (29.3)	82.6 (40.6)	69.7 (42.7)	202.9 (53.7)	190.7 (52.0)	139.1 (38.0)
Share of skilled workers	0.14	0.20	0.09	0.11	0.12	0.18	0.16
Log R & D expenditure	0.67	1.17	0.32	0.46	0.52	0.78	1.09
Share of employees with vocational training	0.17	0.35	0.15	0.14	0.11	0.13	0.22
Establishment size							
8-50	0.19	0.16	0.23	0.24	0.11	0.14	0.15
51-100	0.24	0.16	0.27	0.29	0.19	0.20	0.23
101-500	0.45	0.42	0.44	0.42	0.53	0.50	0.47
501-1000	0.07	0.12	0.05	0.04	0.11	0.10	0.09
1001-	0.05	0.14	0.02	0.01	0.07	0.07	0.06
Firm age							
< 3 years	0.25	0.07	0.08	0.33	0.23	0.27	0.27
4-7 years	0.25	0.10	0.11	0.31	0.24	0.27	0.27
8-12 years	0.25	0.14	0.25	0.23	0.28	0.32	0.24
> 12 years	0.25	0.69	0.56	0.13	0.25	0.15	0.23
FIE and HKMT asset share	0.25	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

Notes: Output value, value added, capital, materials, wages, benefits, and R & D expenditures are measured in thousands of Yuan.

Table 2
Coverage and economic importance of enterprise-based social insurance programs, sample 1

	All benefit items	Pensions and health insurance	Housing funds	Labor and unemployment insurance
Share of participating firms (expenditure > 0)				
All firms	0.18	0.69	0.20	0.47
SOE	0.49	0.80	0.55	0.71
COE	0.14	0.69	0.17	0.44
PRI	0.07	0.59	0.08	0.35
HKMT	0.14	0.81	0.16	0.58
FIE	0.32	0.80	0.35	0.62
Other	0.22	0.70	0.25	0.52
Ratio of insurance payments to total wage costs in participating firms				
All firms	0.38	0.14	0.10	0.05
SOE	0.43	0.24	0.11	0.09
COE	0.44	0.17	0.09	0.06
PRI	0.42	0.11	0.12	0.06
HKMT	0.30	0.09	0.08	0.03
FIE	0.30	0.13	0.08	0.03
Other	0.38	0.17	0.12	0.06

5. Estimation results

The first main result of this paper is found in Table 3. Columns 1 and 2 present results from jointly estimating the restricted model 1, equations (2) and (3). Consider column 1 first. It shows coefficients on capital, materials and labor of 0.08, 0.66 and 0.21, all of which are highly significant and of plausible magnitudes. We next examine row one which shows the productivity and wage differences between women and men. Remembering that $\lambda_F = \phi_F = 1$ indicates no wage or productivity differences between the gender-groups, the estimates indicate that women earn on average 13 % less than men (column 2), and that their productivity is on average 35 % lower (column 1). Looking at row 3 which gives the coefficient of the hypothesis test that the relative wages of women vis-à-vis men equal their relative productivity, $\lambda_F - \phi_F = 0$, the difference of 0.22 is statistically significant and suggests that women's wages exceed their productivity by 22 %. Results in columns 5 and 6 address the question of whether some women fare better than other by estimating the unrestricted model 2 (equations (4) and (5)). They suggest that the wages of unskilled women exceed their productivity by 28 %. For skilled women (row 2) we find that they receive a positive return to education of 74 % ($\lambda_{FS} = 1.74$) , but that the productivity gains for firms that hire this group of workers are even higher ($\phi_F = 4.11$). Wages for skilled females hence fail to reflect their contributions to productivity by 237 %. These results change only marginally when replacing the wage measure of earnings with the measure including both wages and enterprise-provided social insurances. The conclusion is therefore that the firm-based social insurance provisions do not contribute to a polarization of earnings according to gender.

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

Model 1 N = 163,743					Model 2 N = 124.292				
	Log (Output) (1)	Log (Wages) (2)	Log (Output) (3)	Log (Total Comp.) (4)		Log (Output) (5)	Log (Wages) (6)	Log (Output) (7)	Log (Total Comp.) (8)
Female	0.65 (.02)	0.87 (.01)	0.65 (.01)	0.88 (.01)	Female unskilled	0.59 (.03)	0.88 (.01)	0.59 (.02)	0.87 (.01)
Skilled	4.71 (.12)	1.94 (.01)	4.67 (.12)	2.06 (.02)	Female skilled	4.11 (.20)	1.74 (.04)	4.07 (.20)	1.87 (.04)
Female: $\lambda_F - \phi_F = 0$	**0.22**		**0.23**		Male skilled	4.99 (.21)	2.06 (.03)	4.97 (.20)	2.10 (.03)
Skilled: $\lambda_S - \phi_S = 0$	**-2.77**		**-2.61**		Female unskilled: $\lambda_{FU} - \phi_{FU} = 0$	**0.28**		**0.26**	
					Female skilled: $\lambda_{FS} - \phi_{FS} = 0$	**-2.37**		**-2.20**	
					Male skilled: $\lambda_{MS} - \phi_{MS} = 0$	**-2.93**		**-2.87**	
Log capital	0.08 (.00)		0.08 (.00)			0.08 (.00)		0.08 (.00)	
Log materials	0.66 (.00)		0.66 (.02)			.65 (.00)		0.65 (.00)	
Log labor	0.21 (.00)		0.22 (.00)			0.23 (.00)		0.23 (.00)	
Log R & D expenditure	0.01 (.00)	0.04 (.01)	0.02 (.00)	0.04 (.00)		0.01 (.00)	0.03 (.00)	0.02 (.00)	0.03 (.00)
Vocational training (share)	0.00 (.00)	0.03 (.00)	0.01 (.00)	0.07 (.01)		0.00 (.00)	0.03 (.00)	0.00 (.01)	0.07 (.01)
R-squared	0.91	0.84	0.91	0.83		0.92	0.85	0.92	0.84
Correlation between equations	0.04		0.04			0.04		0.04	

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), ownership (six categories, private Chinese firms = reference), age (four categories, established earlier than 1994 = reference). Bold letters indicate that the null-hypothesis $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$ is rejected at the five percent level.

This paper tests Becker's (1971) hypothesis that more competition in the labor and product markets lead to less earnings discrimination in three ways. First, firms are divided into sub-samples according to their ownership sector. Smaller wedges between marginal productivities and remunerations are expected in foreign-invested firms, in HKMT-funded firms and in Chinese private firms. Meanwhile, larger wedges are expected in state- and collective-owned sectors which have softer budget which face lesser product and labor-market competition. A second test of the effect of competition on wage-discrimination is constructed by simultaneously estimating the earnings and production functions for firms located in China's Special Economic Zones[14]. One of the main motivations behind setting up those SEZs was to promote export-oriented production. Indeed, the Shenzhen zone alone accounted for 14 % of the national total export value in 2003 (FIAS, 2008). Assuming that the SEZ located firms operate on the international market to a larger degree than others, we expect smaller wedges between earnings and productivities in these firms. The third test of Becker's hypothesis is conducted by disaggregating the main samples along the median firm size. Since small firms are anticipated to have less market power than large firms, support for Becker would be implied if wage-productivity differentials are larger in firms with bigger workforces than in firms with smaller ones.

We first consider estimation results from the ownership sub-samples. Results in Table 5 show estimated parameters for model 1. The top row shows the earnings- and productivity differences between men and women. The relative wage and total earnings parameters for female employees all take on a value below one which means that women are, on average, receiving lower work compensation than men in all ownership sector. This wage-gap takes on the largest value in SOEs (17 %), while the smallest values are observed for the private Chinese industry (10 %) and in COEs (7 %). Consider next the female productivity parameters for the different ownership sectors. They indicate women's productivity falls behind that of men by a magnitude ranging from 25 % in FIEs to as much as 52 % in COEs. Comparing the relative wage and productivity estimates, these findings mean that women's wage-productivity gap is largest in the COEs (44 %), private Chinese firms (23 %) and SOEs (22 %). The gap is smaller in HKMT (14 %) and FIEs (12 %). One interpretation of these estimates is that the socialist egalitarian ideology still plays a role in wage setting in COEs,

[14] The SEZs set up in 1980 include Shenzhen, Zhuhai, and Shantou in Guangdong Province, Xiamen in Fujian Province, and the entire province of Hainan. Pudong New Area, located in Shanghai, was added in 1990.

