Fragmentation, income, gender and poverty linkages: The case of the Maquila Industry in Guatemala

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Abstract

This article addresses the participation of Guatemala in the world apparel chain of production and its likely impact on income, gender and poverty levels. Making use of household survey data from Guatemala, the study relies on matching techniques for analyzing changes on labour earnings in the assembly industry with special emphasis on female workers.

The evidence suggests that maquila-based employees are, on average, better paid than those occupied in the reserve sector, however, the former group seems to be exposed to a less favourable working environment when compared to those employed in other manufacturing industries. Moreover, the study reveals huge income disparities in terms of gender, exacerbated, among others, by the typical patriarchal structure prevailing in the Guatemalan economy. Our results introduce reservations on the role played by the maquila model, calling for a reassessment of its likely poverty reduction effect in Guatemala.

Key words: Fragmentation of Production, Income disparities, Maquila, Matching, Guatemala

JEL classification: F15, I132, J24, J31

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Introduction

International fragmentation of production, the phenomenon in which countries participate in the production of a good but at different stages, has emerged as an important feature of economic globalisation. At the same time, its expansion has been accompanied by signs of wage deterioration of less skilled workers not only in developed economies but also in developing ones.

The issue of growing income inequality has triggered a large body of research aimed at finding its causes and contents. However, contributors to this literature have devoted little attention to the role that fragmentation might be playing as a possible explanation. Yet, economic predictions upon this issue may differ substantially, depending on the model and assumptions chosen. From a developed country perspective, for instance, a number of researchers argue that wages of unskilled-labour in developed countries have been deteriorating due to firms' practices in developed countries shifting part of their production to low-wage countries. Accordingly, Feenstra & Hanson (1995b) developed a model to explain the increase of relative wages for skilled workers in the U.S. Their model shows that any increase of the Northern capital stock relative to that of the South leads to wage increases of skilled workers in both North and South, due to the shift of production activities to the South.

The process of fragmentation, however, appears a bit more complex for a developing economy as compared to a developed one. While on the one hand, the search for outsourcing requires Northern firms to take into account several considerations to guarantee them benefiting from low production costs (such as: labour cost savings, output cyclicality and economies of scale –see Abraham & Taylor (1996), it implies, on the other hand, that the counterpart -Southern economies- will be inserted into a particular fragmented production chain only if their characteristics fit well with the Northern considerations.

Aside from the availability of a cheap labour cost, - a crucial precondition, - the existence of an attractive foreign investment policy as well as a weak labour market regulation facilitates the insertion of a developing economy into a global production chain. Both the existence of cheap labour, at the time the Northern firm decides to relocate part of its

production abroad, together with lack of mechanisms, to guarantee minimum wages, remain equally important. Thus, even if there might be emerging forces in the low-wage country pushing in the direction of increasing wages, the likelihood of this to materialise is not very significant, especially for less-skilled workers. In this sense, one could argue that in a developing country the process of fragmentation might lead by itself to indirectly strengthening the factors which affect wage disparities.

Furthermore, in case of a developing country, the impact of fragmentation on labour earnings depends also on the type of product, and on the production stage the country is involved in. For instance, one could think about a developing economy whose manufacturing sector participates in a worldwide, fragmented chain of production essentially through assembly activities. If the good produced by this economy is typified as 'parts and components', i.e. it is used as an intermediate by other industries, then its production involves at least some skilled labour. In this case, the argument outlined by Feenstra & Hanson (1995c) fits well since from a Northern perspective this type of labour can be seen as unskilled labour whereas from the South perspective is typified as skilled labour. Nevertheless, this explanation does not seem to be appropriate when the assembled goods are characterised as final goods.

This is the case for several Central American economies. Most of their assembly activities are concentrated in the production of final goods related to the apparel and textiles industry. Yet, in practice, the workforce employed in these activities is typified as unskilled labour from both Northern and Southern perspectives.

In terms of sharing production, the apparel industry constitutes one of the most globalised chains of production. In fact, the garment production network comprises a conglomerated of countries all over the world in which the United States appears as one of the main market for production.

Moreover, taking into account that the assembly industry represents the sector through which most Central American economies, and in particular Guatemala, participate into the world economy, a key question is whether workers currently working in this sector are better off than in their former jobs. Yet, it seems interesting to stress specially the

role of the female labour force since it stands as a prominent characteristic in this industry.

This article attempts to explore empirically the impact the assembly industry has had on labour earnings and poverty in Guatemala. There are several reasons to consider Guatemala an interesting case to study for. First, we expect to contribute to a better understanding of fragmentation and wage linkages from a developing country perspective. Second, Guatemala is not the only economy in Central America where global production processes are centred on the assembly industry. Thus, we believe this study will highlight important aspects to be considered in the design and formulation of policies towards the reduction of poverty and income inequality. Finally, up to our knowledge, this paper constitutes a first attempt to examine poverty and income linkages in the Guatemalan assembly industry since in the past the lack of adequate survey data hindered several efforts to investigate this issue.

The rest of the article is organized as follows: section 2 provides a review of the related literature; section 3 describes briefly the developments of the apparel assembly industry in Guatemala; section 4 outlines the methodological approach; section 4 describes the main findings and finally, section 5 concludes.

Related Literature

The existing literature addressing the impact of fragmentation on income disparities in a developing country framework is very limited. In exploring the Mexican experience in the Maquila industry Feenstra & Hanson (1995a) found that the wage gap increase between skilled and unskilled workers in the South is to be explained by the fact that the activities outsourced to the South are, from a Northern perspective, those that use relatively large amount of low-skilled labour -but considered skilled- from the Southern perspective.

Based on a partial equilibrium framework Nicita & Razzaz (2003) analyzed the implications of a boom in the textile and apparel sector on social welfare and poverty reduction in Madagascar. The author's findings suggest that an expansion of the textile

and apparel industry in Madagascar would provide viable means for a significant number of individuals and households to escape from poverty.

The links between the Maquila industry and its likely impact on household welfare and wages, within the broader context of the Central American experience, has been treated by Jansen et al. (2007). In an assessment of the Maquila provision in CAFTA (Central America Free Trade Agreement) the authors conclude that the Maquila provision will result in annual growth effects between 0.01 % and 1.4% and similar employment effects, especially for female unskilled labour. These results have a further poverty reducing effect, depending on the specific country, with a maximum reducing effect for Honduras, estimated in 0.73%.

In an application for the case of Honduras, De Hoyos, Bussolo, & Nuñez Oscar (2008) estimate the poverty reduction effect derived from the expanding maquila sector, which, according to the authors is closely linked to increased opportunities for women. Their results indicate that poverty in Honduras would have been 1.5 percentage higher had the maquila sector not existed.

To our knowledge, empirical research on the impact the Guatemala's assembly industry has had on income and poverty is rare. The scarcity of adequate surveys and official statistics has hindered the development of studies addressing this issue. Moreover, the majority of available studies assessing the impact of the apparel industry on labour market developments are basically descriptive and based on qualitative interviews.

