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Can *Maquila* Booms Reduce Poverty?

Evidence from Honduras

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Abstract

This paper identifies and estimates the strength of the reduction in poverty linked to improved opportunities for women in the expanding *maquila* sector. A simulation exercise shows that, at a given point in time, poverty in Honduras would have been 1.5 percentage points higher had the *maquila* sector not existed. Of this increase in poverty, 0.35 percentage points is attributable to the wage premium paid to *maquila* workers, 0.1 percentage points to the wage premium received by women in the *maquila* sector, and 1 percentage point to employment creation. Given that female *maquila* workers represent only 1.1 percent of the active population in Honduras, this contribution to poverty reduction is significant.

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I. Introduction

Honduras made progress toward reducing poverty between 1991 and 2006, with the proportion of the population living in extreme poverty falling from 61.5 percent to 47.5 percent. This large decrease in extreme poverty was almost entirely explained by progress in urban areas, where the headcount ratio fell from 52.2 percent in 1991 to 27.9 percent in 2006.[1] Between 1991 and 2006, 6 percent of the population in Honduras left rural areas in search of a better life in the cities; by 2006, 54 percent of the population lived in rural areas, down from 60 percent in 1991. Despite this decline, the fortunes of those left behind did not change much, with the incidence of extreme poverty in rural areas remaining at a high level of 65 percent throughout the period.

Poverty reduction had been taking place in a period of unstable and relatively low economic growth, with per capita income growing at an average annual rate of just 0.9 percent between 1990 and 2005. During this period Honduras' external sector experienced major shocks, the most important being the preferential trade agreement with the United States. Preferential access to the U.S. market translated into annual rates of export growth of 2.7 percent. Export growth was led mainly by the manufacturing *maquila* sector, whose value added (in U.S. dollars) grew at an average rate of 33 percent a year between 1990 and 2006.[2]

A special feature of the *maquila* sector in Honduras is the gender-biased nature of its employment mix: during the 1991–2006 period, close to 7 out of 10 *maquila* employees were women. Given the close relation between the performance of the sector and women's income, this study explores how gender shapes the relationship between trade expansion and poverty. It tests the hypothesis that the reductions in poverty attributed to the *maquila* expansion are, to a certain extent, explained by gender effects.

The paper is organized as follows. The next section presents an overview of the Honduran economy between 1991 and 2006. It describes the country's macroeconomic performance, poverty and inequality indicators, and trends in international trade in general and the *maquila* sector in particular. The following section describes the methodology used to identify the poverty impact of an expansion in the *maquila* sector as well as the gender effects embedded in this relation. The third section presents the results. The last section summarizes the paper's main findings.

II. Trade Expansion and Poverty Alleviation in Honduras, 1990–2006

This section includes a brief description of international trade and its composition, the importance of the *maquila* industry, and poverty trends in Honduras since 1990. The data suggest that the increasing integration with international markets, and its potential poverty-alleviating effect, is associated with Honduras' trade-liberalizing policies.

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1. Authors' computations based on data from INE (2006).
2. A manufacturing firm is defined as a *maquila* when it operates within a fiscal regime that allows it to import intermediate goods on a duty-free or tariff-free basis, process or assemble them (labor value-added), and then reexport the final good, usually to the originating country.

2.1 Trade Policy and the Booming Maquila Sector

In 1990, Honduras began the implementation of pro-trade reforms by unilaterally reducing tariffs and in 1994 it joined the General Agreement on Tariffs and Trade (GATT). The multilateral agreement became the base for Honduras' trade policy granting, at least, Most Favored Nation (MFN) treatment to all its trading partners. Honduras is an active member of the Central American Common Market. It has signed about a dozen bilateral investment treaties and free trade agreements with countries including Canada, Colombia, Chile, the Dominican Republic, Mexico, Panama, Switzerland, Taiwan (China), and the United States. Trade-oriented policies continue to be at the center of the development agenda in Honduras, which is participating in the negotiation of a trade agreement between the European Union and Central America.

Figure 1 Trade Openness in Honduras, 1990–2006
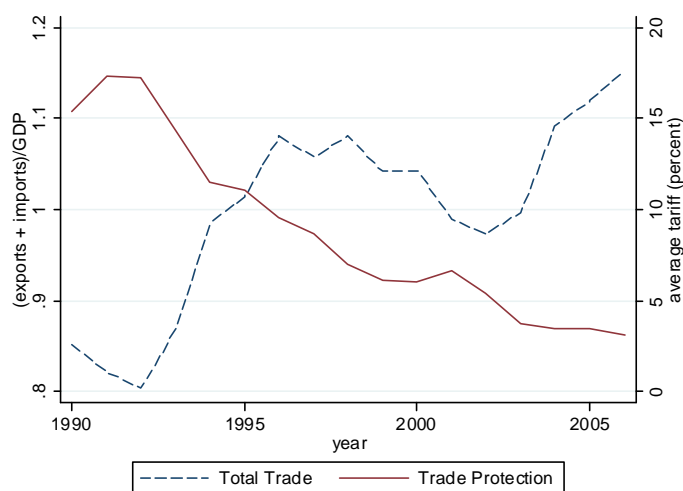
Source: Authors, based on data from the Banco Central de Honduras and Secretaría de Finanzas.

