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MATURE EXPORT-LED GROWTH AND GENDER WAGE INEQUALITY IN TAIWAN

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ABSTRACT

After 1980, the Taiwanese economy was marked by technological change, growing overseas investment by Taiwanese firms, and continuing success with export-oriented manufacturing. In the manufacturing sector these developments coincided with a decline in women's employment opportunities relative to men's, a shift from wage to salaried employment, and an increase in gender wage inequality. Using industry-level panel data, this study investigates the effects of Taiwan's restructuring during this period on gender wage inequality. The most important findings are: greater export orientation adversely affects both men's and women's wages yet reduces gender wage inequality, because male employees face a greater wage penalty than women; greater capital intensity improves both men's and women's wages; and the shift toward salaried jobs improves men's wages while reducing wages of women. These results hold after controlling for the effects of female industrial crowding, female reserve labor supply, firm size, and overseas foreign direct investment.

KEYWORDS

Gender wage inequality, export-oriented growth, Taiwan, gender, earnings, manufacturing industry

I. INTRODUCTION

Taiwan is arguably the most successful practitioner of the export-led growth model, which is an important contributor to the accelerated globalization process of the late twentieth century. It was one of the first countries to adopt this model and to achieve sustained growth rates based on manufacturing for export. Since the late 1970s Taiwan has sought to maintain and strengthen its international competitiveness by adapting its industrial structure to the changes in the global economy. It has moved beyond labor-intensive manufacturing for export toward a more capital-intensive industrial base and a diversified export structure. Since the mid-1980s, there has also been a rapid increase in overseas investment by Taiwanese firms,

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primarily in the Southeast Asian economies. This study evaluates the implications of this second-stage or mature phase of Taiwan's export-led growth strategy for gender wage inequality in manufacturing industry.

The study contributes to the feminist economics project of engendering the investigation of the export-led growth model. Economists' evaluations of Taiwan's record focus on genderless macroeconomic aggregates and, with few exceptions (cf. Gary S. Fields 1992, 1994; Walter Galenson 1979; Paul K. C. Liu 1989; Gustav Ranis 1995), pay little attention to labor market outcomes. These studies praise Taiwan's success in maintaining high growth rates and a stable macroeconomic environment while reducing income inequality among households. However, income inequality between men and women has not received attention in these evaluations. Feminist anthropologists and sociologists, on the other hand, have analyzed the important role women workers played in the success of export-led growth in Taiwan (Lucie Cheng and Ping-Chun Hsiung, 1994; Rita S. Gallin 1990; Ping-Chun Hsiung 1996), and the impact of paid employment outside the home on women's status and intra-family distribution (Linda Gail Arrigo 1980; Norma Diamond 1979; Susan Greenhalgh 1985; Lydia Kung 1983). But most of these small-scale studies focus on the early export-led growth phase. Moreover, they describe the *process* whereby gender inequalities are maintained, but do not link gendered *outcomes* in the labor market to economic variables at either the industry or macroeconomic levels. Feminist economists have begun to fill this research lacuna by assessing the cost of macroeconomic success in the newly industrializing economies (Günseli Berik 1995; Stephanie Seguino 1996, 1997a, 1997b; Joseph Zveglich, Yana Van Der Meulen Rodgers and William Rodgers 1997). These studies have found persistent gender wage inequalities, despite the closing of gender gaps in education, and have raised doubts about the export-led model's ability to improve women's economic status relative to men. The present study refines the empirical methodology necessary for evaluating the gendered impact of restructuring in such macroeconomic success stories or "miracles."

Recent studies that attempt to explain rising wage inequality between skilled and unskilled workers in industrial countries in terms of technological change and changing trade patterns do not use gender as a category of analysis (cf. Richard B. Freeman 1995; Adrian Wood 1994). Conversely, research on gender wage inequality in the U.S. does not investigate the effects of trade (Francine Blau 1998; Francine Blau and Lawrence Kahn 1997; June O'Neill and Solomon Polachek 1993). The present study is one of the first to integrate the analysis of gendered labor market outcomes with the analysis of trade and capital flows and of technological change. Using data for twenty-two manufacturing industries over the 1984–93 period this study estimates an empirical model on the determinants of gender wage inequality and the wage rates of women and men.

II. GLOBALIZATION, EXPORT-LED GROWTH, AND GENDER INEQUALITIES IN MANUFACTURING

The main concern of feminist research on the processes of economic globalization has been the gendered employment and income effects of the implementation of the neoliberal (also known as "supply-side") model in both Third World and industrial countries (Günseli Berik 2000). Feminist research on industrial countries has problematized the implications for women of the structural shift away from industry to services and the trade-induced manufacturing job losses and income insecurity (Marjorie Griffin Cohen 1987; Patricia Connelly *et al.* 1995; Michael Greene and Emily Hoffnar 1995). Feminist research on the Third World has examined the effects of the Structural Adjustment Programs that have ushered in the neoliberal model (cf. Isabella Bakker 1994; Lourdes Benería and Shelley Feldman 1992; Pamela Sparr 1994). This research has shown that the model's imperative to be export-oriented brings about the rapid expansion of employment opportunities for women, and absorbs increasing numbers of women, who are pressed for jobs as a result of worsening living standards.

The feminist literature that specifically focuses on export-orientation has evaluated the typical scenario of export manufacturing based on labor-intensive, low-skill, standardized production processes, and explained the high proportion of women among the employed in terms of the lower unit–labor costs attained with women workers (Diane Elson and Ruth Pearson 1981; Guy Standing 1989). In turn, the labor-cost advantage provided by women is shown to be the outcome of concerted efforts by governments and firms to enact employment and hiring rules that discriminate against women and to mobilize gender ideals and stereotypes that justify women's concentration in unskilled, low-paying, high-turnover jobs (Elson 1995; Seguino 1997a). Thus, gender wage inequality is perpetuated either by women's crowding into a limited set of occupations and industries and/or employer and government-sanctioned discrimination against women in wage-setting in industries or occupations dominated by women. These arguments, known as the "crowding" and "discrimination" hypotheses, have been put forth by feminist economists as explanations for the negative relationship between female share of employment and wage levels in a closed economy framework as well (Barbara Bergmann 1974; Donald Treiman and Heidi Hartmann 1981).