Petersen Kurt (1992) studied the development of the Guatemalan assembly industry. He stressed the employment generating impact although at unfairly rewarded remunerations. Based on interviews on a sample of maquila workers the author found that workers and specially women do not perceive themselves as benefiting from the growth of the Guatemalan assembly industry. The author concludes that as long as unfairly wages and extremely hard labour conditions, such as long working days, unpaid holidays, deficiency of union rights, lack of health insurance and low safety in workplaces persist, the contribution of the maquila industry to the Guatemalan economy will be inherently limited.

The gender issue intrinsically associated to the maquila industry has gained great attention in recent years. The study carried out by Human Rights Watch (2002) revealed that, although characterized as a highly regulated industry, the maquila's female workforce endures high inequality of opportunities and treatment which translates in low wages, inadequate labour conditions, sex discrimination and basic right's violations. The study asserted that this situation has been bolstered by the weakness of labour legislation codes as well as the failure of the government to protect them. Likewise, Berger (2006) explored the maquila impact on labour developments from a gender perspective. She pointed out that the development of the Guatemalan maquila industry is based, among others, on the availability of a cheap labour force which is mainly composed of women. This has enforced owners of maquila's factories to adopt a patriarchal structure on their factory floors as an attempt to ensure their cheap workforce needs. Moreover, female factory workers receive much lower salaries, worse labour conditions than men; endure sex discrimination, and violation of their privacy and equality rights.

Ñopo Hugo & Gonzales Alberto (2008) investigated to what extent gender and ethnicity wage gaps in Guatemala are the result of differences in human capital. The authors argued that there are combinations of individual characteristics for which it is possible to find males in the labour force but not females. Likewise, there are also combinations of individual characteristics for which it is possible to find females, but not males. Accordingly, based on a matching approach, the authors decomposed wage differentials into four combinations of characteristics.[1] Their findings suggest that wage gaps between indigenous and non-indigenous, and between males and females are partially explained by differences in human capital characteristics, especially, education. By assessing the contribution of the determinants of income inequality in Guatemala, Alejos (2003) finds that at a national level, education accounts for over 12% in explaining income inequality. Among non-agricultural workers employed in the formal sector, it accounts for more than 25%. Yet for agricultural workers education does not explain significantly income gaps. This can be caused by the fact that a majority of agricultural workers show low rates of school attendance.

[1] The first one comprises age, marital status and years of education. The second combination adds gender to the variable set. The third and fourth combinations add migratory conditions and whether the person is a resident of the capital, respectively.

All studies mentioned above have contributed, in their own manner, in explaining the expansion of the assembly industry and its controversial effects on labour market developments. Nevertheless the stock of quantitative assessments on the links between maquila sector and its income and poverty effects is still lagging behind. This paper intends to contribute, albeit with some limitations, in filling this gap. First of all, this study is a first attempt to measure to what extent the maquila industry in Guatemala has contributed to changes on income and poverty levels. Although limited data availability does not allow a detailed analysis of the gender issue -- as has been the case in applications for other countries or regions --, we have attempted to construct an indicator capturing –at least partially- the level of labour benefits that workers employed in the maquila sector enjoy. A finer analysis, however, would require a much more detailed data set which could be obtained only by undertaking a specific survey. Second, the indicators and methodology used in this study could be refined with the availability of a richer data set. This is, for the time being, outside of the scope of the present study. The description of our research is provided in the following sections.

Stylised facts of the apparel assembly industry in Guatemala

As many other Central American economies, Guatemala participates into the world chains of production through performing assembly activities which are highly dominated by apparel manufacturing. The existence of cheap labour costs, the proximity to the USA market as well as the implementation of several trade, foreign investment and labour policies have enhanced the growth of this industry since the last two decades.

Guatemala's apparel industry expanded rapidly since the middle of the eighties. In 1984, there were only six *maquilas*[2] operating in Guatemala City. Six years later, the number of maquila factories rose tremendously to 180, reaching a total of 234 in 2001. By July 2008, according to the *Comisión de la Industria del Vestuario y Textiles de Guatemala* (Guatemala Apparel and Textile Industry; VESTEX)[3] there were 169 apparel factories, 90% of which

[2] In Guatemala, the term *"maquila"* refers to garment-assembly production. According to Berger (2006) it originated from the word *"makila"* which was used during colonial times to refer to the portion of flour that the miller kept for himself for grinding a farmer's corn.

[3] It represents the industry's association within the larger private sector group, the Gremio de Exportadores de Productos No Tradicionales (Non Traditional Products Exporters Association, GEXPRONT)

were located in the metropolitan region (departments of Guatemala and Guatemala city) whereas only 10% operated in the departments of Chimaltenango (2), Escuintla (3), Izabal (1), Solola (1), Sacatepéquez (8) and Zacapa (1)[4]. Although, this figure is notably smaller than the one observed in 2001[5], in terms of size, the country accounts still for the largest apparel industry in Central America (see Table 2). Furthermore, the industry represents yet an important source of Guatemala's revenue, having increased from $ 205.7 million in 1990 to $ 612.43 million in 1994 and $ 1.7 billion in 2006.

As known, the assembly industry constitutes one of the last stages of production. In a global chain of production, it involves foreign corporations supplying local maquilas with preassembled materials (e.g. cloth, yarns, and other spare parts). Maquilas then employ workers to assemble these materials into finished products, which are exported back to the foreign corporations. In this vein, Calfat et al (2007) describe the development of the Guatemalan apparel and clothing industry as following a North-South pattern. In fact, numerous Guatemalan maquilas depend on subcontracts and contracts from USA apparel brands such as Ralph Lauren, McGregor and Calvin Klein among others. In 1994, 77 % of total Guatemala apparel exports went to the USA; it grew to 95.5 % in 1995 and to 97% in 2007. These figures clearly show that Guatemala's apparel industry produces almost exclusively for the USA market.

Furthermore, the apparel industry has become an important source of employment. In 1984, there were fewer than 2000 people working in the maquilas' factories. This figure grew more than thirty fold in 1996. By the end of 2004, the number of employees in this sector raised around twice the number of employees of 1996 (from 61 800 to 113 200 workers). Recently, a reduction of the activity has led to gradually cutting down the number of employees since 2005. By the end of 2007 the number of employees diminished to 68 400 workers, which represents a similar level to the one reached in 1996 (see VESTEX (2008))

[4] A detailed description of the Administrative division of Guatemala is provided in Table 1

[5] As part of the Apparel and Textile agreement, the USA launched the gradually elimination of quotas to those countries whose exports were formerly restricted into this market. As a result, the Central American apparel industry experienced a fall in its participation into the USA market which also led to cut back the industry size. Meanwhile, the participation of China in the World apparel chain of Production increased notoriously.

Despite the industry slow down during the last three years, a gradual recovery is expected in the coming months. According to VESTEX[6], the proximity to the market traduces itself in optimal delivery times and low transports costs which represent yet two key advantages for Guatemala's maquilas. Nowadays, the average cost to produce a t-shirt in China is one dollar worth whereas in Guatemala it varies between U$2.5 and 3 dollars. Nevertheless, countries such Vietnam or China require, on average, four weeks to deliver their garments products to US stores –placed in New York or California – whereas it takes only 4 days for garments coming from Guatemala. This fact encourages US-retailers to keep on supplying from Guatemala's maquilas since the income saved from low transport cost is still large enough to compensate for the cost advantage of producers outside the region.