As a result of trade policy, the Honduran economy is developing into a more open and liberalized economy. Its tariff structure is low and more uniform than it used to be, and the application of nontariff measures is very limited (figure 1). The simple average of implicit tariff rates decreased from more than 16 percent in 1991–92 to about 3.3 percent in 2005–06.[3] In 2002, after the damaging effects of Hurricane Mitch, international trade supported a rapid recovery led by the exports of *maquila* manufacturing and agroprocessing industries.

Between 1999 and 2006, exports and domestic markets became more diversified and employment and investment (domestic and foreign) grew, particularly in some nontraditional export activities. The United States remains the country's principal trading partner, with Central America, particularly El Salvador and Guatemala, representing the second-most important market. The European Union is third, with exports to Germany particularly high. In recent years, exports to Mexico and Canada have also increased significantly.

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3. The average implicit tariff was calculated as import tariff revenue/imports fob, excluding oil.

Table 1 Dynamic Performance of the *Maquila* Sector in Honduras, 1990–2006

Measure	1990	1995	2000	2001	2002	2003	2004	2005	2006
Number of firms	24	135	218	230	252	273	294	306	313
Number of employees (thousands)	9.0	55.0	106.5	94.4	105.5	114.2	119.9	125.2	130.1
Average annual wage (current US dollars)	656	1,456	3,142	3,210	3,041	3,358	3,447	3,669	3,829
Value added (current US dollars, in millions)	16.2	162.7	575.4	560.0	612.8	710.0	815.3	969.2	1,062.2

Source: Authors, based on data from Banco Central de Honduras.

Maquila has become the single most important export activity in Honduras. In 2006 it represented 27 percent of total exports of goods and services, up from virtually zero in 1990. Between 1990 and 2006, the value added of exports by the sector rose from $16.2 million to $1,062.2 million, growing at an impressive average annual rate of 33 percent (table 1). The percentage of total exports accounted for by the *maquila* sector rose from 1.5 percent in 1990 to 26 percent in 2006 (figure 2). During the same period, the share of traditional export crops, such as coffee and bananas, declined from 51 percent to 16 percent. In contrast to the sluggish evolution of coffee and bananas, exports of other nontraditional products— particularly farmed shrimp, minerals, palm oil, and other agroindustries—expanded.[4]

Figure 2 Composition of Exports in Honduras, 1990–2006
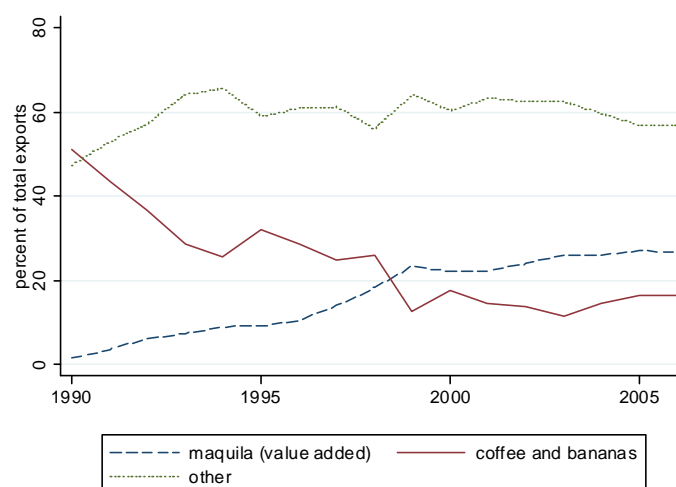
Source: Authors, based on data from the Banco Central de Honduras

The unilateral trade preference conceded by the United States under the Caribbean Basin Initiative, established in 1983, and a variety of other factors (such as logistics, abundant and low

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[4] For an estimation of the ex-ante poverty effects of trade liberalization in Honduras focusing on the agricultural sector, see República de Honduras (2005).

cost of labor, and the granting of export incentives) consolidated Honduras as a major exporter of textiles and apparel to the United States.[5] In 1995 the value added of the *maquila* industry represented 2.2 percent of GDP and 14.5 percent of total manufacturing production; by 2006 the sector accounted for 6.5 percent of GDP and 36.3 percent of manufacturing production (Banco Central de Honduras 2007). During this period the number of *maquila* firms more than doubled, the number of employees working in the sector increased 140 percent, and average annual wages in the sector rose from $1,454 to $3,823 (see table 1). In 2001 the expansion of the *maquila* sector came to a halt, mainly as a result of the slowdown in the U.S. economy. The sector resumed growth in subsequent years.

Honduras' *maquila* sector is highly concentrated in the production of textiles and apparel. In 2006, 313 firms belonged to the sector, 51 percent of which produced textiles and apparel. These firms employed 77.2 percent of the total workers in the *maquila* sector. The rest of the *maquila* sector is made up by firms engaged in manufacturing electronic components for automobiles, furniture, and wood products (23.3 percent of all firms); trade-related activities, such as the import and sale of spare parts for machinery (18.8 percent); and services, such as data processing (6.7 percent) (Banco Central de Honduras 2007).

2.2 Poverty and Workers in the Maquila *Sector*

In 1990 more than 60 percent of Honduras' population lived in rural areas; by 2006 this figure had fallen to 54 percent. Over the same period, GDP grew at the moderate annual rate of 3.2 percent, and the average annual increase in per capita household expenditure was 0.4 percent. Although Honduras' growth achievements are far from remarkable and disparities in the distribution of income are growing, the proportion of the population classified as poor fell almost 13 percentage points between 1991 and 2006 (table 2).

Notwithstanding a nationwide reduction in the poverty rate, there has been little poverty alleviation in rural areas, particularly in the number of households below the extreme poverty line.[6] In contrast, urban areas in Honduras have made substantial progress against poverty, with the extreme poverty headcount ratio plummeting from 52.2 percent in 1991 to 27.9 percent in 2006.