The empirical focus of the feminist literature on export orientation has mainly been the trend in gender composition of employment (Nilüfer agatay and Günseli Berik 1990; Susan P. Joekes 1995; Sharon Stichter 1990). Case studies and cross-country evidence have documented the association of export-orientation with the rise in female share of employment (Nilüfer agatay and Sule Ozler 1995; Wood 1991). However, this

trend also appears to have been stalled or reversed in the few economies that have moved beyond labor-intensive export manufacturing. Studies have found that rising capital intensity, technological upgrading, and improvement in the quality of export products were accompanied by a secular decline in women workers' share of manufacturing employment (Luz Del Alba Acevedo 1990; Joekes 1995; Ruth Pearson 1995). The main explanation for this decline is employer discrimination against hiring women in the new, higher-paid, skill-intensive jobs and capital-intensive production processes. The upgrading of skills with technological change leads to a reduction in the share of jobs requiring less skilled labor. This process entails a decline in the demand for women's labor as some production jobs disappear while others are redefined as "technical" jobs and become "men's" jobs (Acevedo 1990; Cynthia Cockburn 1985; Nance Goldstein 1989; Pearson 1995). In addition, there is evidence that the diffusion of just-in-time organizational innovations is leading to a defeminization of manufacturing employment as men emerge as the more flexible, cost-effective workers compared to women (Martha Roldán 1993).

In contrast to the empirical attention given to gender composition of employment, there are very few studies on the implications of export-oriented growth for gender wage inequality. Seguino (1997b) presents evidence on the East Asian newly industrializing economies that shows that sustained export-led growth since the 1960s has brought about, at best, a negligible decline in gender wage inequalities.

Econometric investigations of gender wage inequalities mostly apply the standard human capital model to various institutional settings and generally attribute a sizable portion of the gender wage inequality to wage discrimination against women (cf. Richard Anker and Catherine Hein 1986; Kenneth Gannicott 1986; Susan Horton 1996; George Pscharapoulos and Zafiris Tzannatos 1992; Zveglich *et al.* 1997).

The alternative to the microeconomic approach is to examine either the inter-industry variation in wages (cf. William T. Dickens and Lawrence F. Katz 1987) or the industry-level determinants of male and female earnings (Randy Hodson and Paula England 1986). This approach shifts the emphasis away from labor supply to labor demand characteristics and is better suited to examine the impact of macroeconomic and trade policies on gender wage inequality. Seguino's research on gender inequalities in East Asia has utilized this alternative approach. She has examined the crowding hypothesis in Korean manufacturing industries and found that the industry-relative earnings are negatively affected by the female share of employment (Seguino 1997a). Similarly, in a comparative study of Korea and Taiwan, Seguino (1996) explained the widening gender wage gap in Taiwan (versus a slow closing of the gap in Korea) by the greater international mobility of capital in Taiwan, which weakens women workers' bargaining power. While the context of both empirical studies is export-oriented economies, neither

study has examined the effect of export orientation at the industry level on wage levels or gender wage inequality.

In this study, I apply the industry-level approach and consider the separate effects of not only export orientation but also a host of other characteristics that represent the industrial underpinnings of restructuring. The contributions of the present study are twofold. I focus on not only gender wage inequality but also on women's and men's wages, thereby highlighting the forces that drive the gender wage inequality. This methodology provides a more complete analysis than studies that use either the average industry wage or the gender wage ratio as the sole dependent variable. Second, by using disaggregated data and choosing the industry as the unit of analysis, the present study provides a stronger empirical foundation for various arguments on the determinants of gender wage inequality. For example, it examines whether or not export orientation has an adverse effect on women's wages and gender wage inequality over and above the wage-depressing effects of female industrial crowding or labor intensity of production.

III. MATURE EXPORT-LED GROWTH IN TAIWAN

The Taiwan economy began its shift toward second-stage export-led growth in the late 1970s. This followed a short period of import substitution in the 1950s, and the export-led growth strategy based on labor-intensive manufactures in the 1960s. Following the 1974–5 recession, which hit Taiwan's export industries hard, the government made efforts to shift Taiwan's manufacturing base away from exclusive reliance on labor-intensive exports toward more capital- or technology-intensive exports and to upgrade product quality in order to maintain Taiwan's international competitiveness. Government policies supported the upgrading of technology, emphasized technical training, implemented infrastructure projects, and created research parks for R&D. In the 1980s, additional measures were taken to encourage R&D and to train technical personnel (Jiann-Chyan Wang and Kuen-Hung Tsai 1995).

These policies have produced the anticipated results. There has indeed been a significant increase in the capital intensity of manufacturing and a diversification of exports, and Taiwan has ascended to a leading role in world production in electronics (DGBAS 1996a; John A. Mathews 1996; James Riedel 1992). During the 1980s and 1990s, the electrical and electronics products industry continued to be the leading generator of export earnings, while there was a shift away from apparel and miscellaneous manufactures toward machinery and transportation equipment industries as major sources of export earnings.[1] There was also a significant increase in the *export orientation* (defined here as the share of exports in gross sectoral output) of the electronics, machinery, textiles, precision equipment industries, while the

apparel, miscellaneous manufactured goods, and non-metal minerals industries became far less export-oriented.[2] From 1981 to 1993, manufactured exports grew at an impressive average annual rate of 12.3 percent, and, on the whole, the manufacturing industry became slightly more open to trade (UNCTAD 1995; DGBAS 1996b).

From the mid-1980s onward, the relocation of labor-intensive industrial production out of Taiwan became an additional force transforming the manufacturing industry. While larger firms sought to develop high-technology industries with short product cycles on Taiwan, smaller and more export-oriented firms began to shift the production of commodities in which Taiwan was losing its export competitiveness to lower labor-cost sites in Southeast Asia (Ranis 1992; Gee San 1992). Rising labor costs in Taiwan, growing foreign exchange surplus, and the appreciation of the currency were the major factors underlying this relocation of production. However, the timing of the significant increase in overseas investment was based on the liberalization of financial markets and foreign exchange in 1985 (Tain-Jy Chen 1992; Joseph S. Lee 1992).[3] Greater openness to foreign direct investment by host countries in Southeast Asia during the 1980s (as part of their implementation of the neoliberal model) provided an additional incentive for capital exports (San 1992).

The impact of overseas foreign direct investment on the industrial structure of Taiwan is difficult to sort out, in view of the trade-inducing effects of some of this investment on the very sectors from which it emanates and the variety of motivations underlying the relocation overseas. Thus far, the industrial restructuring process since the mid-1980s appears to have resulted in limited and selective de-industrialization in labor-intensive industries (Tain-Jy Chen and Yi-Ping Chen 1995). From 1986 to 1994, when the annual average growth rate of manufacturing real GDP was 9 percent, apparel, leather, wood and bamboo products, and miscellaneous manufacturing were the only industries that experienced an absolute decline in their real GDP (DGBAS 1996b). Nonetheless, after 1987, the manufacturing industry experienced a relative and absolute decline in employment. While it is still the largest employer in the economy, manufacturing's share of jobs declined from its peak level of 35 percent in 1987 to 28 percent in 1994 (DGBAS 1998), and, as detailed in the next section, women workers have disproportionately borne the brunt of these employment losses.