Data and Methodological approach

Data and descriptive statistics

A fundamental limitation of previous Guatemalan Household surveys was the fact that information on employment activities and job occupations was gathered using either the ISOC or ISIC classifications[7] up to one-digit. Although it made possible to identify the characteristics of the labour force by broad economic groups, it did not allow any form of identification of the characteristics of labour force across the diverse industries composing the manufacturing sector. More recently, the Guatemalan Living Standard Survey 2006 (ENCOVI-2006)[8] collected this information up to two-digits, making feasible the identification of worker occupation and economic sector at more disaggregated level. Thus, it allows to extract further information on employment in the apparel industry and more importantly, to analyze the characteristics and wellbeing of its employees.

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[6] Figures reported by the executive director of VEXTEX through the national Guatemalan newspaper Siglo XXI. Available online at http://www.sigloxxi.com/noticias/21889 Last consulted 23/07/2008

[7] It is worth to mention that these classifications correspond to the ISIC 3.1 (2002) and to the ISOC-88 respectively. Thus, hereafter we will use ISOC to refer the International Standard Occupational Classification and ISIC to refer the International Standard Industrial Classification.

[8] This survey was carried out by the Guatemalan National Institute of statistics (INE, Spanish acronym) and covered a sample of 13 686 households from the urban and rural areas of the 22 Guatemalan departments.

Overall, a sample of 27,066 people registered information on working activities[9]. As shown in Table 3, the manufacturing sector stands out as the third most important economic activity which also concentrates about 14% of the Guatemalan labour force. Yet, about 51% of the manufacturing labour is composed of women. Inside the manufacturing sector, the manufacture of wearing apparel industry (ISIC 18)[10] accounts for the largest number of workers (1 288 persons or 32.5 %). Within the wearing apparel industry, 67% of workers (711) declared occupational jobs comprised into the operators and artisans, mechanic crafts category (ISOC 74). More specifically, this category includes people who work as fibres prepared, weavers, knitters, tailors, dressmakers, sewers, embroiderers and other related workers. Moreover, 232 persons (23%) reported to obtain their income as assembly workers. These workers declared one of three occupational categories[11] a) machine operators, automated assembly line, b) operator assembly-line/automated and c) other operators in assembly (see Table 4). Notably, women account over 69% of the labour force in this sub-sample. This is not surprising since prior studies on Guatemala's assembly industry developments have pointed out that Guatemala's assembly industry is characterized by high participation of female workers (see for instance, Goldin (2001)).

Taken as whole, the labour force of the apparel industry has a low educational attainment[12]. Approximately 31% (255) of workers are illiterate, a bit more than 59% has completed primary education, almost 19% reached secondary education and a minority of 0.5 % attained high education. Moreover, about 27% of the female workers are completely illiterate and other 57% reached only primary education (see Table 5). This result is not unexpected since traditionally the Guatemalan apparel industry is characterized for being a low-skill labour intensive sector. In terms of ethnicity, about 68% of workers from the apparel industry identify themselves as Mayan whilst the remaining 32% identified themselves as "non-indigenous". Moreover, K´iche´ and Kaqchikel are the two predominant Mayan ethnic groups to which workers belong. In

[9] Retired workers , landlords, and workers with no specified activity were excluded from the sample

[10] Economic activity classified up to two-digit level, according to the International Standard Industrial classification (ISIC rev. 3.1)

[11] A small group (4 persons) declared to work as warehouseman from assembly factories, however, we exclude this type of job in our sample since it is not relevant for this paper.

[12] According to the Guatemalan's education system, a pre-primary formation is required before starting primary education. Yet, it splits secondary education up into two levels: Basic and diversified secondary. Nevertheless, for purposes of this paper we consider pre-primary and primary levels as primary education. Likewise we consider basic and diversified school as secondary education.

addition, age represents another important characteristic. In fact, over 61% of workers are younger than the average sample age (30 years old).

From a social point of view, a number of studies (see for instance Petersen Kurt (1992), Collins (2003)) pointed out that the textile and apparel industry is characterized by offering deplorable labour conditions (e.g. low degree of unionization, forced overtime, no compensations, and constraint on vacation periods) for their workers. Unfortunately, assessing the level of social well being of the workers is not feasible as information on whether or not a particular worker is affiliated to a union and whether or not he or she has been forced to work overtime is not recorded by ordinary surveys such as the ENCOVI-2006 or similar. Alternatively, inspired by McCulloch Neil. & Masako Ota. (2002), Bradshaw et al. (2000), we constructed an indicator to make overall comparisons of job-benefits among the diverse manufacturing industries. The method consists of giving a score to each job-benefit accessed by a particular worker. The score is equal to one minus the probability of enjoying that benefit calculated across all individuals in the sector. Thus if a benefit is extremely common, the recipient of this benefit adds only a small score to the worker's job quality index whereas if only very few workers enjoy the benefit, then its accessibility is given a high score to the indicator. Accordingly, the job-quality indicator is constructed by considering the five following job-benefits: whether the worker enjoy a permanent or temporal position, access to bonus of productivity, access to social security, paid transport and paid uniforms.[13] The addition of the scores of these five benefits provides the individual job-benefit index Q_i [14].

Table 6 depicts the average job-benefit indices by broad economic sectors. As shown, 93%, 88% and 87% of the labour force employed in agriculture, private households with employed persons and wholesale and retail trade sectors respectively do not enjoy any of the job benefits above mentioned. On the contrary, more than 90% of the persons employed in the Public Administration and financial intermediation sectors enjoy at least

[13] Other benefits such as disability income protection, profit share, tuition reimbursement, sick leave and the like were not included due to data constraints.

[14] Mathematically, it can be expressed as follows:

$Q_i = \sum_b q_{ib} \bullet (1 - P_{bs})$; $P_{bs} = (n_{bs} / n_s)$;

where q_{ib} =1 if worker i enjoys the benefit b ; P_{bs} is the probability of enjoying the benefit b in sector s ; n_{bs} is the number of workers enjoying the benefit b in sector s and n_s is the total number of workers in sector s

one of the job-benefit above referred. Yet, agriculture and private households with employed persons sectors account for the lowest job-benefit indicator (0.12) whereas sectors such as electricity gas and water supply and financial intermediation account for the highest job-benefit indices (0.92 and 0.89 respectively).

The manufacturing sector accounts on average a job-benefit index of 0.56. Only 26% of the total labour force employed in this sector enjoys the referred job-benefits (see table 6). Table 7 splits up the manufacturing sector into its diverse industries. As shown, the industry of food and beverage products holds a similar index to the average of the sector (0.57). On the contrary, indicators for either textiles (ISIC code 17) or apparel industries (ISIC code 18) are below the sector mean (0.39 and 0.41 respectively). The shares of workers without job-benefits (second column of the table) suggest that only about two out of ten persons working in the textile and apparel industries enjoy a job-benefit. On the contrary, seven out of ten employees access a job-benefit in less representative industries such as manufacture of chemicals (ISIC 24) and manufacture of rubber (ISIC 25). These figures suggest that employees working in the textile and apparel industries are exposed to worst labour conditions than workers employed in other manufacturing industries.