SOEs, and in the private sector consisting to a large extent of privatized SOEs, meaning that female wages are kept from reflecting contributions to productivity. In conclusion, we can also note that the findings presented in this section are well in line with our expectations based on Becker's hypothesis that competition lowers discrimination.

Disaggregating each gender group according to their skill level (Table 6) and estimating model 2 for the ownership sum-samples yields that unskilled women have earnings that exceed their productivity, but that the earnings of skilled women fall short of their productivity contributions. This result holds for all ownership groups except for SOEs, where both unskilled and skilled females are found to be receiving wages that exceed their productivity. The estimated size of the wage subsidy given to unskilled women is the highest in COEs (51 %) and in private Chinese firms (33 %). The smallest subsidy is instead recorded for FIEs (7 %). Considering skilled employees, a comparison of wages and productivities again indicate that skilled women, as well as skilled men, are not fully compensated for their qualifications' effect on firm output. Regarding the correlation between competition and wage-productivity disparities, these estimation results for model 2 do not provide a clear answer. The positive discrimination of female unskilled workers is less prominent in the FIEs and HKMTs than in the full sample, but at the same time the negative discrimination of skilled women is above average in these ownership sectors. Conversely, SOEs and COEs give larger than average subsidies to unskilled women, while skilled women receive remunerations that are more in line with productivity than what is the case in the other ownership sectors.

Tables B1 and B2 investigate the effects on wages and productivities in different ownership sectors when enterprise-based welfare payments are added to the dependent variable in the earnings equations. The main result of this exercise is that welfare-provisions appear to accrue to skilled women to a larger degree than to unskilled men. Consequently, the negative discrimination of skilled women decreases in all ownership sectors when firm welfare payments are taken into account.

Table 4
Joint production function and wage equation estimates of model 1: Cobb-Douglas production function, ownership-based sub-samples

	SOE		COE		PRI		HKMT		FIE		Other	
	Log (Output) (1)	Log (Wage) (2)	Log (Output) (3)	Log (Wage) (4)	Log (Output) (5)	Log (Wage) (6)	Log (Output) (7)	Log (Wage) (8)	Log (Output) (9)	Log (Wage) (10)	Log (Output) (11)	Log (Wage) (12)
Female	0.62 (.07)	0.83 (.05)	0.48 (.07)	0.93 (.02)	0.67 (.03)	0.90 (.01)	0.69 (.04)	0.87 (.01)	0.75 (.04)	0.87 (.02)	0.67 (.05)	0.89 (.01)
Skilled	4.02 (.31)	2.19 (.03)	3.85 (.49)	1.60 (.05)	4.14 (.20)	1.43 (.02)	5.13 (.31)	2.12 (.04)	6.06 (.37)	2.77 (.05)	4.92 (.29)	1.79 (.03)
Female: $\lambda_F - \phi_F = 0$	**0.22**		**0.44**		**0.23**		**0.19**		**0.12**		**0.22**	
Skilled: $\lambda_S - \phi_S = 0$	**-1.83**		**-2.25**		**-2.71**		**-3.01**		**-3.29**		**-3.13**	
Log capital	0.11 (.00)		0.06 (.00)		0.06 (.00)		0.07 (.00)		0.08 (.00)		0.08 (.00)	
Log materials	0.50 (.00)		0.70 (.00)		0.74 (.00)		0.65 (.00)		0.64 (.00)		0.65 (.00)	
Log labor	0.36 (.01)		0.17 (.01)		0.15 (.00)		0.25 (.01)		0.25 (.01)		0.23 (.01)	
Log R & D expenditure	0.03 (.00)	0.04 (.00)	0.02 (.00)	0.02 (.00)	0.01 (.00)	0.03 (.00)	0.02 (.00)	0.03 (.00)	0.01 (.00)	0.03 (.00)	0.01 (.00)	0.03 (.00)
Vocational training (share)	0.04 (.01)	0.18 (.02)	0.05 (.02)	0.05 (.02)	0.00 (.01)	0.00 (.01)	0.03 (.01)	-0.02 (.02)	-0.00 (.00)	-0.03 (.03)	-0.00 (.00)	1.79 (.03)
R-squared	0.92	0.90	0.89	0.79	0.91	0.78	0.92	0.84	0.92	0.82	0.91	0.84
Correlation between equations	0.09		0.03		0.02		0.04		0.04		0.04	
N	13,310		12,325		66,994		20,262		21,647		29,205	

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). Bold letters indicate that the null-hypothesis of $\lambda_i - \phi_i = 0$ is rejected at the five percent level.

Table 5
Joint production function and wage equation estimates of model 2: Cobb-Douglas production function, ownership-based sub-samples

	SOE		COE		PRI		HKMT		FIE		Other	
	Log (Output) (1)	Log (Wage) (2)	Log (Output) (3)	Log (Wage) (4)	Log (Output) (5)	Log (Wage) (6)	Log (Output) (7)	Log (Wage) (8)	Log (Output) (9)	Log (Wage) (10)	Log (Output) (11)	Log (Wage) (12)
Female unskilled	0.66 (.13)	0.83 (.05)	0.33 (.08)	0.84 (.03)	0.55 (.04)	0.88 (.01)	0.68 (.06)	0.88 (.02)	0.91 (.09)	0.98 (.03)	0.51 (.07)	0.84 (.02)
Female skilled	1.61 (.53)	1.68 (.13)	3.64 (.84)	2.06 (.16)	4.11 (.35)	1.34 (.05)	3.70 (.43)	1.73 (.09)	5.00 (.55)	2.20 (.10)	5.05 (.57)	1.68 (.08)
Male skilled	5.75 (.72)	2.38 (.12)	2.70 (.64)	1.31 (.10)	3.72 (.30)	1.51 (.02)	5.98 (.60)	2.20 (.09)	7.93 (.09)	3.58 (.12)	5.00 (.50)	1.74 (.06)
Female unskilled: $\lambda_{FU} - \phi_{FU} = 0$	**0.18**		**0.51**		**0.33**		**0.21**		**0.07**		**0.32**	
Female skilled: $\lambda_{FS} - \phi_{FS} = 0$	**0.08**		**-1.59**		**-2.77**		**-1.98**		**-2.90**		**-3.36**	
Male skilled: $\lambda_{MS} - \phi_{MS} = 0$	**-3.38**		**-1.38**		**-2.21**		**-3.55**		**-4.35**		**-3.25**	
Log capital	0.12 (.00)		0.06 (.00)		0.06 (.00)		0.07 (.00)		0.08 (.00)		0.09 (.00)	
Log materials	0.49 (.00)		0.70 (.00)		0.73 (.00		0.65 (.00)		0.64 (.00)		0.64 (.00)	
Log labor	0.35 (.01)		0.18 (.01)		0.16 (.00)		0.25 (.00)		0.26 (.00)		0.22 (.00)	
Log R & D expenditure	0.03 (.00)	0.04 (.00)	0.01 (.00)	0.02 (.00)	0.01 (.00)	0.02 (.00)	0.02 (.00)	0.03 (.00)	0.01 (.00)	0.03 (.00)	0.01 (.00)	0.03 (.00)
Vocational training (share)	0.01 (.02)	0.17 (.02)	0.05 (.02)	0.07 (.02)	-0.00 (.01)	0.00 (.00)	0.01 (.01)	-0.05 (.02)	-0.00 (.01)	-0.04 (.02)	-0.00 (.00)	0.07 (.01)
R-squared	0.92	0.90	0.90	0.80	0.91	0.79	0.92	0.83	0.92	0.83	0.92	0.84
Correlation between equations	0.09		0.03		0.02		0.04		0.04		0.04	
N	11,606		7,991		45,313		17,277		18,909		23,198	

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). Bold letters indicate that the null-hypothesis of $\lambda_{ij} - \phi_{ij} = 0$ is rejected at the five percent level.