IV. MATURE EXPORT-LED GROWTH AND GENDER INEQUALITIES IN TAIWAN'S MANUFACTURING INDUSTRY

In the period after 1980, three trends characterize the gendered employment and earnings structure in manufacturing industries. First, there was a slow and steady decline in women's share of employment from 1982

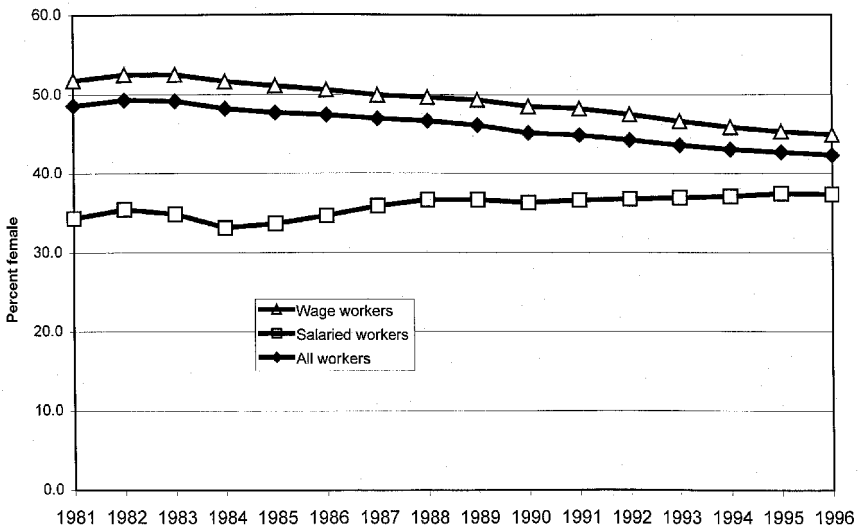

Figure 1 Female share of manufacturing employment, 1981–96
Sources: DGBAS (1990, 1994, 1996a).

onward. This share peaked in 1981, following a dramatic rise over the initial phase of export-led growth (1961–72) and a slow rise during the 1970s (Berik 1995). Figure 1 shows that the decline after 1982 was driven by the decrease in the share of women among wage workers. The female share of wage workers declined from 52 percent in 1982 to 45 percent in 1996, while their share among salaried workers remained nearly constant (around 35 percent) throughout this period. Figure 2 shows that the decline in female share of wage workers was driven by the larger increase in men's employment compared to women's employment in the early 1980s, and a sharper decline for women after 1987. There was an absolute decline in the number of both men and women wage workers after 1987. By 1996 women's wage employment had dropped well below the level of 1981, while men's employment was still above its 1981 level. By contrast, there was a steady increase in the numbers of both women and men salaried workers during this period, resulting in a shift in the employment structure away from wage workers toward salaried workers.

This shift in employment structure is reflected in a second measure, the ratio of wage workers to salaried workers, which has declined particularly dramatically for women (Figure 3). This ratio is likely to be highly correlated with the production–nonproduction worker ratio or the share of office jobs in total employment, both of which are used as proxies for the

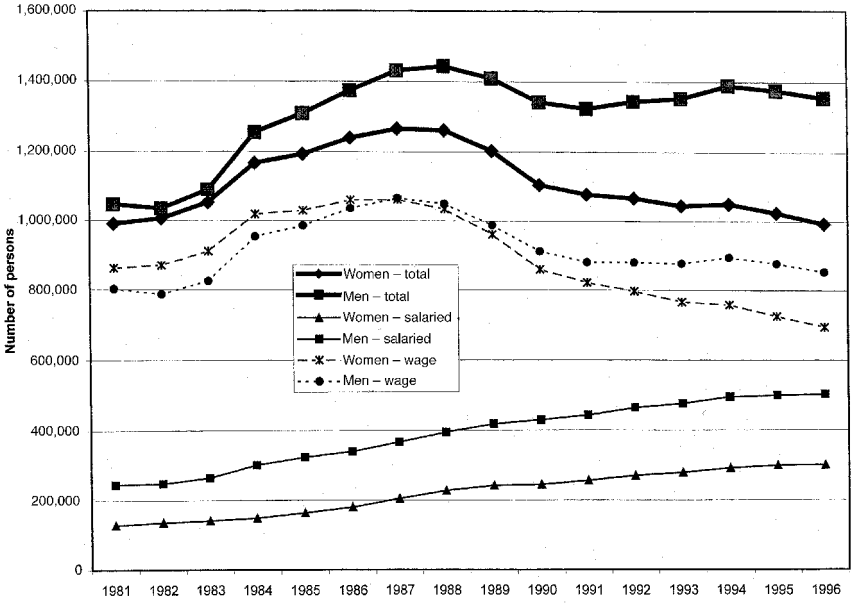

Figure 2 Employment trends in manufacturing industry, 1981–96
Sources: DGBAS (1990, 1994, 1996a).

skill composition of labor force in industrial country research (William R. Cline 1997; Hodson and England 1986). Unfortunately, establishment survey data for Taiwan do not include an occupational breakdown of wage and salaried workers that would allow us to establish a direct link with the occupational structure. In empirical research on industrial countries, the decline in the production–nonproduction worker ratio is interpreted as an indicator of "skilling" of labor (i.e., that fewer production workers per nonproduction worker are needed to produce), and this process is proposed as an explanation for the rise in wage inequality between skilled and unskilled workers (Robert C. Feenstra 1998; Freeman 1995). The relative contributions of technological change and trade-induced decline in the demand for production workers to the rise in wage inequality continues to be a matter of dispute. However, as Feenstra (1998) forcefully argues, the two effects are likely to be working together and may be statistically indistinguishable. Indeed, in the case of Taiwan, one could interpret the decline of the wage–salaried worker ratio as a manifestation of restructuring, which has as its components the large-scale relocation of production to Southeast Asia in the most labor-intensive industries, the trade-displacing effects of some of this offshore production, and domestic technological change. A disproportionate loss of production jobs for women and their smaller gains