Turning on to labour earnings, Table 8 shows hourly income by occupational categories and broad economic activities. Overall, the hourly income in the manufacturing sector is higher than in the agriculture and commerce sectors. A male worker earns on average 14.5 quetzals (around US$ 1.9)[15] per hour in the agriculture sector while he earns around 17 quetzals (or US$ 2.2) at the commerce and manufacturing sectors. Yet, a female worker earns only 9 quetzals per hour in the agriculture sector whilst her labour payments amount to 10 and 16 quetzals in the commerce and manufacturing sectors. These figures depict clearly that on average, female workers obtain lower hourly income than male workers. In fact, a female worker receives around 35% less than a male worker in the agriculture sector and around 38% less in the commerce sector. By occupational category, hourly incomes obtained by female workers comprised in the unskilled labourer (code 91) category are the lowest in the agricultural sector. While on average a male worker earns over 11 quetzals per hour, a female worker receives only 2.5 quetzals, which

[15] Equivalence in dollars was calculated using the average exchange rate for 2006 (US dollar = 7.59 quetzals)

represent 79% less. Likewise, women employed as coffee farmer worker (code 64) or as agricultural labourer in coffee crops (code 94) receive 71% and 30% less than men. These huge disparities can be explained, among others, by the strong patriarchal structure that subsists yet in the agricultural sector which limits not only women labour participation but also their labour payments.

Although a female worker obtains on average better labour payments in the commerce sector than in the agricultural sector, her hourly income is on average around 39% less than the one a man earns. Female workers whose job occupations are comprised into the skilled farmer worker (code 61) and agricultural labourer (code 92) categories earn on average 74% and 71% less than men. On the contrary, no substantial differentials are observed into the operators (code 74); machine operators (code 82) and unskilled workers (code 91) categories. Moreover, a female clerk (code 41) earns on average around 17% more than a man does.

The overall income gap between men and women is on average less pronounced in the manufacturing sector; however, still significant disparities are observed by occupational categories specially for female workers comprised into the salesperson (code 52) mechanic operators (code 73) agricultural labourer (code 92) categories in which labour income is over 60% less than male workers. At the assembly industry, a female worker earns 13% less than a male worker comprised into the machine operators (code 75) and operator's assembly-line categories. The income gap by gender narrows down for workers comprised into the other's assembly operators (code 79) category in which women earn only 4.5 % less than men.

Statistics based on the ENCOVI-2006 show that at a household level, a total of 264 households obtain incomes from the assembly apparel industry. By splitting up this sample, two broad groups are identified. The first sub-sample (a) is composed by 55 households whose labour income comes from both assembly and non-assembly activities. That is, the contribution to total household labour income is made by members working in assembly activities as well as members working in non-assembly activities. The second one (b) is composed by 209 households whose labour income is obtained entirely from the assembly apparel industry. In other words, all members contributing to the household income work in the assembly sector. As shown in Table 9, households in

which only female members work in the assembly industry represent about 45% and 42% of these sub-samples whereas households in which only male work in the assembly sector represent 51% and 43% respectively. These figures should not be interpreted as major participation of males into the assembly workforce as it is caused by the fact that the majority of households in which only female members work in the maquila industry reported to have more than one member involved in this activity, In the case of households with only male members working in the assembly apparel industry the bulk of them reported to have only one member involved in this activity. Moreover, households in which either male or female members work in the assembly apparel industry represent a minority in both sub-samples.

Statistics also illustrate that poverty levels are more pronounced inside the sub-sample (a). As Table 9 shows only 34% of these households are above poverty line whereas 13% of them live in extreme poor conditions and another 53% live in poor conditions. Most of households ranked above poverty line live in urban areas and about 63% of them reported male members as the ones contributing to the household income. About 58% of poor households have only female members working in the assembly industry, whereas they represents only 31% of total households living above poverty line.

On the contrary, only 5% of households whose income comes entirely from the assembly industry – sub-sample (b) - are ranked as extremely poor, 31% are ranked as poor and 63% are considered non-poor. 54% of the extremely poor households declared to have only female members working in the apparel industry. Households in which only male members work in the assembly industry hold similar share into the poor and non-poor sub-groups. The majority of these households live in urban areas. Yet households having both male and female members working in the assembly sector hold 12% and 15% of the total poor and non-poor subgroups.

Table 10 illustrates to what extent male and female members contributes to the household labour hourly earning[16]. Based on the same sub-samples of households, above referred, average hourly income of female and male members was calculated. The results depict that a female member contributes less than male to the household income as she

[16] For comparative purposes the average hourly labour income of each maquila household was computed. It refers exclusively to earnings obtained by paid working activities.

is paid lower than men. Moreover, a female belonging to extremely poor households reported to earn in average between 1.02 and 4.19 quetzals whilst a male appears to earn in average between 4.2 and 12 quetzals per hour. Though less pronounced females belonging to poor and non-poorer households also appear to earn on average less than male. These figures depict once again that huge income disparities persist in terms of gender in the Guatemalan economy.

Empirical Methodology

The data described in the previous sub-section provides a firm footing to assess whether employment in the Guatemalan assembly sector of the wearing apparel industry has kept workers out of poverty as the country moved into the world economy. Actually, these basic comparisons provide only a first picture on the income differentials existing between maquila's workers and workers employed in other industries; however, it does not allow disentangling on whether apparel maquila's workers are better off by working in this sector than in their prior ones. In fact, if we assume that a maquila's worker had positive earnings in his former job, the key question is whether or not his earnings have increased after he moved into this sector. Thus, estimating the impact of the assembly industry on income and poverty would require taking into account the counterfactual income that a maquila's worker would have had if he had stayed in his previous job.

To impute earnings for maquila's workers in a counterfactual scenario of non-maquila employment, information on the labour status (income) of the maquila's workers in his previous position is needed. Unfortunately, this information is usually not available directly from household surveys. As an alternative, the counterfactual earnings levels for those maquila's workers can be inferred on the basis of a reduced-form specification for the determinants of wages among non-maquila workers with similar characteristics. More specifically, it requires estimating a model like:

$$LnY_i = \beta_o + \beta_i X_i + \beta_2 H_i + \varepsilon_i \qquad (1)$$

Where Y_i is the log of worker i's earnings[17]; X_i is a vector of worker i's characteristics (demographic and location covariates); H_i is a vector of sector indicators and ε_i represents random shocks and possible unobserved heterogeneity in income generation.