By comparing estimation results for firms located in the special economic zones (Table 6) with the baseline estimations of models 1 and 2 (Table 3), we next assess if the SEZ-located firms differ from the overall sample in terms of the estimated wage-productivity differentials. The first finding is that gender-earnings differentials are smaller in the SEZ firms than in the full sample. The parameter for the relative wages of women vis-à-vis men now takes the value 0.96, and is not statistically different from 1. This implies that the estimated gender-wage difference is effectively zero. This result is also found for the wages and total earnings of unskilled women relative to unskilled men (columns 6 and 8). Despite the smaller gender-wage differentials for these groups, the sizes of the positive wage subsidies that they receive remain fairly constant due to slight decreases in the estimated productivity differences. For skilled women, we find a quite different result. Female, and male, human capital both effect output to a larger extent in SEZ firms than in the total sample, but this increase is not fully matched by higher individual returns to education. As a result, the wage-productivity differentials for skilled workers of both genders are found to be substantially higher in the SEZs than in the full-sample estimation. To conclude, the empirical evidence presented here does not support the notion that increased competition facing the firm, by operating on the international market, reduces the discrepancy between the productivity contributions and earnings premiums of gender-skill demographic groups.

In a third attempt to test of Becker's hypothesis, sub-samples of small and large firms are used for estimation in order to investigate if smaller firms, with less market power, also display smaller wage-productivity gaps (in absolute terms). Comparing the upper and lower halves of Table 7 we find that the empirical results contradict this hypothesis. For all demographic groups investigated, with exception to skilled men, smaller firms display larger disparities between earnings and productivities than large ones.

Table 6
Joint production function and earnings equation estimates, firms located in special economic zones

Model 1 N = 11,536					Model 2 N = 9,281				
	Log (Output) (1)	Log (Wages) (2)	Log (Output) (3)	Log (Total Comp.) (4)		Log (Output) (5)	Log (Wages) (6)	Log (Output) (7)	Log (Total Comp.) (8)
Female	0.68 (.05)	0.96 (.02)	0.68 (.05)	0.95 (.02)	Female unskilled	0.73 (.09)	0.99 (.03)	0.73 (.10)	0.96 (.03)
Skilled	8.87 (.71)	2.50 (.06)	8.18 (.70)	2.69 (.07)	Female skilled	5.90 (.84)	2.26 (.15)	5.83 (.83)	2.42 (.15)
Female: $\lambda_F - \phi_F = 0$	**0.28**		**0.27**		Male skilled	5.90 (.84)	2.82 (.14)	8.37 (1.14)	2.93 (.14)
Skilled: $\lambda_S - \phi_S = 0$	**-5.77**		**-5.49**		Female unskilled: $\lambda_{FU} - \phi_{FU} = 0$	**0.25**		**0.23**	
					Female skilled: $\lambda_{FS} - \phi_{FS} = 0$	**-3.63**		**-3.41**	
					Male skilled: $\lambda_{MS} - \phi_{MS} = 0$	**-5.66**		**-5.44**	
Log capital	0.07 (.00)		0.07 (.00)			0.07 (.00)		0.07 (.00)	
Log materials	0.64 (.00)		0.66 (.00)			0.63 (.00)		0.63 (.00)	
Log labor	0.25 (.01)		0.25 (.01)			0.27 (.01)		0.27 (.01)	
Log R & D expenditure	0.02 (.00)	0.04 (.00)	0.02 (.00)	0.05 (.00)		0.01 (.00)	0.04 (.00)	0.01 (.00)	0.04 (.00)
Vocational training (share)	0.02 (0.02)	0.07 (.02)	0.02 (0.02)	0.10 (.02)		0.00 (.02)	0.04 (.03)	0.00 (.00)	0.08 (.03)
R-squared	0.92	0.85	0.92	0.85		0.92	0.85	0.92	0.85
Correlation between equations	0.04		0.04			0.04		0.04	

Notes: All equations include a constant term and dummy variables for industry (38 categories, textile = reference), size (five categories, < 51 employees = reference), ownership (six categories, private Chinese firms = reference), age (four categories, established earlier than 1994 = reference). Bold letters indicate that the null-hypothesis $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$ is rejected at the five percent level.

Table 7
Joint production function and earnings equation estimates,
Cobb-Douglas production function, firms with total employment above or below the sample median

High employment, above median (120) N = 81,799					High employment, above median (142) N = 61,980				
	Log (Output) (1)	Log (Wages) (2)	Log (Output) (3)	Log (Total Comp.) (4)		Log (Output) (5)	Log (Wages) (6)	Log (Output) (7)	Log (Total Comp.) (8)
Female	0.65 (.02)	0.88 (.01)	0.65 (.02)	0.88 (.01)	Female unskilled	0.68 (.03)	0.92 (.01)	0.67 (.03)	0.90 (.01)
Skilled	5.04 (.15)	2.21 (.02)	5.02 (.15)	2.34 (.03)	Female skilled	3.06 (.03)	1.68 (.06)	3.06 (.24)	1.81 (.06)
Female: $\lambda_F - \phi_F = 0$	**0.23**		**0.23**		Male skilled	3.06 (.24)	2.47 (.05)	5.54 (.29)	2.53 (.05)
Skilled: $\lambda_S - \phi_S = 0$	**-2.83**		**-2.68**		Female unskilled: $\lambda_{FU} - \phi_{FU} = 0$	**0.24**		**0.22**	
					Female skilled: $\lambda_{FS} - \phi_{FS} = 0$	**-1.38**		**-1.25**	
					Male skilled: $\lambda_{MS} - \phi_{MS} = 0$	**-3.08**		**-3.00**	
Low employment, below or equal to median (120) N= 81,944					Low employment, Below or equal to median (142) N = 62,312				
Female	0.66 (.04)	0.91 (.01)	0.66 (.04)	0.91 (.01)	Female unskilled	0.53 (.05)	0.87 (.01)	0.53 (.04)	0.85 (.01)
Skilled	5.60 (.32)	1.74 (.02)	5.44 (.31)	1.86 (.02)	Female skilled	4.34 (.35)	1.67 (.05)	4.28 (.34)	1.80 (.05)
Female: $\lambda_F - \phi_F = 0$	**0.25**		**0.25**		Male skilled	4.80 (.35)	1.85 (.03)	4.72 (.34)	1.92 (.04)
Skilled: $\lambda_S - \phi_S = 0$	**-3.86**		**-3.59**		Female unskilled: $\lambda_{FU} - \phi_{FU} = 0$	**0.34**		**0.33**	
					Female skilled: $\lambda_{FS} - \phi_{FS} = 0$	**-2.69**		**-2.48**	
					Male skilled: $\lambda_{MS} - \phi_{MS} = 0$	**-2.95**		**-2.80**	

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), ownership (six categories, private Chinese firms = reference), age (four categories, established earlier than 1994 = reference). Bold letters indicate that the null-hypothesis $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$ is rejected at the five percent level.

5.1 Robustness checks

The following section presents the numerous robustness checks carried out to assess the sensitivity of the results presented above. First, we investigate the stability of production function estimates by replacing the C-D specification with Value-Added[15] and Translog versions. Results for the restricted and unrestricted models are placed in Tables B3 and B4 respectively. They show that the general results presented above are robust to the different production function specifications. The wage-productivity gap continues to be positive for women in model 1, and for unskilled women in model 2, while skilled women in model 2 have wages that fall short of their productivity contributions. The size of the estimated gaps however differ between the specifications, a result which stems from the fact that the relative productivity parameters are higher in the Translog model, and lower when Value Added is used as the dependent variable, compared to the C-D specification.