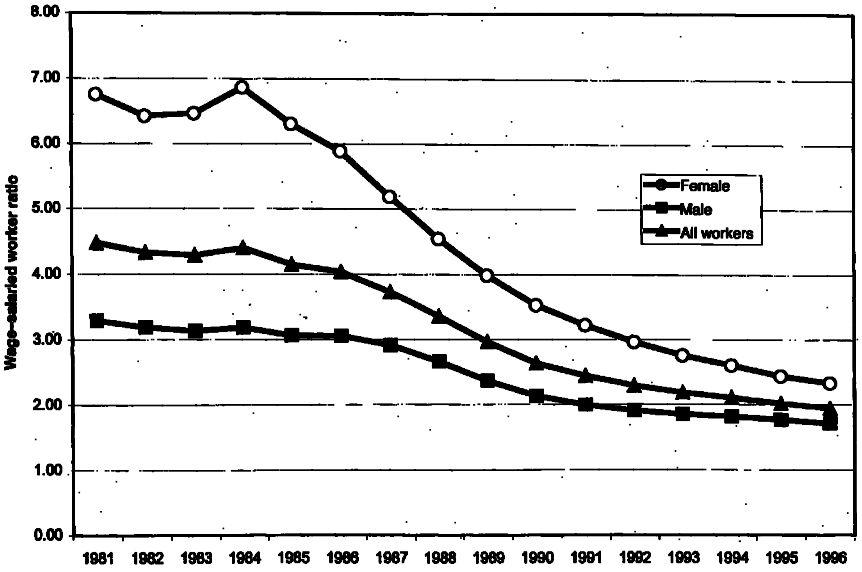

Figure 3 Trends in wage–salaried worker ratio, 1981–96
Sources: DGBAS (1990, 1994, 1996a).

in salaried jobs would explain the sharper decline in the wage–salaried worker ratio for women observed in Figure 3. Such an account of the gendered employment effects of restructuring is also consistent with the employment trends observed in Figure 2.

The third trend is the widening of the earnings inequality between men and women wage workers (Figure 4), which is consistent with a relative decline in demand for female labor.[4] From 1983 to 1992, when nominal earnings of both men and women wage workers rose, the average monthly gender earnings ratio of wage workers declined from a high of 71 percent to 62 percent. After 1992 there was a slight rise in the gender earnings ratio to 65 percent, due to the slower growth in nominal earnings of men relative to women. Gender earnings inequality among salaried workers was greater in 1981 (63 percent) and this inequality increased slightly (to 61 percent). Greater earnings inequality among salaried workers could be due to the more pronounced occupational segregation by sex among the salaried workers relative to wage workers (i.e., the concentration of men in high-paying professional, administrative, and technical jobs and of women in low-paying clerical jobs).[5] Interestingly, gender wage inequalities in the manufacturing industry increased against the backdrop of a narrowing of the overall educational gap between men and women during this period.[6]

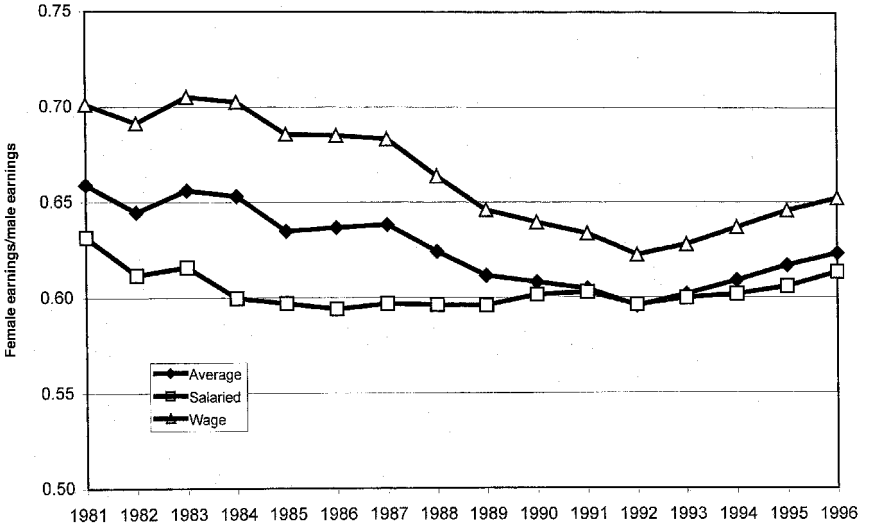

Figure 4 Gender earnings ratio in manufacturing, 1981–96
Sources: DGBAS (1990, 1994, 1996a).

These gendered employment and earnings trends took place in the context of a high level of segregation of male and female workers across industries. The top three employers of women in manufacturing industries accounted for around one-half of women's employment, while the top three employers of men employed one-third of the male workers.[7] Table 1 summarizes the characteristics of manufacturing industries grouped on the basis of female share of wage workers over the 1984–93 period. On average, in comparison with male-intensive industries, female-intensive industries were more labor intensive, more export oriented, had lower labor productivity, lower gender wage inequality, and accounted for a higher share of Taiwan's export earnings from manufacturing. The wage–salaried worker ratio, outward foreign direct investment as a share of sectoral GDP (OFDI/GDP), and firm size were not significantly different between the female-intensive and male-intensive industries.

In sum, during the 1981–96 period of restructuring in Taiwan, gender wage inequality among wage (i.e. blue-collar, production) workers increased as women's share of wage workers declined. By contrast, there has been virtually no change in either variable for the salaried (i.e. white-collar, nonproduction) workers. Against this backdrop of aggregate trends, I will pursue a disaggregated analysis of gender wage inequality among *wage* workers using panel data for twenty-two industries of the manufacturing sector for the 1984–93 period.[8]

Table 1 Characteristics of female-intensive and male-intensive industries[a] (Mean values for 1984–93, weighted by size of total industry employment)

Characteristics[b]	*Female-intensive industries*[c] (N = *80*)[d]	*Male-intensive industries* (N = *140*)
Capital intensity(1,000 NT$/employee)**	584.5	921.9
Labor productivity(NT$/employee)**	36,081	59,932
Wage–salaried worker ratio	3.5	3.3
Export-orientation (Exports as a share of output) (%)***	48.0	23.0
Industry share of manufactured exports (%)***	11.0	4.4
Percent of industries where outward foreign direct investment as a share of GDP exceeds 0.5%	42.8	35.3
Percent of industries where average firm has more than 60 employees	3.23	6.44
Gender wage ratio (%)***	75	69

Notes:

(a) "Female-(male-)intensive" is defined as industries where women's (men's) share of wage workers was greater than 50 percent in each year during the 1984–93 period. Accordingly, the female-intensive industries are the apparel, tobacco, textile, leather, plastics, electrical/electronics, precision instruments, miscellaneous manufacturing industries, and the male-intensive industries are the food, wood products, furniture, paper, printing, industrial chemicals, chemical products, petroleum and coal, rubber, nonmetal minerals, basic metal, fabricated metal, machinery, transport equipment industries.

(b) See Table 2 for definitions and data sources of all variables, except labor productivity and industry share of manufactured exports. Labor productivity is measured as the value of average monthly output in 1991 constant NT$ per equi-employed employee, and the data are reported in DGBAS (1995). Industry share of exports data are based on UNCTAD (1995).

(c) ***, ** denote that the hypothesis of equality of means is rejected at the 1 percent and 5 percent levels, respectively (two-tailed tests).