The propensity score matching approach[18] is applied to select the sample of non-maquila workers (control group). This methodology is being widely used in several fields of research and can be applied for all situations where one has a treatment, a group of treated individuals and a group of untreated individual (control group). Accordingly, the selection process is achieved by estimating what we called the "propensity to be assembly worker". That is the predicted probability that an individual has on working in the assembly apparel industry on the basis of his observed characteristics. More formally, the propensity is obtained from the estimation of a logit model as follows:

$$L_i = \beta_o + \beta_1 X_i + \beta_2 H_i + \varepsilon_i \qquad (2)$$

Where L_i is the logit of a dichotomous variable that takes the value of 1 if the *i*th individual is employed in the assembly apparel industry and 0 otherwise; X_i is a vector of individual characteristics and H_i is a vector of household' characteristics. In other words, the probability of moving into the maquila industry is a function of a series of demographic characteristics which include gender, age, and level of education, head of household, marital status, urban or rural location, regional location and number of members in the household. The workers are ranked according to the estimated probabilities, and, those whose characteristics match well with the ones comprised into the treated group are selected as our control sample.

Based on the assumption of labour mobility across sectors, it can be inferred that workers who move to the assembly sector come from others unskilled-labour intensive sectors of the economy. With this in mind, the sample used for the propensity score is composed by individuals working either in the apparel or the "reserve" sectors. The last one is thought as a sector whose workers can easily move to the maquila industry.

[17] As it is assumed that a maquila's worker has previously worked in the "reserve sector", the income we considered is the one obtained from working activities. In this sense, income from remittances, retirement pension & leasing earnings are not included.

[18] Caliendo & Kopeinig (2005) provide an extensive review of this methodology.

Information on economic activities, type of workers and job occupations was used to determine the labour force immersed into this sector. Accordingly, the reserve sector comprises workers employed in agriculture, small commerce and other non-assembly textiles and related manufactures. It is significantly important to mention that the former idea was meant to restrict the "reserve sector" only to workers employed in the apparel and related manufacturing non-assembly industries, however, by reviewing our survey data, it depicted that 18% of workers employed in the apparel industry were also employed in the agriculture. Yet, in his study Goldin (2001) reported that 90% of households involved in Guatemalan's maquila work were formerly involved in agriculture activities. Likewise, since small commerce is characterized by high informality, it is more likely that people searching for jobs from this sector move to an export-oriented industry such as the assembly sector. Regarding to the type of worker, we consider people who declared to work into the following categories: working in private firms, domestic cleaners and helpers; agricultural self-employed, non agricultural self-employed and relative workers without payment. People working in governmental institutions or having own non-agricultural or agricultural business were excluded from the sample. Furthermore, a total of eleven occupational categories were selected as follows: Sales person (code 52); subsistence farmers, (code 62); Coffee farmers (code 63); officers and operators of extractive industries (code 71); mechanic operator, precision grinding (code 73); operators and artisans (code 74); stationary plant and machine operator (code 81); machine operators (code 82); unskilled workers (code 91); agricultural labourer (code 93) and agricultural labourer in coffee crops (code 94).

An issue arising from estimating equation (1) is that earnings are unobserved for many individuals who work in the reserve sector. As known, unpaid jobs are commonly observed for those individuals working in family agricultural farms or small family businesses which are by definition comprised into the reserve sector. Notwithstanding, there is an inherent labour retribution that should be valued as it represents the labour costs that would be paid to any other particular worker if the household member could not perform his job. To deal with this quandary, we follow Nicita (2008). His methodology consists on estimating Heckman sample selection model to impute a predicted income for all the individuals for which the actual individual income is not observed in the sample. The covariates used to predict selection are gender, age, urban,

years of schooling, household size, and marital status and a dummy indicating whether or not the individual works in the reserve sector.

Once the matching between the treated and the control groups is performed, we assess the average gains (losses) that workers have got on their labour incomes by working in the assembly sector. To accomplish this task, the average treatment effect on the treated (ATT) is computed. The ATT is defined as the mean difference between the incomes of treated and control groups. Mathematically it can be expressed as follows:

$$\Delta_{ATT} = E(\Delta) = E(Y_i^1 - Y_i^0 \mid D = 1) \tag{3}$$

where Y_i^1 is the labour earning individual i obtains by working in the maquila industry (treated) and Y_i^0 is the imputed labour earning that individual i would had have if he stayed in his previous job (non-treated). The next section is dedicated to explain in detail the results we obtained by applying this methodology

Estimation Results

First at all, it is worth to mention that not all individuals who reported to work into the apparel sector (ISIC code 18) are employed in maquilas factories[19]. Criteria of selection were based on economic activities, occupational categories and occupational status. Accordingly, our sample is mainly composed by individuals who reported to work as machine operators (ISOC 75); assembly operators (ISOC 76) and other assembly operators (ISOC 79). Additionally, we included in our sample a total of 137 workers who reported to work as operators and artisans (ISOC 74) as we consider this category embraces also a pool of workers employed in the maquila industry. Moreover, a careful selection was carried out to determine which workers within this category could be included in our sample. Accordingly, information on worker location and occupational status as well as location of maquila factories was used. For instance, we consider only workers who reported to have a dependent employment relationship. Self-employees were excluded as it is more likely to consider them as occupied in small apparel factories

[19] Due to data restrictions, several studies such as De Hoyos et al. (2008) have considered textiles and apparel industry as a proxy for *Maquila sector*. As this might cause some bias on the results we attempt to refine the definition of the maquila sector.

owned by local entrepreneurs. Furthermore, by considering maquilas location, we excluded also a representative number of observations from Totonicapan as the apparel industry developed in this department is basically composed by artisan's textiles. Although considered as an export-oriented sector, it does not classify as assembly apparel.

The results of the earning equation used to impute labour earnings are shown in Table 11. The natural logarithm of the hourly earnings is set up as dependent variable. Monthly earnings from all dependent jobs, including any payment in-kind, were divided by the number of hours worked per month to get the individual's hourly earnings.

The bottom part of Table 11 shows the results for selection. In this article, selectivity addresses the probability of getting a rewarded job. The coefficients of age and age squared are introduced to capture the life cycle pattern of wages. Their respective signs being positive and negative, as it correspond to an inverse U-shape curve. In other words, it indicates that an individual acquires more experience as he gets older and this gives him more opportunities to get a job. However, at certain age, these opportunities start to decrease. Accordingly, the estimation results depict that the probability of an individual to get a rewarded job reaches its maximum at 32 years old. Moreover, living in urban areas increases in 0.10 percentage points the probability of getting a rewarded job. The probability increases also for men in 0.80 percentage points. Educational attainment does not seem to increase the probability of getting a job but affecting the level of earnings. On the contrary; workers from the reserve sector decrease greatly their probability of having a rewarded job in 6.11 percentage points. In addition the significance of the inverse mill's ration (lambda) indicates clearly that its inclusion was needed to avoid sample selection bias.