The observation that women are less productive than men is consistent with the notion that women are biologically disadvantaged in jobs that require more physical strength. Such jobs are however not likely to represent a large share of the data. Another explanation could lie in omitted productivity-effects of worker characteristics such as experience and tenure. These factors are likely to co-vary systematically with gender; in particular as Chinese women are required by law to retire five years earlier than men. In addition, and as noted above, the use of cross-sectional data in this paper does not allow us to distinguish whether the lower productivity of females stem from their lower work performance within firms, or from a gender-productivity variation across firms resulting from women being compelled to self-select into joining less productive firms. The latter could be true if women join more labor-intensive firms, where the marginal product of labor is smaller due to the low capital-to-labor ratio. This hypothesis is tested by dividing the full samples according to the ratio of capital-to-labor-ratio of firms. If the hypothesis is true, the female productivity parameter should rise when this firm-characteristic is controlled for. Parameter estimates placed in Table B5 however provide the opposite result. The estimated relative productivity of women-to-men (column 1), and that of unskilled women to unskilled men (column 3), are only slightly

[15] As discussed by Griliches and Ringstad (1971), the value added specification of the production function also improves comparability of data across industries and across establishments within industries. Moreover, it allows greater comparability when industries or establishments differ in the degree of vertical integration and it can be derived from quite polar production function specifications: one in which thee 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).

altered by the sample division. In the case of skilled women, the parameter even falls in the below-median sample (column 3, row 8).

Table B6 examines two issues. Firstly, whether discrimination is more severe in plants where women make up a larger share of the labor force, and secondly whether the share of women is correlated with technological change which affects productivity and conserves on male labor. The data is divided into firms with above- and below-median percentages of women in the workforce. If wage discrimination worsens when the share of women in the firms' labor force becomes larger, we should see that the estimated productivity gap in the sub-sample with a lower share of women should display a smaller wage-productivity gap than the sub-sample with a higher share of females. The findings reported in Table B6 provide some support of this prediction. Women are treated more favorably in plants with a low share of female workers. The estimated positive wage premium received is larger than in the sub-sample of firms with a high share of females (38 % compared to 19 %). Examining the situations of unskilled and skilled women separately, both groups benefit in firms with fewer women, unskilled women by gaining a larger positive wage-productivity gap, and skilled women by receiving a smaller negative gap. For the second hypothesis investigated, our primary interest is in the relative productivity parameters of the two sub-samples. A positive correlation between the share of women and technological change that saves on (male) production workers would produce an upward bias on the full sample estimations of the female productivity parameter. Under that circumstance, dividing the sample to control for the share of females should cause the relative productivity parameters of women relative to men to fall. Comparing the estimation results presented in Table B6 with those in the baseline models in Table 3, we note that this is not the case. The female productivity parameter of model 1 is hardly affected by the disaggregation. In the case of unskilled female workers, the relative productivity vis-à-vis unskilled males rises in the sub-sample with a high share of females, but falls in the sub-sample with a low share.

The findings presented above suggest that enterprise-provided welfare does not significantly impact on the gender-distribution of firm earnings. To test the robustness of this result, and to separate the potential effects of program coverage from those of benefit size, we drop all firms that do not participate in all three social insurance programs. For the remaining firms, welfare costs amount to 37 %, and 38 % compared to total wage costs for sample 1 and sample 2 respectively. Reporting results from simultaneously estimating earnings and

production equations for these firms, Table B7 does not provide evidence that the size of welfare payments made by firms in the reduced sample affect the gender-division of worker earnings. Comparing the relative female earnings parameters from the wage equations, columns 2 and 6, with the total earnings equations, columns 4 and 8, we see that the relative earnings parameters are unaffected by the inclusion of social insurance benefits provided to employees in the dependent variable.

In an attempt to correct for measurement error in the labor inputs of different gender-skill groups of employees; individual survey data is used to create weights for the labor variables to reflect differences in work hours between the demographic groups. Data is obtained from the China Household Income Data (CHIP) project, and was collected by the CASS in 2002. 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 days worked in a month and the number of months worked in a year. Labor input weights are then created by normalizing the work-week measure with respect to the same demographic groups that are used in the empirical analysis of model 1 and 2, namely male and skilled workers in the restricted model, and unskilled male workers in the unrestricted model[5]. As the CHIP data contains unambiguous ownership information on SOEs, COEs, Private firms, and Foreign-owned firms, this robustness check is performed using NBS firm-level data for those ownership sectors only.

Presented in Table B8, the calculated labor input weights 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 (see e.g. Wang, 2004). As seen in Tables B9 and B10, multiplying the labor inputs with these weights and performing the joint production function and earnings equation estimations however has little impact on the general conclusions of this paper. The estimated relative wage and productivity parameters for women in model 1, and for unskilled females in model 2, are unaffected by the adjustment of the labor input variable. Conversely to this lack of alterations following the adjustments, the results for skilled females suggest that previous assessments of the wage-productivity differential for this demographic group may be under-estimated. When controlling for the shorter work-weeks of this group, their relative productivity compared to unskilled men rises (compare columns 2 and 5, Table B10) and causes wages to fall further

behind productivity. This fall of 36 percentage points is larger than the corresponding result of controlling for the shorter work-weeks of skilled men, which amounts to 17 percentage points.

Previous research suggests that industrial segregation by gender is an important factor in gender-wage inequality (Maurer-Fazio et al., 1999; Hughes and Maurer-Fazio, 2002; Fan 2003). Inspecting Table A5 in Appendix, we indeed find a considerable variation in the share of women employed in the 39 industrial sectors covered by the dataset. By removing the industrial dummies from the estimated production and wage equation and comparing the estimated parameters to baseline estimates in Table 3, we can examining the role of this industrial gender-segregation in our gender-skill measures of relative wages and productivities. If women are crowded into low-paying industries, the female-to-male wage differential λ_F should fall when the dummies are removed. Results (not reported) do however not provide evidence of any substantive parameter changes following the removal of the dummy-variables.

6. Conclusions

This paper has used Chinese firm-level data for the industrial sector to jointly estimate earnings equations and production functions with the purpose of investigating whether workers with different gender and qualifications face discriminatory behavior in the hands of employers. To achieve this goal, the paper has compared the wages and welfare benefits that unskilled and skilled men and women receive with the productivity they generate to assess whether worker earnings match their productivities. Regarding the discrepancies between earnings and productivities, interpreted as discrimination, the key question has been to evaluate whether these are smaller in firms that face more competition on the product and labor markets.

For women, the empirical results in this paper suggest that they are positively discriminated in the sense that that they receive wages that exceeds their productivity. Examining unskilled and skilled women separately yields the finding that only unskilled female workers are

favored[16]. In contrast, skilled female employees earn less than their contributions to productivity, which means that they are negatively discriminated. This result is similar for male skilled workers. As such, the findings could imply that industrial employees are under-incentivized regarding the acquisition of new skills. Adding firm's expenditures on providing social insurance coverage for workers to the earnings measure does not alter the general results presented in this paragraph. We can thus conclude that enterprise-provided welfare does not contribute to gender polarization of earnings within the Chinese industrial sector.

As argued by Becker (1971), competition in labor and product markets makes discrimination more costly for firms, and should therefore reduce discriminatory wage-setting practices. This paper used three ways of testing whether competition is positively related to decreased disparities between the productivities and earnings of gender-skill groups in China. It is found that the gap between earnings and productivities of women relative to men are larger in SOEs and COEs than in HKMT and FIEs. This result provides support for Becker's hypothesis if we believe that State- and Collectively-owned firms face less competition than HKMT and foreign-invested ones. Further investigations of Becker's hypothesis however yields the result that firms located in China's special economic zones, where they are assumed to face more than average competition, under-compensate both skilled men and women to a larger extent than the average industrial firm. In a third examination of the competition-discrimination link, disaggregating the full samples used according to the size of the workforce in firms suggests that earning-productivity gaps are larger in small firms than in large ones. This result contradicts Becker's argument since smaller firms can be expected to have less market power and face more competition than large ones. In conclusion, the accumulated empirical evidence regarding the effect of competition on earnings discrimination in Chinese industrial firms is mixed.

Finally, it should be noted that the results presented in this paper are only one piece of the puzzle that is the aggregate picture of the socioeconomic situation of female industrial workers. For example, an assessment of discrimination in wages and benefits do not capture the, arguably, growing gender stratification of job security, in particular in the private and foreign-invested sectors of the economy (Razavi, 2007).

[16] This result is in line with the argument put forth by Dong and Zhang (2009), namely that socialist ideology may have suppressed human capital characteristics as a basis for work compensation and created lingering wage subsidies for females working in the industrial sector.