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5. For a brief description of the main factors behind the increase in Honduras' *maquila* exports, see annex 1.
6. People in rural areas, particularly poor small-scale farmers, were seriously affected by Hurricane Mitch.

Table 2 Poverty Headcount Ratio and Gini Coefficient in Honduras, 1991–2006 (percent)

Welfare measure	1991	1995	2001	2006
Extreme poverty				
Rural	68.0	65.1	69.2	65.1
Urban	52.2	41.9	32.7	27.9
National	61.5	55.1	51.2	47.5
Moderate poverty				
Rural	80.3	75.6	78.1	73.6
Urban	79.4	74.4	63.5	59.6
National	79.9	75.1	70.9	67.0
Gini coefficient				
National	52.4	55.5	56.6	58.6

Source: Authors' computation based on data from EPHPM.

How much of the significant reduction in poverty can be explained by the *maquila* boom? The answer depends on the proportion of households in the neighborhood of the poverty line whose incomes depend on the *maquila* sector, the change in real wages of *maquila* workers living in households near the poverty line, and the possibility for people near the poverty line to get jobs in the *maquila* sector. The share of Honduras' workforce working in the *maquila* sector increased from 1.3 percent in 1991 to 4.4 percent in 2006; during this time the prevalence of poverty among *maquila* workers fell 22 percentage points (from 54.6 percent to 32.9 percent or 40.0 percent), an achievement well above the national level (table 3). This is an indicator that the overall poverty reduction documented in table 2 was at least partly caused by fast-growing labor participation and earnings in the *maquila* sector. The potential contribution of the *maquila* sector to poverty alleviation in Honduras is significant: in 1991, only 3.3 percent of the total households above the poverty line had a member working in *maquila*, in 2006 this proportion increased to 10.8 percent. This is hardly surprising given the high number of employment created in the *maquila* industry which had a direct positive income effect for those workers that found a job in this sector and an indirect effect via the general equilibrium wages in the economy (table 3).

Table 3 *Maquila* Performance and National Poverty Rates, 1991–2006

Item	*1991*	*1995*	*2001*	*2006*
Total number of workers in *maquila*	19,400	45,327	90,016	106,501
Percentage of active population working in *maquila*	1.3	2.6	4.3	4.4
Percentage of *maquila* workers living under the poverty line	54.6	58.0	37.6	32.9
Percentage of nonpoor households with family member working in *maquila*	3.3	4.4	10.7	10.8

Source: Authors' computation based on data from the EPHPM with the moderate poverty line set by INE.

An important component of the welfare effect brought about by an increase in the *maquila* sector activity is given by its capacity to create new jobs. The proportion of total employment in the *maquila* sector increased steadily beginning in 1991 (table 4). Although the change in the gender mix in the sector favored men, still in 2006 more than half of all *maquila* workers are women. Two other important aspects highlighted by table 4 are the increase in the working-age population and the increase in underemployment. These trends suggest that the Honduran economy was unable to create the new jobs needed to satisfy the demographically driven increase in labor supply, contributing to the proliferation of part-time jobs, most of which are in the informal sector. In addition, unable to find jobs in their home country, many young Hondurans have migrated, mainly to the United States.

Table 4 Labor Participation and the *Maquila* Contribution, 1991–2006 (percent)

Item	1991	1995	2001	2006
Working-age population (15–65)	51.7	52.1	53.4	56.1
Of which: Active population	59.4	61.0	60.8	58.3
Of which: Employed	81.1	76.3	78.5	75.1
Men in *maquila*	0.5	0.9	1.9	2.7
Women in *maquila*	1.1	2.4	3.5	3.1
Underemployed	14.4	19.4	17.1	22.6
Unemployed	4.5	4.3	4.3	2.3

Source: Authors' computation based on data from EPHPM.

III. Methodology

The trade reforms introduced in Honduras during the 1990s could be seen as an external shock redistributing resources to the *maquila* sector. Redistribution of productive factors is given through price mechanisms (that is, increases in labor demand in the *maquila* sector causes a rise in the relative wages of labor, an increase in labor participation, or both in that sector). The poverty impact of the changes brought about by trade reform can be analyzed using the empirical framework developed in this section.[7]

Household h is defined as poor if its per capita household income (or expenditure), y_h, is below a predetermined poverty line, z. At the national level, poverty indices can take into account the proportion, depth, and severity of poverty. These three aspects of poverty (the poverty headcount, the poverty gap, and the distance from the poverty line) are estimated using the poverty measures developed by Foster, Greer, and Thorbecke (1984):

$$P_\alpha = \frac{1}{N} \sum_{h=1}^{N} \left(\frac{z - y_h}{z} \right)^\alpha \qquad \forall (y_h \leq z) \tag{1}$$

where N is the total population and α is a parameter that penalizes the differences between the income of the poor and the poverty line. Let us define the income of household h as the sum of incomes of all household members derived from various sources:

$$y_h = \frac{Y_h}{G_h} = \sum_{g=1}^{G} w_{g,h} + Y_h^o \tag{2}$$

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7. A similar methodology, with an application to Mexico, can be found in Artecona and Cunningham (2002) and De Hoyos (2005 and 2006).