It is worth to mention that covariates used in both outcome and selection regressions have been adjusted before interpreting their effect in the outcome equation[20]. Column C

[20] Econometrically, when a covariate appears either in the outcome and the selection regressions, its estimated coefficient in the outcome regression is affected by its presence in the selection equation as well. In other words, the marginal effect on the outcome variable Y (hourly income) is composed of the effect on the selection equation and the outcome equation. Following Sigelman & Zeng (1999) the marginal effect of the *Kth* element of X (set of covariates) on the conditional expectation of Y, is computed as follows:

in table 11 depicts the adjusted coefficients for gender, age, age squared, education and urban. As shown, they are close to the estimated ones and their sensitiveness is tight. The variables of interest in the outcome regression are in general significant and have the expected sign. For instance, the signs of the coefficients of age and age squared are in accordance with the human capital theory which states that earnings follows a parabolic curve due to depreciation of worker's human capital in the form of taking more time to perform tasks as they aged. Our estimation depicts that the parabolic curve peaks at the age of 33 years. One can argue that the curve peaks at a very early age, however; this can be explained by the fact that Guatemalan economic active population is characterized as rather young.

The variable gender shows that men earn 38% more than women. A one year increase on education will cause and increase of 4% on individual's earnings. Likewise, people who work in the metropolitan region earn 67% more than people working in other regions. On the contrary, ethnicity has a negative marginal effect in determining earnings. The results indicate that Mayan people earn 25% less than non-mayan people, which suggests that Guatemalan's earnings gaps are wider in terms of gender and ethnicity.

Table 12 reports the results of the estimation of propensity scores as in equation(2). A first estimation is applied to the whole sample which is composed by 9241 individuals working either in the assembly apparel or the reserve sector. The coefficients measure the change in the log odds in favour of being employed in the assembly sector as dependent variable. In other words, it means that coefficients showing a positive sign are identified as determinants that make individuals more likely to be employed in the maquila industry. The estimation results shows that the probability of being hired in the maquila industry reaches a maximum at age of 26. Though this maximum appears to be lower than the maximum observed in the Guatemalan labour market as a whole[21], it goes according with what it is commonly observed in the sector. In general, the majority of

$$\frac{\partial E\left(y \mid z^{*}>0, x\right)}{\left(\partial x_{k}\right)}=\beta_{k}-\alpha_{k} \rho \sigma_{u} \delta\left(-w \alpha\right)$$

Where β_k is the coefficient of k in the outcome equation, α_k is the corresponding coefficient of k in the selection equation, ρ is the correlation between the errors in the two equations, σ_u is the error tern in the outcome equation and $\delta(-w\alpha)$ is a function of the inverse of the mill ratio

[21] See earnings equations results.

assembly factories recruit young people. Moreover, in the case of women, it is commonly observed that they get fired once they reach the age of 30 years old or get pregnant.

As shown, coefficients of all regions have a negative sign which indicates that residing in those regions decrease the log odds of being employed in the assembly industry. In other words, it means that people residing in the Metropolitan region of Guatemala (omitted region) are more likely to be employed in the maquila sector. This is not surprising if we consider that 90% of maquila factories operate in this region. Likewise, residing in urban areas increases the log odd of being employed in the maquila industry by 0.79. Similarly, it is shown that the odds of being employed in the assembly sector increase by 0.65 for individuals holding a household head status. In contrast, the coefficient of gender (1=male, 0 otherwise) indicates that being male worker decreases considerably the log odd by 1.08 of being employed in this sector. Yet, the connotation behind a negative and significant coefficient of Gender is that women are the most likely to be employed in the assembly sector. Although this result goes according with what has been traditionally observed in the Guatemalan assembly apparel industry, we cannot disregard the fact that male participation into the maquila's workforce is growing. In fact, STITCH (2008) points out, despite women still accounting for the vast majority of assembly workers, an increasing number of male in the assembly factories , as a result of the economic crisis in the country.

For comparative purposes, we split up the sample into a female and male sub-category. Estimations of the propensity scores for the male sample are reported in columns 3 and 4, whereas columns 5 and 6 report the results for the female sample. As shown, the probability of being employed in the maquila industry increase by 0.58 odds for single women. Coefficients of age, urban and regional covariates depict similar results as in the total sample. Education shows not significant coefficients in all samples which might be caused by the fact that Guatemalan assembly production activities are basically characterised as non-skilled labour intensive..

The next step after performing matching is to compute the average treatment effect (ATT). As shown in Table 13, the total sample is composed by 9241 individuals; of which 340 are employed in the maquila industry (treated) whilst the remaining belong to the reserve sector (control). The results illustrate a treatment effect on the treated of

0.397. That is, the average hourly earning of a worker currently employed in the maquila sector (treated) is 39% higher than the one obtained having stayed working in their former job which is given by the matched control group members. In value terms, it means that on average an assembly worker earns 10.54 quetzals per hour whereas in his/her former occupation he/she would have earned about 7.09 quetzals. These results suggest that in general the workforce employed in the Guatemalan's maquila industry has benefited in terms of income from the growth of this industry.

In terms of gender, however, it seems that assembly male workforce has benefited more than the assembly female workforce. In fact, the results reveal that on average a male assembly worker earns per hour about 42% more than the hourly income he would had obtained if he stayed working in his former occupation. In other words, it means that on average a male worker is paid about 4.59 quetzals more than the hourly income he would have received in his previous job. On the other hand, the average hourly earning a female worker is paid in the assembly industry is 34% higher than the hourly earning she would have obtained if she remained working in her former job. In monetary terms, it means that in the assembly industry a female worker earns on average 8.39 quetzals per hour whereas in her former occupation she would have earned 5.91 quetzals.

These results are in line with those obtained by De Hoyos et al (2008) for the case of Honduras, indicating that wages paid to maquila workers are on average higher than those paid to workers outside the sector. However behind the inter-sectoral wage premium, gender differences, within the sector, clearly persist. Moreover, given the current deteriorating situation in the Guatemalan economy, with a rising male participation in the maquila working force, there is a real possibility that the gender wage gap may endure or even accentuate in the near future.

Conclusions and remarks

The apparel industry illustrates a typical mode of production which incorporates Guatemala into the global economy, which is in fact one of the most globalised chains of production. The existence of cheap labour costs, the proximity to the USA market as well as the implementation of special trade regimes, foreign investment and labour policies have enhanced the growth of this industry during the last two decades. Furthermore, the booming of the Guatemalan apparel industry has been highly

dominated by assembled activities which use intensively unskilled labour and more in particular, female workers.

Several studies have explored- in a more qualitative mode- the impact the apparel industry has had on labour market developments; however, the scarcity of adequate figures has hindered the development of a body of research aimed at assessing, in a more systematic manner, and within a more quantitative framework, the effects the apparel industry has had on the Guatemalan labour market and on the livelihoods of one of its most important stakeholders: the workforce.. Accordingly, this study intends to contribute to this literature and relies, for this purpose, on the matching approach to assess the effects the apparel industry has had on Guatemalan labour force in terms of income and poverty.

The main finding of the paper can be summarized as follows:

- Basic statistics depict that a young workforce under the average of 30 years old is employed in the Guatemalan assembly apparel industry. Females represent about 69% of total workforce of the Guatemalan's apparel industry. Overall, workers in this sector are characterized by having a low educational attainment. The majority of workers have only attained primary education. Yet, the rate of literacy is higher for female workers than for male workers. Mayan is the predominant ethnic group among these workers.