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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) In the Statistical yearbook, a proportion of the statistic reported is also added to the "State" category, this corresponds to the share of the sum of state capital to the sum of total paid-in capital minus individual capital. I count the individual firm as State-owned if the state's share in total capital is greater than 50% within the firm.
(3) Counted as "State" in the Statistical Yearbook if they 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 are identified and moved from the "Other" to the "State" category.

Table A3
Summary statistics, sample 2

Variables	All firms	SOE	COE	PRI	HKMT	FIE	Other
No. of firms	124,292	11,606	7,991	45,313	17,277	18,909	23,198
Log output	10.46	10.40	10.20	10.18	10.63	10.86	10.69
Log value added	9.21	9.41	8.91	8.84	9.37	9.71	9.41
Log capital	8.77	9.85	8.25	8.22	8.88	9.16	9.10
Log materials	9.85	9.44	9.60	9.65	10.05	10.22	10.05
Log wages	7.65	8.20	7.28	7.18	8.02	8.11	7.76
Log wages and benefits	7.77	8.46	7.42	7.26	8.11	8.24	7.90
Employment	373.3	1004.8	240.5	187.1	408.7	397.0	421.0
Female unskilled employees	136.8 (36.6)	226.0 (22.5)	95.7 (39.8)	75.2 (40.2)	202.6 (49.6)	184.7 (46.5)	138.8 (33.0)
Female skilled employees	18.9 (5.1)	67.1 (6.7)	8.2 (3.4)	6.7 (3.6)	15.5 (3.8)	21.0 (5.3)	23.2 (5.5)
Male unskilled employees	180.5 (48.3)	556.5 (55.4)	122.0 (50.7)	93.0 (49.7)	167.1 (40.9)	158.1 (39.8)	211.9 (50.3)
Male skilled employees	37.0 (9.9)	155.2 (15.4)	14.5 (6.0)	12.2 (6.5)	23.5 (5.7)	33.2 (8.4)	47.2 (11.2)
Log R & D expenditure	0.80	1.30	0.40	0.57	0.58	0.84	1.28
Share of employees with vocational training	0.18	0.37	0.16	0.16	0.11	0.13	0.23
Establishment size							
8-50	0.15	0.13	0.19	0.20	0.09	0.12	0.12
51-100	0.22	0.15	0.25	0.28	0.18	0.19	0.21
101-500	0.48	0.43	0.47	0.46	0.53	0.51	0.49
501-1000	0.08	0.13	0.06	0.05	0.12	0.11	0.10
1001-	0.06	0.16	0.03	0.02	0.08	0.08	0.08
Firm age							
< 3 years	0.25	0.07	0.07	0.32	0.23	0.26	0.25
4-7 years	0.25	0.10	0.11	0.32	0.24	0.26	0.27
8-12 years	0.25	0.14	0.25	0.24	0.28	0.32	0.24
> 12 years	0.25	0.70	0.58	0.13	0.25	0.16	0.24
FIE and HKMT asset share	0.23	0.01	0.01	0.01	0.78	0.75	0.01
State asset share	0.08	0.81	0.02	0.00	0.01	0.01	0.02

Notes: Output value, value added, capital, materials, wages, benefits, and R & D expenditures are measured in thousands of Yuan.

Table A4
Coverage and economic importance of social insurance programs, sample 2

	All benefit items	Pensions and health insurance	Housing funds	Labor and unemployment insurance
Share of participating firms (expenditure > 0)				
All firms	0.21	0.73	0.24	0.52
SOE	0.52	0.83	0.60	0.74
COE	0.17	0.68	0.20	0.45
PRI	0.08	0.63	0.10	0.37
HKMT	0.15	0.83	0.16	0.60
FIE	0.33	0.81	0.37	0.64
Other	0.25	0.74	0.29	0.56
Ratio of insurance payments to total wage costs in participating firms				
All firms	0.37	0.14	0.10	0.05
SOE	0.44	0.24	0.10	0.09
COE	0.44	0.18	0.09	0.06
PRI	0.41	0.12	0.11	0.06
HKMT	0.29	0.10	0.08	0.03
FIE	0.29	0.14	0.08	0.03
Other	0.37	0.17	0.11	0.06

Table A5
Number of firms and share of female employees by industry

Industry	No. of firms Sample 1	No. of firms Sample 2	Share of female employees (sample 1)
Extraction of Petroleum and Natural Gas	117	95	0.19
Mfg. of Apparel, Footwear and Caps	7,376	6,03	0.71
Mfg. of Articles for culture, education and Sports	2,27	1,844	0.58
Mfg. of Artwork and Other Manufacturing	196	148	0.29
Mfg. of Beverages	1,953	1,585	0.42
Mfg. of Chemical Fiber	786	590	0.46
Mfg. of Comm. Equip., Computers, and Electronic Equipment	2,679	2,276	0.44
Mfg. of Electrical Machinery and Equipment	6,605	5,812	0.53
Mfg. of Foods	3,332	2,771	0.50
Mfg. of Furniture	1,913	1,535	0.34
Mfg. of General Purpose Machinery	12,356	8,797	0.28
Mfg. of Articles for culture, education and Sports	3,145	2,514	0.57
Mfg. of Leather, Fur, Feather and Related Products	3,775	2,966	0.59
Mfg. of Medicines	3,112	2,805	0.47
Mfg. of Metal Products	8,577	6,236	0.33
Mfg. of Non-metallic Mineral Products	11,354	7,779	0.30
Mfg. of Paper and Paper Pdoducts	4,158	3,015	0.39
Mfg. of Plastics	7,373	5,587	0.45
Mfg. of Rubber	1,879	1,417	0.44
Mfg. of Special Purpose Machinery	6,478	4,993	0.28
Mfg. of Tobacco	118	111	0.39
Mfg. of Transport Equipment	7,599	6,041	0.32
Mfg. of Weapons and Ammunition	10,557	8,458	0.43
Mfg. of raw Chemical Mat'ls and Chem. Products	11,797	8,5	0.30
Mining and Processing of Ferrous Metal Ores	790	407	0.14
Mining and Processing of Non-Ferrous Metal Ores	735	431	0.19
Mining and Processing of Non-metal Ores	964	530	0.19
Mining and Washing of Coal	2,18	1,074	0.12
Mining and Processing of Other Ores	7	3	0.15
Printing, Reproduction and Recording Media	3,206	2,629	0.46
Food Processing	7,391	5,35	0.39
Processing of Petroleum and Nuclear Fuel	1,125	850	0.25
Processing of Timber, Mfg. of Wood, etc. Products	2,521	1,706	0.43
Production and Distrib. Of Water	1,827	1,686	0.40
Production and Distrib. of Electric Power and Heat Power	3,533	3,181	0.28
Production and Distrib. of Gas	322	292	0.33
Smelting and Pressing of Ferrous Metals	3,646	2,387	0.20
Smelting and Pressing of Non-ferrous Metals	2,912	2,024	0.26
Textile Industry	13,079	9,837	0.64
Total no. of firms	163,743	124,292	

Table A6
Number of firms and share of female employees by geographical region

Geographical region	No. of firms Sample 1	No. of firms Sample 2	Share of female employees (sample 1)
Anhui	3,164	2,228	0.39
Beijing	4,058	3,344	0.35
Chongqing	1,913	1,567	0.35
Fujian	8,295	6,324	0.47
Gansu	893	699	0.30
Guangdong	24,514	19,753	0.44
Guanxi AR	2,167	1,742	0.37
Guizhou	1,304	986	0.29
Hainan	380	285	0.38
Hebei	5,117	3,642	0.33
Heilongjiang	1,707	1,408	0.34
Henan	112	110	0.36
Hubei	3,663	2,638	0.39
Hunan	4,637	3,092	0.34
Inner Mongolia AR	1,551	1,201	0.31
Jiangsu	23,894	17,552	0.45
Jiangxi	2,423	1,71	0.41
Jilin	1,67	1,369	0.34
Liaoning	6,695	5,231	0.35
Ningxia AR	394	346	0.32
Qinghai	174	142	0.32
Shaanxi	1,758	1,365	0.33
Shandong	15,387	11,405	0.41
Shanghai	10,56	8,381	0.42
Shanxi	2,245	1,467	0.24
Sishuan	4,649	3,625	0.33
Tianjin	2,929	2,268	0.39
Tibet AR	71	55	0.27
Xinjiang AR	913	804	0.34
Yunnan	1,419	1,161	0.32
Zhejiang	25,087	18,392	0.43
Total no. of firms	163,743	124,292	