where $w_{g,h}$ is the wage of member g in household h and Y_h^o represents income from other sources of household h. Hence y_h measures per capita household disposable income, the welfare measure used here. The *maquila* sector is linked to household welfare—and hence poverty—by changes in wages and employment attributable to the sector's performance. Following human capital theory, the log of wages is defined as a function of personal characteristics and a random component. In order to identify the conditional gender wage gaps and the wage effects accounted by the *maquila* sector, we introduce a dummy variable for women and for workers in *maquila*:

$$\ln(w_i) = \sum_j \beta_j x_{i,j} + \delta_1 D_w + \gamma D_m + \varepsilon_i \ . \tag{3}$$

According to equation (3), the wage of worker i is a function of j personal characteristics, $x_{i,j}$; a dummy variable, D_w, which takes the value 1 when the worker is a women; a dummy variable for workers in the *maquila* sector, D_m; a set of parameters; and a random component, ε_i.[8] To test the hypothesis that part of the relation between the *maquila* expansion and poverty operates through gender, let us decompose the impact from *maquila* to wages and express this as a linear function of gender:

$$\frac{\partial \ln(w_i)}{\partial D_m} = \gamma = \delta_2 + \delta_3 D_w \ . \tag{4}$$

Substituting equation (4) into equation (3) yields

$$\ln(w_i) = \sum_j \beta_j x_{i,j} + \delta_1 D_w + \delta_2 D_m + \delta_3 D_w D_m + u_i . \tag{5}$$

Parameters δ_1 and δ_2 in equation (5) measure the gender and *maquila* premium, respectively; δ_3 captures the wage effects of the *maquila* sector (over and above the gender impacts) that operate through gender. An alternative interpretation for the interactive effect, δ_3, can be found in the economics of discrimination literature, which posits that the gender wage gap tends to be smaller in export-oriented sectors (Becker 1971). The gender wage gap is linked to the export-oriented *maquila* sector by the increased competition brought about by trade integration (Artecona and Cunningham (2002), Arbache and Santos (2005)). The interactive effect, δ_3, is equal to the difference in the gender wage gap in and out of the *maquila* sector (table 5)**.** If the *maquila* sector is more competitive (and hence employers care more about workers' productivity rather than the gender) and there is some degree of discrimination in the labor market, the wage gap between male and female workers in the *maquila* sector should be smaller than in other sectors; δ_3 should thus be greater than zero.

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[8] Given data restrictions, the textile and apparel industry is used as a proxy for *maquila* sector. In 2006, the textile and apparel industry concentrates 77 percent and 79 percent of the total labor force and value added of the *maquila* sector, respectively (Banco Central de Honduras 2007). For more details see Annex 2.

Table 5. Wage Premia by Subgroup

Item	Sector of employment	
	Maquila	*Non*-maquila
Men	δ_2	Control
Women	$\delta_1 + \delta_2 + \delta_3$	δ_1
Wage gap (men/women)	$-(\delta_1 + \delta_3)$	$-\delta_1$

Source: Based on equation 5

The excluded category in equation (5) is men outside the *maquila* sector; the three parameters capturing the gender, *maquila,* and interaction effects are interpreted as shifts in wages with respect to this control group. To clarify these effects, we show the wage premia assigned by equation (5) to the different population subgroups. A woman working in the *maquila* sector, for example, will receive a market premium equal to $\delta_1 + \delta_2 + \delta_3$ (with respect to men outside the *maquila* sector) controlling for the market remuneration to her personal characteristics $\sum_j \beta_j x_{i,j}$.

The wage premium of women working in the *maquila* sector with respect to women in the other sectors will be equal to $(\delta_1 + \delta_2 + \delta_3) - \delta_1 = \delta_2 + \delta_3$.

So far the analysis has not incorporated any time dimension. As noted earlier, from a theoretical point of view, trade reforms can be seen as a shock redistributing resources across the different sectors of the economy. This redistribution process is concomitant to price changes or changes in market returns to personal characteristics. We are interested in the welfare effects brought about by change in *maquila* employment, the change in the premia given to workers in the *maquila* sector, changes in the overall gender gap, and in particular the interactive effect capturing the gender wage gap differential between the export-oriented sector and other sectors. The change in the wage premia can be easily measured by introducing a time dimension to equation (5). Define t as time dummies, and redefine $D_w = D_1$, $D_m = D_2$, and $D_w D_m = D_3$ as follows:

$$\ln(w_i^t) = \sum_{j=1}^{J} \beta_j x_{i,j}^t + \sum_{k=1}^{3} \delta_k D_k^t + \sum_{t=2}^{T} \phi_t t + \sum_{k=1}^{3} \sum_{t=2}^{T} \lambda_k^t D_k^t t + v_i^t \ . \tag{6}$$

The first term on the right-hand side of equation (6) captures the returns to personal characteristics; the second term captures the effects shown in table 5; the third term shows time controls; the fourth term allows for time-varying gender, *maquila,* and interactive effects; and the last term is a normally distributed random component. Parameters λ_k^t (called difference-in-difference estimators) reveal how the premia shown in table 5 vary over time.[9] If the trade

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9. In strict sense, these are triple difference estimators, because they capture differences between men and women, between workers inside and outside of the *maquila* sector, and over time.

reforms in Honduras had a greater positive effect on women in the *maquila* sector (making their real wages increase faster than wages in other categories over time), λ_k^t should be significantly different from zero and positive.

IV. Results

The poverty effects of a boom in the *maquila* sector are estimated using data from the Encuesta Permanente de Hogares de Propósitos Múltiples (EPHPM)—Honduras' nationally representative household survey—for 1991, 1995, 2001, and 2006. The time span covered by these surveys (1991–2006) captures a period of significant tariff reduction and strong growth of the *maquila* industry (see figure 1).