- In terms of labour conditions, in contrast to other manufacturing industries only a minority of maquila workers enjoy labour benefits such as social security, and productivity bonus, among others. This reflects the fact that workers of the Guatemalan apparel assembly industry are exposed to poor labour conditions than those employed in other manufacturing industries.

- By broad economic sectors, manufacturing workers earn on average more than those working in the commerce and the agricultural sector. However, inside the manufacturing sector there exists yet great disparities among the diverse industries as well as among the diverse type of occupations. These disparities are more pronounced in terms of gender.

- In terms of poverty, more than 60% of households who obtain their income entirely from the assembly apparel industry are ranked as non-poor. Nevertheless, poverty levels are higher for those households in which only female members are the ones employed in the assembly industry. Yet, the low salaries obtained by women in the maquila industry results also in a low contribution to total household income. This outcome is clear evidence that female's members contribute significantly less than male to the total household income and more in particular in those households ranked as extremely poor.

- Based on the matching approach, the evidence suggests that workers in the assembly apparel industry earn wages that are about 40 percent higher than the ones they would have obtained having stayed working in their former occupations outside the sector.

Although these results recognize higher labour rewards in the assembly apparel industry than the ones paid in the agriculture or the commerce sectors, the balance does not appear favourable for the female workforce employed in this industry. While our results suggest, on average, higher wages for maquila worker occupations, in terms of gender, however, the increase the apparel industry has had on labour rewards seems to be substantially higher for male workers than for female workers. This wide gender income gap inside the maquila sector seems to follow the generalised discriminatory trend observed in the Guatemalan labour market outside the assembly sector.

Given the present conditions of the maquila sector in Guatemala, characterised by a persistent gender wage gap, deplorable working conditions –as reflected in our job-benefit indicator calculations- and the prevalence of poverty in households where a female member is the main income contributor, the present study casts doubts on the role of the maquila model as an engine of development and its likely contribution to poverty reduction in Guatemala.

References

1. Abraham, K. G., & Taylor, S. K. (1996). Firms' Use of Outside Contractors: Theory and Evidence. Journal of Labor Economics, 14(3), 394-424.

2. Alejos, L. A. (2003). Contribution of the Determinants of Income Inequality in Guatemala. The UWCAd Economics Society , --.

3. Berger, S. A. (2006). Guatemaltecas The Women's Movement 1986–2003. (p. 157). University of Texas, Press.

4. Bradshaw, J., Gordon, D., Middelton, S., Townsend, P., Pantazis, C., Levitas, R., Payne S., & Bramley, G. (2000). Explorations of the Relationship between Poverty and Social Exclusion in Britain . Paper for International Association for Research in Income and Wealth Conference , Cracow.

5. Calfat G., Cassimon D., Flores R., & Rivas A. (2008). Far from Champions Close to Midgets: International Sharing Production in Central and South America . IOB - University of Antwerpen , Discussion Paper(41).

6. Caliendo, M., & Kopeinig, S. (2005). Some Practical Guidance for the Implementation of Propensity Score Matching. SSRN ELibrary.

7. Collins, J. L. (2003). Gender, Labor and Power in the Global Apparel Industry. USA: University Chicago Press.

8. De Hoyos, R., Bussolo, M., & Nuńez Oscar . (2008). Can Maquila Booms Reduce Poverty? Evidence from Honduras". The World Bank , Policy Research Working Paper(4789).

9. Feenstra, R., & Hanson , G. (1995a). Foreign Direct Investment and Relative Wages: Evidence from Mexico's Maquiladoras. NBER, Working Paper(5122).

10. Feenstra, R. , & Hanson, G. (1995b). Foreign Investment, Outsourcing and Relative Wages. NBER, Working Paper(5121).

11. Feenstra, R. C., & Hanson, G. H. (1995c). Foreign Direct Investment and Relative Wages: Evidence from Mexico's Maquiladoras No. 5122.

12. Goldin, L. R. (2001). Maquila Age Maya: Changing Households and Communities of the Central Highlands of Guatemala. Journal of Latin American Anthropology, 6(1), 30-57.

13. Human Rights Watch. (2002). From the Household to the Factory , Sex Discrimination in The Guatemala Labour Force. USA: Human Rights Watch.

14. Jansen, H. G. P., Morly Samuel., Kessler, G., Pińeiro, V., Sanchez, M., & Torero, M. (2007). The impact of the Central America Free Trade Agreement on the Central American Textile Maquila Industry. International Food Policy Research Institute IFPRI, Discussion

Papper(720).

15. McCulloch Neil., & Masako Ota. (2002). Export Horticulture and Poverty in Kenya. Institute of Development Studies -Sussex, WP(174).

16. Nicita, A. (2008). Who Benefits from Export-led Growth? Evidence from Madagascar's Textile and Apparel Industry. J Afr Econ, 17(3), 465-489.

17. Nicita, A., & Razzaz, S. (2003). Who Benefits and how much ? How Gender Affects Welfare Impacts of a Booming Textile Industry. World Bank , Policy Research Working Paper (3029).

18. Ñopo Hugo , & Gonzales Alberto. (2008). Gender and Ethnic Wage Gaps in Guatemala from a Matching Comparisons Perspective. Inter- American Development Bank , Working Paper(641).

19. Petersen Kurt. (1992). The Maquiladora Revolution in Guatemala. Center for International Human Rights at Yale Law School, Occasional Paper Series(2).

20. Sigelman, L., & Zeng, L. (1999). Analyzing Censored and Sample-Selected Data with Tobit and Heckit Models. Political Analysis, 8(2), 167-182.

21. STITCH (Mattson Corey //Ayer Marie). (2008). The Maquila in Guatemala: Facts and Trends . STITCH Organizers for Labour Justice, (Last Consulted 12/12/2008).

22. VESTEX. (2008). Profile of Guatemalan Apparel and Textile Industry . VESTEX Statitistics , -,available online at:

http://www.vestex.com.gt/fotos/downloads/Perfileningles%20(portal%20julio%202007).pdf

Annex

Table 1: Guatemalan Administrative Division

Code	Region	Departments
1	Metropolitan	Guatemala
2	North	Alta Verapaza y Baja Verapaz
3	North-East	Izabal, Zacapa, Chiquimula, & El Progreso
4	South-East	Santa Rosa, Jalapa y Jutiapa
5	Centre	Sacatépequez, Chimaltenango, Escuintla
6	South-West	Totonicapán, Sololá, Quetzaltenango, Retalhleu, Suchitepéquez and San Marco
7	North-West	Huehetenango and Quiché
8	Peten	Petén

Source: INE Guatemala

Table 2: Trends of the composition of the Apparel & Textile Sector in Central American

Country	Number of Firms					No Employees	
	1998(1)	2003					
	Apparel & Garments	Apparel	Textiles	Serv. & Acces.	Total by Country	1998	2001
Costa Rica	99	43	0	2	45	35699	19728
El Salvador	209	126	14	52	192	73505	87030
Guatemala	245	199	50	260	509	71403	140346
Honduras	179	163	14	24	201	95745	96602
Nicaragua	36	22	1	1	24	16000	39539