Appendix B: Extended analysis and robustness checks

Table B1
Joint production function and total earnings equation estimates of model 1:
Cobb-Douglas production function, ownership-based sub-samples

	SOE		COE		PRI		HKMT		FIE		Other	
	Log (Output) (1)	Log (Total Comp.) (2)	Log (Output) (3)	Log (Total Comp.) (4)	Log (Output) (5)	Log (Total Comp.) (6)	Log (Output) (7)	Log (Total Comp.) (8)	Log (Output) (9)	Log (Total Comp.) (10)	Log (Total Comp.) (11)	Log (Total Comp.) (12)
Female	0.62 (.07)	0.86 (.03)	0.49 (.07)	0.99 (.03)	0.67 (.03)	0.89 (.01)	0.68 (.04)	0.87 (.01)	0.75 (.04)	0.87 (.02)	0.68 (.04)	0.90 (.02)
Skilled	4.06 (.32)	2.27 (.06)	3.81 (.49)	1.74 (.06)	4.08 (.20)	1.50 (.02)	5.08 (.30)	2.27 (.05)	6.00 (.37)	3.02 (.06)	4.91 (.30)	1.85 (.03)
Female: $\lambda_F - \phi_F = 0$	**0.24**		**0.50**		**0.23**		**0.18**		**0.12**		**0.22**	
Skilled: $\lambda_S - \phi_S = 0$	**-1.79**		**-2.07**		**-2.58**		**-2.81**		**-2.98**		**-3.05**	
Log capital	0.11 (.00)		0.06 (.00)		0.06 (.00)		0.07 (.00)		0.08 (.00)		0.05 (.00)	
Log materials	0.50 (.00)		0.70 (.00)		0.74 (.00)		0.65 (.00)		0.64 (.00)		0.65 (.00)	
Log labor	0.35 (.01)		0.16 (.01)		0.15 (.00)		0.25 (.01)		0.26 (.01)		0.23 (.01)	
Log R & D expenditure	0.03 (.00)	0.04 (.00)	0.02 (.00)	0.03 (.00)	0.01 (.00)	0.03 (.00)	0.01 (.00)	0.03 (.00)	0.01 (.00)	0.03 (.00)	0.02 (.00)	0.04 (.00)
Vocational training (share)	0.04 (.02)	0.21 (.02)	0.05 (.01)	0.08 (.02)	0.00 (.01)	0.02 (.01)	0.03 (.01)	-0.00 (.00)	-0.00 (.01)	-0.00 (.01)	0.00 (.01)	0.12 (.01)
R-squared	0.92	0.89	0.89	0.78	0.91	0.77	0.92	0.83	0.92	0.82	0.91	0.83
Correlation between equations	0.09		0.03		0.03		0.04		0.05		0.04	
N	13,310		12,325		66,994		20,262		21,647		29,205	

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). Bold letters indicate that the null-hypothesis of $\lambda_i - \phi_i = 0$ is rejected at the five percent level.

Table B2
Joint production function and total earnings equation estimates of model 2:
Cobb-Douglas production function, ownership-based sub-samples

	SOE		COE		PRI		HKMT		FIE		Other	
	Log (Output) (1)	Log (Total Comp.) (2)	Log (Output) (3)	Log (Total Comp.) (4)	Log (Output) (5)	Log (Total Comp.) (6)	Log (Output) (7)	Log (Total Comp.) (8)	Log (Output) (9)	Log (Total Comp.) (10)	Log (Output) (11)	Log (Total Comp.) (12)
Female unskilled	0.66 (.14)	0.84 (.05)	0.33 (.08)	0.87 (.04)	0.55 (.04)	0.86 (.01)	0.67 (.06)	0.88 (.02)	0.90 (.08)	1.00 (.03)	0.60 (.08)	0.83 (.02)
Female skilled	1.61 (.55)	1.78 (.14)	3.64 (.85)	2.46 (.18)	4.08 (.35)	1.47 (.05)	3.68 (.43)	1.78 (.10)	4.90 (.53)	2.22 (.11)	5.02 (.58)	1.77 (.09)
Male skilled	5.84 (.75)	2.33 (.12)	2.65 (.64)	1.25 (.11)	3.70 (.30)	1.52 (.04)	5.92 (.57)	2.58 (.10)	7.84 (.77)	3.95 (.14)	5.01 (.50)	1.67 (.06)
Female unskilled: $\lambda_{FU} - \phi_{FU} = 0$	0.18		**0.53**		**0.31**		**0.21**		0.10		**0.31**	
Female skilled: $\lambda_{FS} - \phi_{FS} = 0$	0.18		**-1.17**		**-2.61**		**-1.90**		**-2.69**		**-3.25**	
Male skilled: $\lambda_{MS} - \phi_{MS} = 0$	**-3.51**		**-1.42**		**-2.17**		**-3.34**		**-3.87**		**-3.35**	
Log capital	0.12 (.00)		0.06 (.00)		0.06 (.00)		0.07 (.00)		0.08 (.00)		0.09 (.00)	
Log materials	0.50 (.00)		0.70 (.00)		0.73 (.00)		0.65 (.00)		0.63 (.00)		0.64 (.00)	
Log labor	0.39 (.01)		0.18 (.00)		0.17 (.00)		0.25 (.00)		0.26 (.00)		0.22 (.00)	
Log R & D expenditure	0.03 (.00)	0.05 (.00)	0.01 (.00)	0.03 (.00)	0.01 (.00)	0.03 (.00)	0.01 (.00)	0.03 (.00)	0.01 (.00)	0.03 (.00)	0.16 (.00)	0.04 (.00)
Vocational training (share)	0.01 (.01)	0.23 (.02)	0.05 (.02)	0.11 (.03)	-0.00 (.01)	0.02 (.01)	0.02 (.01)	-0.02 (.01)	-0.00 (.01)	-0.01 (.01)	-0.01 (.01)	0.13 (.01)
R-squared	0.92	0.89	0.90	0.78	0.91	0.78	0.92	0.83	0.92	0.82	0.92	0.84
Correlation between equations	0.08		0.03		0.03		0.04		0.05		0.04	
N	11,606		7,991		45,313		17,277		18,909		23,198	

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). Bold letters indicate that the null-hypothesis of $\lambda_{ij} - \phi_{ij} = 0$ is rejected at the five percent level.

Table B3
Joint estimation of production function and earnings equations of model 1: Value-Added and Translog production functions, full sample

	Log (Ouput) (1)	Log (Wage) (2)	Log (Ouput) (3)	Log (Total Comp.) (4)	Log (Value Added) (5)	Log (Wage) (6)	Log (Value Added) (7)	Log (Total Comp.) (8)
Female	0.72 (.02)	0.88 (.01)	0.72 (.00)	0.89 (.01)	0.60 (.01)	0.88 (.01)	0.60 (.01)	0.88 (.01)
Skilled	5.06 (.10)	1.96 (.01)	5.07 (.10)	2.08 (.01)	4.43 (.09)	1.94 (.01)	4.39 (.09)	2.06 (.01)
Female: $\lambda_F - \phi_F = 0$	**0.16**		**0.16**		**0.27**		**0.28**	
Skilled: $\lambda_S - \phi_S = 0$	**-3.10**		**-2.99**		**-2.49**		**-2.33**	
Log capital	0.13 (.00)		0.13 (.00)		0.22 (.00)		0.22 (.00)	
Log capital * log capital	0.02 (.00)		0.02 (.00)					
Log capital * log material	-0.04 (.00)		-0.04 (.00)					
Log capital * log labor quality	.01 (.00)		0.01 (.00)					
Log materials	0.20 (.00)		0.19 (.00)					
Log materials * log materials	0.72 (.00)		0.07 (.00)					
Log materials * log labor quality	-0.10 (.00)		-0.10 (.00)					
Log labor quality	0.60 (.01)		0.58 (.01)		0.65 (.01)		0.65 (.01)	
Log labor quality * log labor quality	0.04 (.00)		0.04 (.00)					
Log R & D expenditure	0.01 (.00)	0.03 (.00)	0.01 (.00)	0.04 (.00)	0.05 (.00)	0.03 (.00)	0.05 (.00)	0.04 (.00)
Vocational training (share)	0.00 (.00)	0.03 (.01)	0.00 (.00)	0.06 (.01)	-0.03 (.01)	0.03 (.00)	-0.03 (.01)	0.07 (.01)
R-squared	0.94	0.84	0.94	0.83	0.56	0.84	0.53	0.83
Correlation between equations	0.03		0.03		0.13		0.14	

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), ownership (six categories, private Chinese firms = reference), age (four categories, established earlier than 1994 = reference). Bold letters indicate that the null-hypothesis $\lambda_i - \phi_i = 0$ is rejected at the five percent level.