All of the regression results for the four specifications of equation (6) account for EPHPM's survey design (that is, clustering, stratification, and expansion factors on point estimators and standard errors); all of the results presented show heteroskedastic-robust standard errors and control for year and industry fixed effects (table 6).[10] The first specification shows the result of a standard human capital equation, with the log of wages a function of years of schooling and its squared form, experience and experience squared, and a dummy variable for urban workers. The results of this specification are as expected. One additional year of schooling yields a 10 percent increase in wages; experience has a positive, though marginally decreasing, effect on earnings; and urban wages are about 16 percent higher than rural wages. Female wage-earners in Honduras earn 27 percent less than men, once observable characteristics are taken into account. Regardless of their gender, *maquila* workers earn a conditional wage premium of 31 percent over workers outside the sector. These results are robust, both qualitatively and quantitatively, to differences in model specification.

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10. The industries included are mining; manufacturing; electricity, gas, and water; construction; commerce; restaurant and hotels; transport and communication; financial services; and other services. The excluded category is the agricultural sector.

Table 6. Regression Results

Item	Specification 1	Specification 2	Specification 3a	Specification 3b
Core variable				
Schooling	0.0953**	0.0954**	0.0956**	0.0956**
Schooling squared	0.0020**	0.0020**	0.0019**	0.0019**
Experience	0.0192**	0.0185**	0.0185**	0.0185**
Experience squared	–0.0000**	–0.0000**	–0.0000**	–0.0000**
Urban dummy	0.1630**	0.1632**	0.1635**	0.1635**
Maquila and women control				
Women dummy (δ_1)	–0.2710**	-0.2871**	-0.3684**	—
Maquila dummy (δ_2)	0.3139**	0.2157**	0.2276**	—
Women * *maquila* (δ_3)		0.1664**	0.2578**	—
Dynamic effects				
Women				
1991			—	-0.3684**
1995			0.0447	-0.3237**
2001			0.0727**	-0.2957**
2006			0.1650**	-0.2034**
Maquila				
1991			—	0.2276**
1995			–0.1815*	0.0461
2001			0.0117	0.2393**
2006			0.0367	0.2643**
Women * *maquila*				
1991			—	0.2578**
1995			0.0799	0.3377**
2001			–0.0742	0.1836**
2006			–0.2280**	0.0298
Year controls	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes
Constant	6.4083**	6.4260**	6.5318**	6.1634**
R-squared	0.47	0.47	0.47	0.47

* Significant at 5 percent; ** significant at 1 percent. *Note*: The dependent variable is the log of wages. Schooling is measured as the years of formal education. Industry controls include dummy-variables for each of the nine industries at the one-digit level of industrial aggregation; the agricultural sector was chosen as the base category. Specifications 3a and 3b are two different ways of presenting the same equation. Sample size is 43,268.

The second specification includes three dummy variables capturing the gender wage gap, a *maquila*-specific wage premium, and a premium associated with women in the *maquila* sector, respectively. Recall that the interactive term measures the difference in the gender wage gap inside and outside the *maquila* sector. Between 1991 and 2006, women earned average wages that were 28.7 percent lower than those of men. The average wage of workers in the *maquila* sector was more than 20 percent higher than those of workers outside the sector. Controlling for observable characteristics, female workers in the *maquila* sector earned 9.5 percent (≈ –28.7 +

21.6 + 16.6) more than men working outside the *maquila* sector and 38 percent ($\approx$ 28.7 + 9.5) more than women working outside the sector (table 7).[11]

Table 7 Wage Premium Results from Specification (2) (percent)

Item	Maquila	*Non-maquila*
Men	$\delta_2 = 21.5$	Control
Women	$\delta_1 + \delta_2 + \delta_3 = 9.5$	$\delta_1 = -28.7$
Wage gap (men/women)	$-(\delta_1 + \delta_3) = 12$	$-\delta_1 = 28.7$

Source: Authors' estimates. Note: All the parameters are significant at the 1 percent level.

The results for specification 2 reveal another important feature of the *maquila* sector: the fact that the gender wage gap is 16.6 percentage points smaller than the gap observed in industries outside the sector. For this reason, the increase in the importance of the *maquila* industry in total employment had a gender-equalizing effect.

The wage premia shown in table 7 are the average over the entire period of analysis; these estimates do not consider any time dimension, as observations from the four household surveys are pooled in a single sample. One of the hypotheses outlined earlier was that the *maquila* boom of the 1990s resulted in a growing wage premium for workers in the sector. To test this hypothesis, we formulate specification (3a) in table 6, which allows for dynamic effects (the wage premia related to gender, the *maquila* sector, and the interaction between this two can take different values over time). All the time-interacting terms, or difference-in-difference (DID) estimators, take 1991 as the base year, capturing the change in the parameter over time with respect to the initial year. Consider first the DID estimator for the premium received by workers in *maquila*. The lack of statistical significance for this estimator indicates that the *maquila* premium remained constant during the time period analyzed here, except in 1995. This is not the case for the gender wage gap, which decreased over time (significantly so in 2001 and 2006). The reduction in the gender wage gap outside the *maquila* sector partly explains the lack of significant dynamic effects on wage premia for women working in *maquila*. In fact, the DID estimator on the interactive term is negative and significant in 2006, implying that women did not receive an extra wage premium for working in the *maquila* sector in 2006 (that is, the gender wage gap was the same in and out of the *maquila* sector).