(d) The sample size is equal to the number of industries times the number of years.

V. THE DETERMINANTS OF GENDER WAGE INEQUALITY: ESTIMATION AND RESULTS

The empirical model presented here seeks to identify the effect of industry characteristics on gender wage inequality among wage workers in manufacturing industry. Since the changes in the gender wage inequality are driven by changes in men's and women's wages, the empirical model consists of two independent wage equations for women and men, and a gender wage ratio equation derived from these two equations. In each equation,

the independent variables and the number of observations are identical. Thus,

$$\ln(Wage)_{it} = \beta_0 + \beta_1 \ln(Export/Output)_{it} + \beta_2 \ln(OFDI/GDP)_{it} + \beta_3 \ln(Capital/Labor)_{it} + \beta_4 \ln(Wage/Salaried)_{it} + \beta_5(Female\ Share)_{it} + \beta_6(Female\ Reserve)_i + \beta_7(Firm\ Size)_i + u_{it}$$

where *Wage* is defined as the average hourly real wages of women and men, and the gender wage ratio, respectively, in the three equations of the model. The gender wage ratio is the ratio of female to male average hourly real wage rates. i is the industry subscript ($i = 1, \ldots, 22$), t is the year subscript ($t = 1983, \ldots, 1994$), making each observation an industry-year, and u_{it} is the random disturbance term. The variables used in the regression analysis are defined and their data sources identified in Table 2. [9]

The first four explanatory variables capture various facets of Taiwan's restructuring process that are the outcome of strategies to maintain and strengthen industry international competitiveness: export orientation, overseas investment, technological change, and job restructuring. The last three variables control for the effects of female crowding, female reserve labor supply, and firm size.[10] Descriptive statistics on these variables are reported in Table 3.

The value of exports as a share of sectoral gross output (*Export/Output*) measures the export orientation of sector. Export orientation is expected to be associated with lower industry average wages given the greater pressures to maintain or achieve international competitiveness. However, its effect on the gender wage ratio is theoretically ambiguous. There are no studies that could inform hypotheses on the relative effects of export orientation on men's and women's wages.

The relative importance of outward foreign direct investment in a given industry is captured by a dummy variable (*OFDI/GDP*), which takes the value of 1 in years when its value exceeds 0.5 percent of the sectoral GDP and is 0 otherwise. The available data measure the volume of foreign direct investment *approved* by the government, not the actual amount. Since these figures are highly volatile from one year to another, and an approved investment may be realized gradually, it is more appropriate to treat *OFDI/GDP* as a dummy rather than a continuous variable.[11] I adopted a very low benchmark value in view of the significant underestimation of the volume of overseas investment in official Taiwanese data.[12] While funds for overseas investment in a particular industry do not necessarily emanate from that industry, nonetheless, where such overseas investment is sizable, one would expect the domestic industry to pay lower wages due to weaker labor demand. Within an industry, the relative effects of *OFDI/GDP* on men's and women's wages will depend on women's relative vulnerability to layoffs, that is, their relative bargaining power. That, in turn, depends on the nature of jobs staffed by women and men workers and the gendered pattern of

Table 2 Variables and data sources

Variables	*Description*	*Sources*[a, b]
Dependent variables		
Women's real hourly earnings Men's real hourly earnings	(Average monthly earnings/Monthly hours worked)/Industry WPI	Monthly earnings and hours from *Yearbook of Earnings and Productivity* (1994a, 1996a); wholesale price index is from *Quarterly National Income Statistics in Taiwan Area* (1996b) [22]
Gender wage ratio	Women's real hourly earnings/Men's real hourly earnings	
Independent variables		
Export/Output[c]	Exports/Industry gross output	*Input-Output Tables* (1984, 1986, 1989, 1991, 1994) [18]
OFDI/GDP	Outward foreign direct investment (in NT$)/Nominal GDP of industry	*Investment Commission, 1998* [15]; *National Income in Taiwan Area 1995* [22]
Capital/Labor	Value of real net fixed capital stock per employee	*Yearbook of Earnings and Productivity* (1996a) [18]
Wage/Salaried	Number of wage workers/number of salaried workers	*Yearbook of Earnings and Productivity* (1990, 1994a, 1996a) [22]
Female Share	Share of women among wage workers	*Yearbook of Earnings and Productivity* (1990, 1994a, 1996a) [22]
Female Reserve	(Women unpaid family workers + own account workers)/Total female employment in industry	*Yearbook of Manpower Survey Statistics, 1990* (1991) [20]
Firm Size	Number of employees per firm in industry	*The Report on 1991 Industrial and Commercial Census* (1993) [22]

Notes:
(a) See References for full citations.
(b) Numbers in square brackets refer to the level of disaggregation of the data (i.e. the number of industrial sectors) used by the reporting source.
(c) Missing values for this variable were estimated by fitting a trend line to the observations for 1984, 1986, 1989, 1991, 1994.

layoffs. If women in these industries are in less skilled jobs, have less seniority, or face institutional barriers that prevent them from acquiring seniority, then one would expect women to be laid off in greater numbers and face stronger downward pressure on their wages in comparison with men. This would lead us to expect negative effects not only on men's and women's wages but also on the gender wage ratio.

Table 3 Means and standard deviations of variables (mean values for 1984–93, weighted by size of industry total employment, $N = 220$)

Variables	*Mean*	*Standard deviation*
Female real hourly earnings (in 1991 constant NT$)	68.1	23.4
Male real hourly earnings (in 1991 constant NT$)	96.2	36.0
Gender wage ratio (%)	71.9	6.3
Export/Output (%)	36.1	18.0
Outward foreign direct investment/GDP (>0.5% = 1) (%)	40.6	
Capital intensity (1,000 NT$/worker)	745.4	915.6
Wage–salaried worker ratio	3.4	1.2
Female share of wage workers (%)	49.2	19.2
Female reserve (size of reserve > 10% = 1) (%)	31.2	
Firm size (average employment > 60 = 1) (%)	3.2	

Sources: See Table 2.

The capital intensity of production (*Capital/Labor*) is the technology variable and a proxy for labor productivity. A high level of capital investment is expected to increase worker productivity and make possible the payment of higher wages. Its effect on gender wage inequality depends on whether there is a gender difference in workers' ability to translate higher productivity into higher wages. The literature suggests that men are better able to bargain for or are granted greater wage increases than women (cf. Heidi Hartmann 1979). If this is true, then we expect a higher capital–labor ratio to be associated with a lower gender wage ratio (i.e., greater gender wage inequality).[13]

The ratio of wage–salaried workers (*Wage/Salaried*) in a given industry captures the job restructuring that may be driven by technological change, changing trade structure, or both. If, as noted earlier, a lower wage–salaried worker ratio is interpreted as a proxy for greater skill level, then a lower ratio is expected to be associated with higher average industry wages. Thus, we expect the wage–salaried worker ratio to be negatively related to both women's and men's wages. However, the effect on the gender wage ratio is likely to be positive. This follows from my observations on Figures 2 and 3 that the wage–salaried worker ratio is on the decline and is accompanied by a fall in demand for female relative to male workers. This implies that in the course of the job restructuring or skilling process women's wages may rise less than men's, and thereby increase gender wage inequality.