Table B4
Joint estimation of production function and earnings equations of model 2: Value-Added and Translog production functions, full sample

	Log (Ouput) (1)	Log (Wage) (2)	Log (Ouput) (3)	Log (Total Comp.) (4)	Log (Value Added) (5)	Log (Wage) (6)	Log (Value Added) (7)	Log (Total Comp.) (8)
Female unskilled	0.80 (.03)	0.88 (.01)	0.80 (.03)	0.86 (.01)	0.54 (.02)	0.87 (.01)	0.54 (.02)	0.86 (.01)
Female skilled	3.32 (.17)	1.68 (.04)	3.33 (.17)	1.81 (.04)	3.85 (.16)	1.75 (.04)	3.81 (.16)	01.88 (.04)
Male skilled	5.73 (.21)	2.09 (.03)	5.79 (.21)	2.12 (.03)	4.75 (.16)	2.07 (.03)	4.72 (.16)	2.10 (.03)
Female unskilled: $\lambda_{FU} - \phi_{FU} = 0$	**0.09**		**0.07**		**0.33**		**0.31**	
Female skilled: $\lambda_{FS} - \phi_{FS} = 0$	**-1.64**		**-1.52**		**-2.10**		**-1.93**	
Male skilled: $\lambda_{MS} - \phi_{MS} = 0$	**-3.65**		**-3.64**		**-2.68**		**-2.62**	
Log capital	0.12 (.00)		0.13 (.00)		0.22 (.00)		0.22 (.00)	
Log capital * log capital	0.02 (.00)		0.02 (.00)					
Log capital * log material	-0.04 (.00)		-0.04 (.00)					
Log capital * log labor quality	0.02 (.00)		0.01 (.00)					
Log materials	0.19 (.01)		0.19 (.01)					
Log materials * log materials	0.07 (.00)		0.07 (.00)					
Log materials * log labor quality	-0.10 (.00)		-0.10 (.00)					
Log labor quality	0.60 (.01)		0.60 (.01)		0.66 (.00)		0.66 (.00)	
Log labor quality * log labor quality	0.04 (.00)		0.04 (.00)					
Log R & D expenditure	0.01 (.00)	0.03 (.00)	0.01 (.00)	0.04 (.00)	0.04 (.01)	0.03 (.00)	0.04 (.00)	0.04 (.00)
Vocational training (share)	-0.00 (.00)	0.03 (.01)	0.01 (.00)	0.06 (.01)	-0.05 (.01)	0.03 (.01)	-0.04 (0.01)	0.07 (.01)
R-squared	0.94	0.85	0.94	0.84	0.58	0.85	0.58	0.84
Correlation between equations	0.03		0.03		0.13		0.13	

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), ownership (six categories, private Chinese firms = reference), age (four categories, established earlier than 1994 = reference). Bold letters indicate that the null-hypothesis $\lambda_{ij} - \phi_{ij} = 0$ is rejected at the five percent level.

Table B5
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 median (1.76) N = 81,872			High capital-to-labor ratio, above median (1.74) N = 62,146		
	Log (Output) (1)	Log (Wages) (2)		Log (Output) (3)	Log (Wages) (4)
Female	0.68 (.04)	0.90 (.01)	Female unskilled	0.57 (.06)	0.91 (.02)
Skilled	5.39 (.24)	1.89 (.02)	Female skilled	4.61 (.43)	1.69 (.05)
Female: $\lambda_F - \phi_F = 0$	**0.23**		Male skilled	5.47 (.44)	2.05 (.04)
Skilled: $\lambda_S - \phi_S = 0$	**-3.50**		Female unskilled: $\lambda_{FU} - \phi_{FU} = 0$	**0.34**	
			Female skilled: $\lambda_{FS} - \phi_{FS} = 0$	**-2.92**	
			Male skilled: $\lambda_{MS} - \phi_{MS} = 0$	**-3.42**	
Low capital-to-labor ratio, below or equal to median (1.76) N = 81,871			Low capital-to-labor ratio, below or equal to median (1.74) N = 62,146		
Female	0.69 (.02)	0.92 (.01)	Female unskilled	0.64 (.03)	0.92 (.01)
Skilled	4.02 (.12)	1.71 (.02)	Female skilled	3.06 (.21)	1.46 (.05)
Female: $\lambda_F - \phi_F = 0$	**0.23**		Male skilled	4.17 (.22)	1.78 (-04)
Skilled: $\lambda_S - \phi_S = 0$	**-2.30**		Female unskilled: $\lambda_{FU} - \phi_{FU} = 0$	**0.28**	
			Female skilled: $\lambda_{FS} - \phi_{FS} = 0$	**-1.59**	
			Male skilled: $\lambda_{MS} - \phi_{MS} = 0$	**-2.40**	

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), ownership (six categories, private Chinese firms = reference), age (four categories, established earlier than 1994 = reference). Bold letters indicate that the null-hypothesis $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$ is rejected at the five percent level.

Table B6
Joint production function and earnings equation estimates,
Cobb-Douglas production function, firm sub-samples based on the median share of female employees

High percent female, above median (0.37) N = 81,872			High percent female, above median (0.39) N = 62,079		
	Log (Output) (1)	Log (Wages) (2)		Log (Output) (5)	Log (Wages) (6)
Female	0.68 (.03)	0.87 (.01)	Female unskilled	0.74 (.05)	0.91 (.02)
Skilled	4.88 (.17)	1.90 (.02)	Female skilled	3.25 (.23)	1.40 (.04)
				5.59	2.37
Female: $\lambda_F - \phi_F = 0$	**0.19**		Male skilled	(.45)	(.07)
Skilled: $\lambda_S - \phi_S = 0$	**-2.98**		Female unskilled: $\lambda_{FU} - \phi_{FU} = 0$	**0.17**	
			Female skilled: $\lambda_{FS} - \phi_{FS} = 0$	**-1.85**	
			Male skilled: $\lambda_{MS} - \phi_{MS} = 0$	**-3.22**	
Low percent female, below or equal to median (0.37) N = 81,871			Low percent female, below or equal to median (0.39) N = 62,213		
Female	0.63 (.06)	1.02 (.02)	Female unskilled	0.37 (.10)	0.83 (.03)
Skilled	4.46 (.17)	1.91 (.02)	Female skilled	4.20 (.43)	2.63 (.08)
				4.28	1.71
Female: $\lambda_F - \phi_F = 0$	**0.38**		Male skilled	(.25)	(.04)
Skilled: $\lambda_S - \phi_S = 0$	**-2.55**		Female unskilled: $\lambda_{FU} - \phi_{FU} = 0$	**0.46**	
			Female skilled: $\lambda_{FS} - \phi_{FS} = 0$	**-1.57**	
			Male skilled: $\lambda_{MS} - \phi_{MS} = 0$	**-2.56**	

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), ownership (six categories, private Chinese firms = reference), age (four categories, established earlier than 1994 = reference). Bold letters indicate that the null-hypothesis $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$ is rejected at the five percent level.