The lack of significant dynamic effects deserves some explanation. Although the results on *maquila* wage premia suggest some level of labor market segmentation, a minimum degree of labor mobility would be enough to offset any long-term trend in wage differentials between the *maquila* and other sectors. As shown by the identical specifications (3a) and (3b), *maquila* workers earned wages that were about 24 percent higher than workers outside the sector in all

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11. Consider the case of a woman employed outside the *maquila* sector. According to specification 2 of table 6, she earns 28.7 percent less than. Because she is not working in the *maquila* sector, she does not benefit from the 9.5 percent premium that women in the sector enjoy. Therefore, on average a woman employed outside the sector earns 38 percent less than a woman employed in the sector.

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years but 1995. This differential may be enough to attract the workers the industry needs, creating no incentives for entrepreneurs to raise it over time. With some labor mobility, the trade-mandated increase in female labor demand would not only manifest itself as an increase in wages of women in the *maquila* industry but also expand to the rest of the economy, thereby reducing the overall gender wage gap. The long-term reduction in the gender wage gap (which had fallen 7.3 percent from the 1991 baseline by 2001 and 16.5 percent by 2006) can thus be at least partly explained by an increase in female labor demand in the *maquila* sector.

4.1 The Poverty Impact of a Growing Maquila Sector

To measure the poverty effects of the *maquila* boom documented above, we construct a distribution of hypothetical household per capita income that captures what the poverty level in Honduras would have been if the *maquila* industry had ceased to operate in any given year. The short-term income effect of a sudden elimination of the sector can be decomposed into two separate impacts: wage premia and employment. This section presents two simulations, one examining what the poverty level in Honduras would have been had the *maquila* industry not paid a wage premium and one examining what the poverty level would be if all *maquila* jobs had been eliminated. These counterfactuals illustrate the short-term poverty impact of income changes originating in the *maquila* sector. We ignore the long-term or general equilibrium effects of the *maquila* boom.[12]

To formalize the simulation process, we redefine equation (2) in terms of the results from specification (4) in table 6:

$$
\begin{aligned}
Y_h &= \sum_{g=1}^{G} w_{g,h} + Y_h^o \\
w_i^t &= \exp\left\{ \sum_{j=1}^{J} \hat{\beta}_j x_{i,j}^t + \sum_{t=2}^{T} \hat{\phi}_t t + \sum_{k=1}^{3} \sum_{t=1}^{T} \hat{\lambda}_k^t D_k^t t + \hat{v}_i^t \right\}
\end{aligned}
\qquad (7)
$$

The wage equation in equation (7) allows for different gender, *maquila*, and *maquila*–gender effects for each year.[13] Hypothetical wages can be constructed based on expression (7), assuming that, say, the premia for workers in the *maquila* sector, λ_2^t $t = (1991, 1995, 2001, 2006)$ are equal to zero or that wages for all *maquila* workers are set to zero. In 1991, for example, the simulated wages for workers in the *maquila* sector would have been 22.7 percent lower than their observed level (see specification 3b in table 6). Adding the simulated wages to the exogenous household incomes (Y_h^o) and dividing this by the number of household members yields the simulated household per capita incomes, $y_h^t = Y_h^t / G_h$. These values are use to compute hypothetical poverty indices:

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[12] Using a dynamic CGE model, Morley, Nakasone, and Piñeiro (2007) estimate the ex-ante general equilibrium poverty effects of CAFTA in Honduras.

13. The wage equation in equation (7) includes the estimated individual-specific residuals $\hat{v}_i^t$ using the results from specification 3a in table 6.

$$P_\alpha^t = \frac{1}{N} \sum_{h=1}^{N} \left(\frac{z - y_h^t}{z} \right)^\alpha \qquad \forall (y_h \leq z). \qquad (8)$$

The difference between the observed and simulated poverty, $P_\alpha^t - P_\alpha$, can be thought of as the amount of poverty reduction attributed to the *maquila* premia, employment, or both, depending on the simulation.[14] Because both the *maquila* premia and the jobs created by this sector had positive income effects, it will come as not surprise that these impacts reduce poverty. The aim of the exercise is to quantify the importance of the *maquila* industry for poverty alleviation in Honduras.

Three simulations are run, two of which capture the poverty effects attributable to the *maquila* wage premia (as shown in specification 3b in table 6) and one of which creates a hypothetical world in which Honduras had no *maquila* jobs. In the first simulation, the year-specific *maquila* sector wage premia are subtracted from wages of all *maquila* workers (table 8). This counterfactual captures the difference between the observed poverty headcount and the headcount ratio that would have prevailed in Honduras had *maquila* workers not enjoyed a premium like the one shown by specification (3b) in table 6. The second simulation captures the poverty effects of the *maquila* sector wage premium, including its effect through gender. In this simulation both sets of *maquila* premia (the *maquila* effect and the *women*maquila* effect in table 6) are subtracted from the wages of women in the *maquila* sector.[15]

Table 8. Estimated Poverty Headcounts in the Absence of *Maquila* Effects, 1991–2006

Headcount ratio	1991	1995	2001	2006
Actual	79.9	75.1	70.9	67.0
Without *maquila* premium	80.0	75.1	71.5	67.6
Without *maquila* and gender premia	80.1	75.3	71.6	67.6
Without premia and *maquila* employment	80.5	75.9	73.0	69.4

Source: Authors' estimates. *Note*: Poverty is measured using a moderate poverty line. Simulations are based on estimated parameters from specification (3a) in table 6.