The share of women among wage workers (*Female Share*) tests for the crowding and employer discrimination arguments, both of which predict a negative relationship between the female share of employment and the average wage. In the former case this is due to the wage-depressing effects of women's industrial crowding and in the latter case because the preponderance of women in a given industry gives employers the license to pay

lower wages. Originally, these arguments were formulated for and found empirical support at the occupational level. At the industry level, however, the results are mixed. For Korea, Seguino (1997a) found that a higher female share depresses the average industry wage, while Hodson and England (1986) did not find a statistically significant effect of gender composition of employment on either men's or women's wages at the industry level. In keeping with this literature, my expectation is that a high female share will depress the wages of men as well as women in the industry. Of particular interest are the relative magnitudes of its impact on men's and women's wage rates, which determine the direction of change in gender wage inequality.

In addition to female crowding within, female crowding outside the registered establishments is also likely to affect wage levels and gender wage inequality. Thus, the model includes a dummy variable (*Female Reserve*) to estimate the impact of the female employment in each industry outside the registered manufacturing establishments covered by the Employee Earnings Survey (see note 9). Using household survey data, I defined the female reserve labor supply variable on the basis of the share of women unpaid family workers and own-account workers in total female employment in each industry. This, in part, is the labor force examined by Hsiung (1996). She argues that the state-sponsored program of "living room factories" implemented after 1978 was designed to mobilize the labor of housewives to work out of their homes for subcontractors. The creation of this female reserve labor supply is arguably an integral component of Taiwan's mature export-led growth strategy.[14] The existence of a sizable female reserve is expected to temper wage increases for women and (depending on the substitutability between women and men) for male workers employed in registered establishments in those industries. If the female reserve is a weak substitute for this group of men, then *Female Reserve* will be negatively related to the gender wage ratio. A cut-off level of 10 percent is used to distinguish between industries that have a sizable female reserve labor supply and those where this reserve is either nonexistent or small.[15] In the context of the present industry-level analysis this measure is superior to the *economy-wide* unemployment rate, which is commonly used as a measure of surplus labor.

Finally, the model includes *Firm Size*, which is measured as a dummy variable constructed on the basis of the average number of employees per firm in industry *i*. Taiwan is well known for the predominance of small and medium enterprises in its manufacturing industry. Here, industries for which the average firm size is 60 or more employees are classified as those with large firms, for which the variable takes on the value of 1. Tobacco, petroleum and coal products, and industrial chemicals are the only industries in which the average firm size is large. Large firms are expected to generate higher revenues per worker due to economies of scale, which may

Table 4 Determinants of women's and men's wages and the gender wage ratio in Taiwan's manufacturing industry, 1984–93 (with year fixed effects)

	Women's wage rate (log of hourly real wage)	*Men's wage rate (log of hourly real wage)*	*Gender wage ratio (log of female to male wage ratio)*
ln(*Export/Output*)	–0.040	–0.062	0.022
	(0.023)*	(0.016)***	(0.014)
OFDI /GDP (>0.5% = 1)	–0.022	–0.011	–0.012
	(0.014)	(0.011)	(0.007)
ln(*Capital/Labor*)	0.023	0.020	0.003
	(0.012)*	(0.010)**	(0.007)
ln(*Wage/Salaried*)	0.072	–0.093	0.165
	(0.028)**	(0.023)***	(0.018)***
ln(*Female Share*)	–0.104	–0.153	0.049
	(0.027)***	(0.020)***	(0.016)***
Female Reserve (>10% = 1)	–0.066	–0.028	–0.038
	(0.016)***	(0.014)**	(0.012)***
Firm Size (large = 1)	0.133	0.139	–0.006
	(0.073)*	(0.061)**	(0.032)
R^2	0.93	0.96	0.58
N	220	220	220

Notes: Standard errors are reported in parentheses. ***, **, * denote that the value is significant at the 99, 95, 90 percent probability levels. The results are White-corrected for heteroskedasticity.

translate into higher wage rates in industries with larger average firm size. As with the capital–labor ratio, the effect of average firm size on gender wage inequality depends on whether there is a gender difference in workers' ability to secure higher wages on the basis of greater firm revenues.

The model is estimated using year fixed effects in order to capture the variation across the years.[16] In estimation, observations are weighted by total sectoral employment since there are significant differences in industry size. The results are reported in Table 4. Because the estimated model is in logarithmic form the regression coefficients are elasticities. The estimated coefficient of each variable in the gender wage ratio equation is, by definition, equal to the difference between the respective coefficients in the female and male wage equations.[17]

The estimated wage equations explain nearly all of the variation in women's and men's wages, with R^2's of 0.93 and 0.96, respectively. The results for women's wage equation indicate that, with the exception of the wage–salaried worker ratio, all coefficients have the expected signs. Export orientation, female share of employment, female reserve labor supply, and *OFDI/GDP* reduce women's wages, while capital–labor ratio and firm size raise them, all as predicted.[18] The inverse relationship between export

orientation and women's wages in a multiple regression framework provides a stronger foundation for feminist arguments concerning the effects of export orientation. Export orientation is associated with lower wages for women over and above the adverse effects of female crowding inside and outside the registered manufacturing establishments, and when skill composition, productivity, and firm size are controlled for.[19] The positive sign on the wage–salaried worker ratio coefficient suggests that women's wages are higher where this ratio is higher. This means that as the industry occupational mix shifts from wage to salaried workers the pay of women wage workers is declining.

The signs of the estimated coefficients of men's wage equation are also consistent with my expectations.[20] The results show that employment in export-oriented industries brings a wage penalty not only for women but also for men. Compared to men who work in more domestic market-oriented industries, men in relatively export-oriented industries are paid lower wages. Moreover, the wage penalty is greater for men than for women (i.e., a wage reduction of –0.062 percent for men vs. –0.040 percent for women for each percent increase in export orientation). A similarly surprising result concerns the relative magnitudes of the impact of female share on men's and women's wages. Men are more adversely affected than women from working in industries with a higher share of women (a wage penalty of –0.153 and –0.104 percent, respectively). Thus, each of these variables has a positive effect on the gender wage ratio. The estimated elasticities of the gender wage ratio with respect to export orientation and female share are 0.022 and 0.049, respectively.