Table B7
Joint production function and earnings equation estimates,
Cobb-Douglas production function, firms with non-zero expenditures on all three social insurance items

Model 1 N = 29,473					Model 2 N = 26,101				
	Log (Ouput) (1)	Log (Wage) (2)	Log (Ouput) (3)	Log (Total Comp.) (4)		Log (Ouput) (5)	Log (Wage) (6)	Log (Ouput) (7)	Log (Total Comp.) (8)
Female	0.69 (.04)	0.86 (.02)	0.69 (.04)	0.87 (.02)	Female unskilled	0.68 (.07)	0.87 (.02)	0.68 (.07)	0.86 (.02)
Skilled	4.92 (.28)	2.31 (.04)	4.86 (.28)	2.31 (.04)	Female skilled	3.61 (.41)	1.98 (.08)	0.57 (.40)	2.08 (.08)
Female: $\lambda_F - \phi_F = 0$	**0.17**		**0.18**		Male skilled	5.89 (.50)	2.41 (.07)	5.81 (.49)	2.34 (.07)
Skilled: $\lambda_S - \phi_S = 0$	**-2.61**		**-2.55**		Female unskilled: $\lambda_{FU} - \phi_{FU} = 0$	**0.19**		**0.18**	
					Female skilled: $\lambda_{FS} - \phi_{FS} = 0$	**-1.62**		**-1.49**	
					Male skilled: $\lambda_{MS} - \phi_{MS} = 0$	**-3.48**		**-3.47**	
Log capital	0.11 (.00)		0.11 (.00)			0.11 (.00)		0.11 (.00)	
Log materials	0.56 (.00)		0.56 (.00)			0.56 (.00)		0.56 (.00)	
Log labor	0.31 (.01)		0.31 (.01)			0.28 (.00)		0.29 (.00)	
Log R & D expenditure	0.01 (.00)	0.02 (.00)	0.01 (.00)	0.02 (.00)		0.01 (.00)	0.02 (.00)	0.01 (.00)	0.02 (.00)
Vocational training (share)	-0.01 (.01)	0.09 (.01)	-0.02 (.01)	0.14 (.01)		-0.02 (.01)	0.09 (.01)	-0.02 (.01)	0.14 (.01)
R-squared	0.92	0.87	0.92	0.87		0.92	0.87	0.92	0.87
Correlation between equations	0.05		0.06			0.05		0.05	

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), ownership (six categories, private Chinese firms = reference), age (four categories, established earlier than 1994 = reference). Bold letters indicate that the null-hypothesis $\lambda_i - \phi_i = 0$ or $\lambda_{ij} - \phi_{ij} = 0$ is rejected at the five percent level.

Table B8
Labor input weights for gender-skill groups

Ownership sector	Model 1	Labor input weight	Model 2	Labor input Weight
SOE	Male unskilled	1,000	Male	1,000
	Female unskilled	0,959	Female	0,958
	Female skilled	0,945	Unskilled	1,000
	Males skilled	0,992	Skillled	0,860
COE	Male unskilled	1,000	Male	1,000
	Female unskilled	0,951	Female	0,943
	Female skilled	0,861	Unskilled	1,000
	Males skilled	0,999	Skillled	0,962
PRI	Male unskilled	1,000	Male	1,000
	Female unskilled	0,955	Female	0,932
	Female skilled	0,738	Unskilled	1,000
	Males skilled	0,918	Skillled	0,860
FIE	Male unskilled	1,000	Male	1,000
	Female unskilled	1,103	Female	1,068
	Female skilled	0,964	Unskilled	1,000
	Males skilled	0,945	Skillled	0,918

Table B9
Joint production function and earnings equation estimates of model 1, Cobb-Douglas production function, gender-skill weighted labor inputs

	Comparative sample				With labor input weights			
	Log (Ouput) (1)	Log (Wage) (2)	Log (Ouput) (3)	Log (Total Comp.) (4)	Log (Ouput) (5)	Log (Wage) (6)	Log (Ouput) (7)	Log (Total Comp.) (8)
Female	0.63 (.00)	0.87 (.01)	0.63 (.02)	0.88 (.01)	0.63 (.02)	0.86 (.01)	0.62 (.02)	0.86 (.01)
Skilled	4.82 (.14)	1.96 (.02)	4.79 (.14)	2.08 (.02)	5.33 (.16)	2.10 (.02)	5.29 (.15)	2.22 (.02)
Female: $\lambda_F - \phi_F = 0$	**0.24**		**0.24**		**0.24**		**0.24**	
Skilled: $\lambda_S - \phi_S = 0$	**-2.86**		**-2.71**		**-3.24**		**-3.06**	
Log capital	0.09 (.00)		0.08 (.00)		0.08 (.00)		0.09 (.00)	
Log materials	0.67 (.00)		0.67 (.00)		0.67 (.00)		0.67 (.00)	
Log labor quality	0.20 (.00)		0.20 (.00)		0.20 (.00)		0.20 (.00)	
Log R & D expenditure	0.02 (.00)	0.03 (.00)	0.02 (.00)	0.04 (.00)	0.02 (.01)	0.03 (.00)	0.02 (.00)	0.04 (.00)
Vocational training (share)	0.01 (.01)	0.03 (.00)	0.01 (.00)	0.06 (.01)	0.01 (.00)	0.03 (.01)	0.01 (.00)	0.06 (.01)
R-squared	0.91	0.84	0.91	0.83	0.91	0.84	0.91	0.83
Correlation between equations	0.04		0.04		0.04		0.04	

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), ownership (six categories, private Chinese firms = reference), age (four categories, established earlier than 1994 = reference). Bold letters indicate that the null-hypothesis $\lambda_i - \phi_i = 0$ is rejected at the five percent level. N = 114,276

Table B10
Joint production function and earnings equation estimates of model 2, Cobb-Douglas production function, gender-skill weighted labor inputs

	Comparative sample				With labor input weights			
	Log (Output) (1)	Log (Wages) (2)	Log (Output) (3)	Log (Total Comp.) (4)	Log (Output) (5)	Log (Wages) (6)	Log (Output) (7)	Log (Total Comp.) (8)
Female unskilled	0.58 (.03)	0.88 (.01)	0.58 (.03)	0.86 (.01)	0.58 (.03)	0.87 (.01)	0.58 (.03)	0.86 (.01)
Female skilled	3.82 (.24)	1.72 (.04)	3.78 (.23)	1.87 (.05)	4.67 (.28)	2.21 (.05)	4.62 (.28)	2.40 (.06)
Male skilled	4.68 (.24)	2.08 (.04)	4.65 (.24)	2.14 (.05)	4.92 (.25)	2.16 (.04)	4.89 (.25)	2.20 (.04)
Female unskilled: $\lambda_{FU} - \phi_{FU} = 0$	**0.29**		**0.28**		**0.29**		**0.28**	
Female skilled: $\lambda_{FS} - \phi_{FS} = 0$	**-2.10**		**-1.91**		**-2.46**		**-2.22**	
Male skilled: $\lambda_{MS} - \phi_{MS} = 0$	**-2.59**		**-2.51**		**-2.76**		**-2.68**	
Log capital	0.08 (.00)		0.08 (.01)		0.08 (.01)		0.08 (.00)	
Log materials	0.65 (.00)		0.65 (.00)		0.65 (.00)		0.65 (.00)	
Log labor	0.22 (.00)		0.22 (.00)		0.22 (.00)		0.22 (.00)	
Log R & D expenditure	0.02 (.00)	0.03 (.00)	0.02 (.00)	0.04 (.00)	0.02 (.00)	0.02 (.00)	0.03 (.00)	0.04 (.00)
Vocational training (share)	0.01 (.01)	0.03 (.01)	0.01 (.01)	0.06 (.01)	0.00 (.00)	0.00 (.00)	0.03 (.01)	0.06 (.01)
R-squared	0.91	0.85	0.91	0.84	0.91	0.85	0.91	0.84
Correlation between equations	0.04		0.04		0.04	0.04		

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), ownership (six categories, private Chinese firms = reference), age (four categories, established earlier than 1994 = reference). Bold letters indicate that the null-hypothesis $\lambda_{ij} - \phi_{ij} = 0$ is rejected at the five percent level. N = 83,817.