Given that all parameters measuring wage premia in the *maquila* sector are nonnegative, it is not surprising that eliminating them increases poverty. If the *maquila* sector had not paid a premium, the moderate national poverty headcount in 2001 would have been 71.5 percent instead of the observed level of 70.9 percent; if the premium enjoyed by women in the *maquila* sector had also been eliminated (together with the interaction effect), the poverty headcount would have risen to

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[14] Nicita and Razzas (2003) estimate a model with enough economic structure to capture the employment effects associated with a boom in the textile and apparel industry. The authors find that for each new job created in the textile industry, 4.5 individuals experience an increase in their purchasing power.

15. Because only significant parameters were taken into account in this microsimulation, the *maquila* effect in 1995 is equal to zero.

71.6 percent. By itself the *maquila* premium accounted for 0.31 poverty points in the national poverty level (0.44 when allowing for gender-specific effects).

Figure 3. Percentage of Total Poverty Headcount Attributable to Various Factors
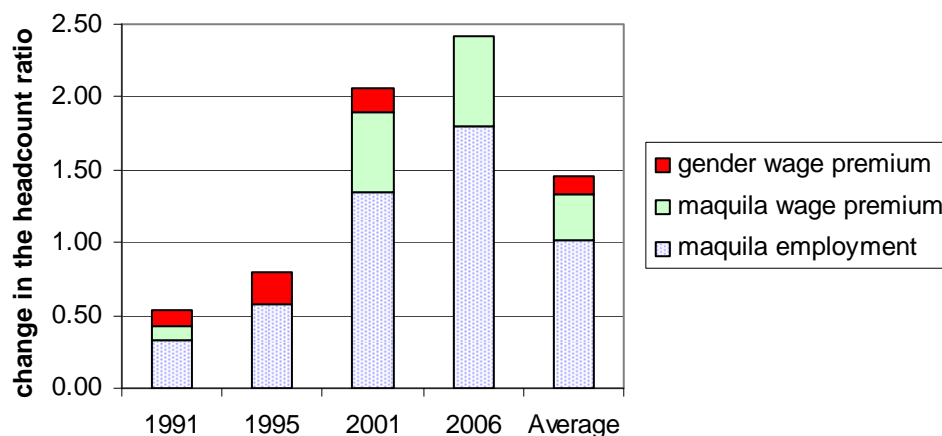
Source: Authors simulations, based on estimation results from specification 3a in table 6. *Note*: Percentages are computed as the marginal difference in the poverty headcount shown by the cumulative effects displayed in table 8.

A third simulation captures the cumulative poverty effects of *maquila* premia and employment. This simulation sets the wage of all *maquila* workers equal to zero in order to produce a rough idea of how important the *maquila* sector is for poverty alleviation in Honduras.[16] The results show that had there been no *maquila* jobs in Honduras in 2001, the moderate poverty headcount would have been almost 2 percentage points higher on average (73.0 percent instead of 70.9 percent).

The results presented in table 8 are complemented by the presentation of the marginal contribution of each component (*maquila*, *maquila**women, and employment) shown in figure 3.[17] On average the *maquila* sector accounts for almost 1.45 percentage point reduction in the poverty headcount, of which 1.00 point is attributable to employment creation, 0.35 points to *maquila* wage premium, and 0.10 to the wage premium of women working in the *maquila* sector.

These poverty effects seem rather small. One has to bear in mind, however, the limited impact of the *maquila* sector for overall household income. Wages paid in the *maquila* sector account for less than 4 percent of total household income in Honduras. Furthermore, the incidence of poverty among *maquila* workers is lower than the national average (see table 3). Finally, as shown by the

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16. This simulation is not a counterfactual of how the Honduras economy would have looked in the absence of a *maquila* sector. Creating such a scenario would require estimates of the general equilibrium effects of the sector. Therefore this simulation should be seen as an upper bound estimate of the poverty reduction effects of the maquila boom.

17. The poverty effects attributable to the different components are equal to the marginal difference in the poverty headcount shown by the cumulative effects presented in table 8. There is an obvious problem of path dependency in our simulations.

results of the dynamic model, the premia paid in the *maquila* sector did not increase as a result of the boom. These factors explain why the reduction of poverty attributable to the additional premium paid to workers in the *maquila* sector (including the women's premium) is on average less than 0.5 percent.

Over time this premium contributed more and more to poverty reduction: in 1991 it accounted for 0.2 percent of the decline in poverty; by 2006 it had contributed 0.6 percent. Expansion of the *maquila* sector means that more people benefit from the additional gender-*maquila* premia and more individuals escape poverty. Although the *maquila* boom of the 1990s did not have a significant effect on wage premia, given the jobs it created, particularly jobs for women, it certainly helped alleviate poverty in Honduras.

V. Conclusions

Between 1990 and 2006, Honduras experienced significant poverty reduction and a booming *maquila* sector, a sector intensive in the employment of female workers. This paper identifies and estimates the strength of the reduction in poverty caused by the improved opportunities the expanding sector offered to women.

The analysis shows that after controlling for observable characteristics, workers in the *maquila* sector earned wages that were about 30 percent higher than those of workers outside the sector. This gap was fairly stable overtime. Firms in *maquila* sector appear to be less discriminatory, as suggested by a gender wage gap that is 16 percent smaller than the gap outside the *maquila* sector.[18] This result is in line with the literature on labor market discrimination, which posits that firms operating in more competitive product markets should be less discriminatory in their hiring or remunerating policies. Given its intensity in the use of female labor, the expanding maquila sector contributed to the economy-wide reduction in gender wage gap in Honduras.