Another surprising result concerns the conflicting effects of the wage–salaried worker ratio on men's and women's wages. While women benefit from being employed in industries with a higher wage–salaried worker ratio, men are disadvantaged by it. As a result, the wage–salaried worker ratio is strongly positively related to the gender wage ratio. This suggests that the decline in the wage–salaried worker ratio is associated with a new pattern of occupational segregation among *wage* workers that places women in lower paying jobs compared to men. In the absence of data on the occupational breakdown among wage workers it is not possible to examine whether or not this is the case. However, this study shows that the decline in wage–salaried worker ratio observed in Figure 3 represents an alarming trend for women and a beneficial one for men wage workers.

It is noteworthy that a higher outward foreign direct investment as a share of GDP (*OFDI/GDP*) is associated with greater wage inequality. While this result is consistent with Seguino (1996), the two studies are not directly comparable because of methodological differences. Most important among these is that Seguino's work was based on *economy-wide* measures of international capital-mobility instead of industry-level data and it pooled data for Taiwan and Korea. It should also be pointed out that the levels of

statistical significance reported by Seguino for this variable are dramatically higher than what I found for Taiwan. In view of the quality and limitations of the underlying foreign direct investment data (see notes 11 and 12), however, this result warrants further examination in future research.

Finally, large firm size provides women and men equal pay-off and does not have an important effect on wage inequality. Capital–labor ratio has a larger positive impact on women's wage and consequently improves wage inequality, although this result is not statistically significant at the conventional levels. Working in industries that have a sizable female reserve labor supply increases gender wage inequality because women's wages are more adversely affected than men's wages. The latter result suggests the weak substitutability of women reserve workers for men employed in registered establishments.

On the whole, estimating a three-equation model, which explores the determinants of the wages of men and women as well as the gender wage ratio, provides considerable information on the factors underlying wage determination compared to estimating a single gender wage ratio equation. This approach provides a more adequate exploration of the gender dimension of wage inequality, highlighting the effects of industry characteristics on men's as well as women's wages. It shows, for example, that export orientation has an adverse effect on men's as well as women's wages, a result that is not obvious (and obscured) if the focus is solely on women's wages, average industry wages, or the gender wage ratio. The results pertaining to the female share and export orientation variables suggest that feminist economists' concern about gender wage inequality cannot be limited to women's standing relative to men, but that the level and direction of change in men's wages are equally relevant. Clearly, women's smaller losses relative to men's losses cannot be good news.

VI. CONCLUSION

This study investigated the effects of Taiwan's changing role in the global economy after 1980 on gender wage inequalities. During this period, Taiwan's manufacturing industry underwent transformations that were shaped by the forces of domestic technological restructuring and growing investment outflow to Southeast Asia.

At the aggregate level, this period was characterized by employment losses in manufacturing industry, a relative shrinking of the sector, and a shift in the job opportunities in manufacturing industry from wage to salaried employment. Against this backdrop, women wage workers experienced a disproportionate loss of employment opportunities. While this loss is not necessarily negative (since female intensity of manufacturing employment is often an indicator of women's secondary status in the labor market (Joekes 1995)), the growing gender wage inequality that accompanied these

trends suggests that the emerging employment opportunities in manufacturing did not improve the economic status of women relative to men.

Using an industry-level approach, I examined the separate effects of export orientation, overseas investment by Taiwanese firms, job restructuring, and capital intensity, after controlling for female share of industry employment, female reserve labor supply, and average firm size. This analysis showed that, from 1984 to 1993, greater export orientation adversely affected both women's and men's wages, and resulted in lower gender wage inequality only because employment in export-oriented industries had a greater wage penalty for men than for women. Outward foreign direct investment did not have an important effect on either wage levels or gender wage inequality. Further investigation of the effect of overseas investment using more complete investment data (which include investment approvals in China after 1991) may provide different results. However, this study finds that export-oriented manufacturing is a source of lower pay not only for women workers, as suggested by earlier research, but also for men.

This study also found that technological restructuring during this period did not improve the relative economic status of women. Higher capital intensity improved women's wages marginally more than men's, leaving women's relative economic status virtually unchanged. On the other hand, women wage workers were losers in absolute and relative terms from the trend toward growing importance of salaried jobs in manufacturing industry. This result is consistent with earlier feminist analyses of the implications of technological change, product upgrading, and redefinition of job titles, and may be strengthened if data on the occupational underpinnings of the job restructuring under way among wage workers were to become available.

Two features of the empirical methodology considerably strengthen the explanatory power of this analysis. First, using an empirical model that examined the determinants of women's and men's wages as well as gender wage inequality allowed us to identify the sources of change in gender wage inequality and to make sense of some of the puzzling effects on the gender wage ratio, such as the positive effects of export orientation and female share of employment. These results suggest that determining the *absolute* changes in men's and women's economic status as well as changes in women's economic status *relative* to men is necessary for evaluating changes in gender inequalities. Second, using industry-level data at a finer level of aggregation than is usual helped establish sharper statistical links between gendered economic outcomes and the characteristics of the export-oriented model that is undergoing restructuring. This investigation showed that export orientation, labor intensity, smaller firm size, and female crowding within and outside registered establishments were the industry characteristics that had separate, negative effects on women's wage levels. But the same industry characteristics adversely affected men's wages as well, albeit the magnitude of some of these effects differed by gender. The

wage–salaried worker ratio was the only industry characteristic that had opposite effects on men's and women's wages. Whether the magnitude and direction of these wage effects of restructuring are short-lived are questions that need to be investigated in the future. Nonetheless, a feminist analysis of Taiwan's economic success in the 1984–93 period shows that the underlying restructuring process is neither gender- nor class-neutral.

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NOTES

[1] In 1983, the top four sources of export earnings (as a share of manufactured exports) were electronics (17 percent), apparel (10 percent), miscellaneous manufactures (10 percent), and textile (9 percent) industries. In 1993 the largest shares of export earnings were generated by electronics (20 percent), machinery (20 percent), textiles (11 percent) and transportation equipment (9 percent) industries (author's calculations based on UNCTAD (1995)). For this analysis, I grouped the export data based on the annual trade data reported at the four-digit-level SITC (revision 2) according to three-digit-level ISIC (revision 2).

[2] I calculated exports as a share of sectoral gross output from input–output tables (DGBAS, various years). Apparel was the most open sector in 1984 when 65 percent of its output was exported. By 1994 this share declined to 49 percent. Over this period, the electronics industry increased its share of exported output from 45 to 67 percent, textiles from 23 to 54 percent, machinery from 20 to 50 percent, and precision equipment from 64 to 77 percent.