A simulation exercise shows that, at a given point in time, poverty in Honduras would have been 1.5 percentage points higher had the *maquila* sector not existed. Of this increase in poverty, 0.35 percentage points is attributable to the wage premium paid to *maquila* workers, 0.1 percentage points to the wage premium received by women in the *maquila* sector, and 1 percentage point to employment creation. Given that female *maquila* workers represent only 1.1 percent of the active population in Honduras, this contribution to poverty reduction is significant.

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18. The difference declined in 2006.

Annex 1: Main Factors behind Expansion of the *Maquila* Industry in Honduras

U.S. Trade Preferences

Outward processing is essentially a preferential trade arrangement that exempts from import duties the value of materials from a preference-giving country used in foreign assembly (i.e. a *maquila*). The outward- processing programs in apparel and textiles under the Caribbean Basin Initiative (CBI) are among the most successful preferential trade arrangements; since the 1980s they have become an important part of U.S. apparel imports. The CBI, established in 1983, originally left in place custom duties on a small group of products, including textiles and clothing. In 1986 the United States instituted the Special Access Program (SAP), which encouraged outward-processing trade in apparel and textiles with the beneficiary countries of the CBI. It also provided preferential market access and maintained the rules of origin. In 2000 the United States adopted the Caribbean Basin Trade Partnership Act of 2000 (CBTPA), which improved preferential treatment of outward- processing apparel from CBI countries. The new act eliminated all tariffs (which averaged 5.8 percent in 1998–99) and maintained the SAP requirements of the usage of U.S.–made materials from import duties (see Skripnitchenko and Abbott 2003). The CBTPA spurred the *maquila* industry in the CBI region, offsetting the effect of "NAFTA parity."

Export Incentives, Logistic, and the Cost of Labor

The development of the *maquila* industry has been supported by a special legal framework that provides incentives such as temporary import and duty-free import on inputs for exports, originated in 1976 with the adoption of the law establishing the free zone of Puerto Cortés (Decree No. 356 of July 1976). A second law (the Decree No. 30 of December 20, 1984) created the temporary import regime. The law establishing export processing zones (Decree No. 37-87 of April 1987) enhanced the expansion of the *maquila* industry, providing incentives to develop large private industrial parks in which to establish *maquila* enterprises. Decree No. 130-98 of May 20, 1998, amended the law establishing the free trade zone of Puerto Cortés to allow the organization of free trade zones in any part of Honduras. These export-supporting schemes are subject to the disciplines of the World Trade Organization (WTO) Agreement on Subsidies and Countervailing Measures. However, as a developing country listed in Annex VII (b) of the Agreement, Honduras can apply to maintain these schemes beyond 2009 if per capita GNP does not surpass $1,000 in constant 1990 dollars for three consecutive years. Honduras' relatively short end-to-end logistic time, good facilities in free export zones, the largest port in Central America, and fairly low wages are important assets for the continued growth of Honduras' *maquila* industry. In March 2006 Honduran and U.S. authorities signed the Container Security Initiative (CSI), a partnership that should help accelerate the entry of cargo from Puerto Cortés into the United States.

The DR–CAFTA Free Trade Agreement and the WTO

The DR–CAFTA spurred the *maquila* sector in Central America. However, the January 1, 2005 inclusion of textiles and apparel in the WTO rules has resulted in declining demand in the United States for CBI outward-processing apparel, which faces strong competition from countries such as Bangladesh, China, and Vietnam. In addition, the negotiations within the deferred Doha

Round that are expected to reduce tariffs in the industrial sector (known as NAMA, for nonagricultural market access) are likely to result in the erosion of the DR-CAFTA market access preference for textile and clothing. Low, Eiermartini, and Richtering (2005) argue that Honduras will be one of the developing countries most severely affected by the erosion preferences in NAMA, indicating that an important part of the erosion would come from the textile and apparel sector.

Annex 2: Identifying Employees in the *Maquila* Industry from Honduras's Household Surveys (EPHPM)

Before 2006 the Honduras household survey (EPHPM) did not include information on maquila labor participation. This Annex shows how workers were classified into maquila versus non-maquila for years prior to 2006.

In 2006, the EPHPM shows that firms within the maquila regime and part of the textile and apparel industry are highly concentrated in few departments (or provinces) in Honduras.[19] In all years, the EPHPM reports information on employees working in the manufacture of textiles, knitting mills, or manufacture of wearing apparel, except footwear, as classify by the UN International Standard Industrial Classification of all Economics Activities, Third Revision (ISIC Rev. 3).

For years other than 2006, when the question about working in a *maquila* was not included, a worker was classified as being part of the maquila industry when the following conditions were satisfied: currently employed, employed by the private sector, working in the textile and apparel industry, working in an establishment with 10 or more workers, and located in departments where *maquila* operate.

In order to evaluate the "goodness of fit" of these criteria of classification, workers were classified into maquila and non-maquila in 2006 following the procedure described above and compared with the observed classification. In 98 percent of the cases, this procedure correctly identified workers in maquila sector also part of the textile and apparel industry giving us a high level of confidence in the approach.

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[19] The departments with a high concentration of maquila firms are: Cortes, Atlántida, Francisco Morazán, Yoro, Santa Bárbara, Comayagua.

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