[3] Approved overseas investment remained less than 1 percent of Taiwan's gross fixed capital formation until 1988, after which it rose dramatically (author's calculations based on DGBAS (1989, 1998) and Investment Commission (1998)). Commentators agree that even the dramatic rise in overseas Taiwanese

investment reflected in these statistics is a gross underestimate of the actual investment figures (Chen 1992; Lee 1992; San 1992).

[4] Over the 1984–93 period, the trends in time-adjusted earnings ratios (i.e. corrected for gender differences in hours worked) were nearly identical to the trends in unadjusted ratios in Figure 4 (for the 1981–96 period). Moreover, both trends are consistent with trends revealed by the household survey data, which indicate a widening of gender earnings inequality among workers with less than a high school degree from 1978 to 1992 and a stagnant wage inequality for high school and college graduates (Zveglich *et al.* 1997).

[5] Household survey data indicate a high degree of sex segregation in white-collar occupations. In 1993, for example, 27 percent of the male employees in the manufacturing industry were in professional and administrative occupations while only 12 percent of the women were in these occupations. By contrast, 14 percent of women and 3 percent of men were clerical workers. The same data also show that women accounted for 77 percent of clerical and 39 percent of the professional and administrative jobs (DGBAS 1994b). This data source does not include an occupational breakdown of production occupations.

[6] Between 1981 and 1993, average years of schooling increased from 7.49 years to 9.24 years for men and 5.27 years to 7.8 years for women, thereby narrowing the gap from 2.2 years to 1.3 years (DGBAS 1998).

[7] In 1981, the top three employers of women were textiles, electronics, plastics, and top employers of men were electronics, fabricated metal products, transport equipment industries. By 1996, fabricated metal products had replaced plastic products as the third largest employer of women and the basic metals industry had replaced transport equipment as the third largest employer of men. Electronics and textiles are also among the industries with the highest female shares of employment (DGBAS 1996a).

[8] Data constraints regarding gender-differentiated hours determined the period used in the regression analysis. The twenty-two industries are food processing, tobacco, textiles, apparel, leather products, wood products, furniture, paper, printing, industrial chemicals, chemical products, petroleum and coal, rubber, plastics, nonmetal minerals, basic metals, fabricated metals, machinery, electrical/electronics, transport equipment, precision instruments, miscellaneous manufacturing.

[9] The earnings and employment data used in this analysis come from the monthly establishment surveys (Employee Earnings Surveys) conducted from 1972 onward and reported in DGBAS (1990, 1994a, 1996a). The employees in the Employee Earnings Survey include white-collar and blue-collar workers, permanent, temporary, contract workers and apprentices with pay, who work in either private or government establishments. The employee category *excludes* own-account workers, unpaid family workers, and contract workers who work on a piece-rate basis outside establishments. The survey covers all registered establishments, including ones that employ fewer than five workers. In the survey, all establishments employing more than 200 workers are surveyed. The rest of the establishments are divided into six strata and surveyed by random sampling. See DGBAS (1990: 740) for details of the sampling methodology.

[10] While various aspects of the restructuring process are interrelated, only export orientation and capital intensity (i.e. capital–output ratio) is highly correlated (–0.76). In addition, firm size is correlated with export orientation (–0.65) and the capital–labor ratio (0.68). These statistical relationships are consistent with observations that export-oriented firms are smaller and use more labor-intensive technologies.

[11] The years in which *OFDI/GDP* fell short of the benchmark value but where the preceding and subsequent years' values were high, were also designated as *OFDI/GDP* = 1 year. This "loose" definition was adopted so as to take into consideration the lagged effects of outward flow of investment on the wage determination process in a given industry. The regression results reported in Table 4 were found to be not sensitive to the use of either the loose definition of this variable over the rigid one or a dichotomous definition over a continuous one.

[12] Comparison of Taiwan's official data on approved overseas investment with the host country figures indicates that the former figures are substantially lower. Owing to underreporting of overseas investment by small and medium-sized enterprises, in some years the investment total reported in Taiwanese statistics equals only *five* percent of the host government figures on incoming Taiwanese investment (San 1992)!

[13] Labor productivity is an alternative variable to capital intensity. The correlation coefficient between the two variables over the 1984–93 period is 0.98, and in alternative regressions they yield very similar results. Here, only the results based on regressions that include capital intensity are reported.

[14] The effects of this program may be seen in the rise of both the proportion of women who are employed as unpaid family workers and the share of women among unpaid family workers. The share of unpaid family workers among women employed in the manufacturing industry rose from a low of 4.6 percent in 1981 to 7 percent in 1990 (where it also stood in 1996). Likewise, the share of women among unpaid family workers in manufacturing rose from a low of 55.4 percent in 1976 to 72 percent in 1990 (and 77 percent in 1996) (Cheng and Hsiung 1994, and author's calculations based on DGBAS 1991, 1997).

[15] I identified these sectors on the basis of household survey data reported in DGBAS (1991). Among the twenty-two industries, the industries where the size of the female reserve supply of labor is greater than 10 percent are the food, wood products, printing, basic metals, fabricated metals, machinery, and miscellaneous manufacturing industries. In 1990 the proportion of female reserve supply was 25 percent in fabricated metals, 21 percent in food, 19 percent each in printing and machinery, 12 percent in wood products, and 11 percent each in basic metals and miscellaneous manufacturing. The female reserve ratios calculated for 1996 (which falls beyond the period used in the regression analysis) also yield the same set of industries (with the exception of miscellaneous manufacturing), as having a sizable share of female reserve labor (DGBAS 1997).

[16] The empirical model does not include the usual controls for labor quality due to the lack of industry-level data on average worker characteristics. Published gender-differentiated education data for Taiwan, for instance, are available only for the country as a whole and therefore it is not possible to determine the industry-level variability of educational attainment and its impact over these years. Nonetheless, I estimated another set of regressions (without year fixed effects) that includes average years of schooling of men and women. This specification yielded schooling as a highly significant variable but did not alter the results otherwise. This suggests that the year fixed effects adequately capture the impact of rising educational level over the period under consideration (see note 6). The results of this alternative specification are available from the author upon request.

[17] If female share and export-orientation are influenced by the male and female wage rates, then the model may be subject to simultaneity problems. In view of this possibility, I estimated alternative regressions using one-period lagged values of female share and export orientation (instead of their current values). This

alternative specification did not alter the results reported in Table 4, which suggests that a serious simultaneity problem does not exist. The results of this alternative specification are available from the author upon request.

[18] All estimated coefficients, except *OFDI/GDP*, are statistically significant at least at the 90 percent probability level.

[19] Note that the estimated coefficients are statistically significant despite the relatively high correlation coefficients between export orientation, capital–labor ratio, and firm size noted earlier (see note 10).

[20] Again, all estimated coefficients, except *OFDI/GDP*, are statistically significant at least at the 90 percent probability level.

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