Source : INCAE, Regional directory 1998, 2003

(1)/ Detailed sector composition was not available for this year

Table 3: Guatemalan Labour Structure

ISIC	Economic Activity	Labour force					
		Total	%	Male	%	Female	%
1	Agriculture, hunting and forestry	10,670	37.8	8,918	51.6	1752	17.9
2	Mining & quarrying	41	0.2	36	0.2	5	0.1
3	Manufacturing	3,791	13.7	1,870	10.8	1,921	19.7
4	Electricity gas & water supply	62	0.3	54	0.3	8	0.1
5	Construction	1,719	7.9	1,700	9.8	19	0.2
6	Wholesale and retail trade	5,738	19.2	2,264	13.1	3,474	35.6
7	Transport, storage & communications	739	3.4	698	4.0	41	0.4
8	Financial intermediation	611	2.8	460	2.7	151	1.5
9	Public administration and defence	580	2.5	456	2.6	124	1.3
10	Education	950	4.1	316	1.8	634	6.5
11	Health and social work	2,106	8.0	492	2.8	1,614	16.5
12	Extraterritorial Organization and bodies	59	0.3	35	0.2	24	0.2
	Total	27,066		17,299		9,767	
	Manufacturing						
15	Manufacture of food products and beverages	1222	31.0	562	30.1	660	34.4
16	Manufacture of tobacco products	25	0.3	1	0.1	24	1.2
17	Manufacture of textiles	179	4.2	66	3.5	113	5.9
18	Manufacture of wearing apparel;	1288	32.5	428	22.9	860	44.8
19	Tanning and dressing of leather;	68	2.4	53	2.8	15	0.8
20	Manufacture of wood and of products of wood	200	4.6	94	5.0	106	5.5
21	Manufacture of paper and paper products	25	0.8	23	1.2	2	0.1
22	Publishing, printing and reproduction of recorded	55	1.6	45	2.4	10	0.5
23	Manufacture of coke, refined petroleum products a	3	0.1	3	0.2	0	0.0
24	Manufacture of chemicals and chemical products	65	2.1	36	1.9	29	1.5
25	Manufacture of rubber and plastics products	19	0.6	12	0.6	7	0.4
26	Manufacture of other non-metallic mineral prod.	116	3.3	87	4.7	29	1.5
27	Manufacture of basic metals	6	0.2	6	0.3	0	0.0
28	Manufacture of fabricated metal prod.	152	5.6	150	8.0	2	0.1
29	Manufacture of machinery and equipment n.e.c.	27	0.9	27	1.4	0	0.0
31	Manufacture of electrical machinery and apparat.	2	0.1	2	0.1	0	0.0
32	Manufacture of radio, television and communicat.	18	0.5	18	1.0	0	0.0
33	Manufacture of medical, precision and optical inst.	4	0.1	4	0.2	0	0.0
34	Manufacture of motor vehicles,	1	0.0	1	0.1	0	0.0
35	Manufacture of other transport equipment	7	0.2	7	0.4	0	0.0
36	Manufacture of furniture; manufacturing n.e.c.	301	8.6	242	12.9	59	3.1
37	Recycling	8	0.3	3	0.2	5	0.3
	Total	3791		1870		1921	

Source : Authors' calculations based on Guatemala's LSMS (ENCOVI-2006)

Table 4: Labour force on the Guatemalan's Textile and Apparel Industries

Code	Occupational Category	Manufacture of wearing apparel (ISIC: 18)				Manufacture of textiles (ISIC 17)			
		N persons	Male	Female	%	N person	Male	Female	%
12	Chief executive, entreprise	3	2	1	0.3				
13	Managing director, entreprise	2	2	0	1.5				
24	Specialists, organisation/ Administration	2	2	0	0.2				
31	Technicians & Professionals, physics/chemicals c	2	2	0	0.2	2	0	2	1.1
34	Other technicians & Professionals	3	1	2	0.3	3	2	1	1.7
41	Clerks	5	4	1	0.5	3	2	1	1.7
43	Warehouseman from assembly factories	4	4	0	0.4				
51	Service workers and Protective services	7	4	3	0.7	1	1	0	0.6
52	Salesperson, wholesale establishment	3	0	3	0.1				
61	Farm worker, skilled agricultural					1	1	0	0.6
71	Officers & operators , extractive industries	1	1	0	0.1				
72	Operators, metallurgic	3	3	0	0.3	10	10	0	5.6
73	Mecanic operator, precision grinding	3	2	1	0.2				
74	Operators & artisans, mechanics crafts	964	253	711	66.8	134	32	102	74.9
75	Machine operators, automated assembly line	25	11	14	2.5				
76	Operator assembly-line/automated	188	96	92	18.9				
79	Other operators in assembly	19	9	10	1.8				
82	Machine operators,	41	24	17	3.8	18	15	3	10.1
83	Driver-vehicles & operators equiments	1	1	0	0.1				
91	Unskilled workers	4	4	0	0.4	4	2	2	2.2
93	Labourer, mining, construction, manufacturing	8	3	5	0.7	3	1	2	1.7
	Total	1288	428	860		179	66	113	
	Sub-total Occupational categories 74-79	1196	369	827					
	%		30.85	69.15					

Source : Authors' calculations based on Guatemala's LSMS (ENCOVI-2006)

Table 5: Educational attainment of the Labour force in the apparel Industry

Code	Occupational category	Education Level					Share */			
		Illiteracy	Primary [a]	Secondary [b]	High Educ.	Total	Illiteracy	Primary [a]	Secondary [b]	High Educ.
Females										
	Total	**219**	**471**	**133**	**4**	**827**	**26.5**	**57.0**	**16.1**	**0.5**
74	Operators & artisans, mechanics crafts	209	396	103	3	711	25.3	55.7	14.5	0.4
75	Machine operators, automated assembly line		6	7	1	14		42.9	50.0	7.1
76	Operator assembly-line/automated	10	61	21		92	1.2	66.3	22.8	
79	Other operators in assembly		8	2		10		80.0	20.0	
Males										
	Total	**36**	**239**	**92**	**2**	**369**	**4.4**	**64.8**	**24.9**	**0.5**
74	Operators & artisans, mechanics crafts	31	160	61	1	253	3.7	63.2	24.1	0.4
75	Machine operators, automated assembly line		3	7	1	11		27.3	63.6	9.1
76	Operator assembly-line/automated	5	69	22		96	0.6	71.9	22.9	
79	Other operators in assembly		7	2		9		77.8	22.2	
Total		**255**	**710**	**225**	**6**	**1196**	**30.8**	**59.4**	**18.8**	**0.5**

Source: Authors' calculations based on Guatemalan's Household Survey (ENCOVI-2006)

Notes: a/ It comprises either pre-primary nor primary levels; b/ It includes both basic and diversificated secondary education

*/ share as a percentage of total workers per occupational category

Table 6: Job-benefits indicator by economic sectors

Code	Economic Sector	Workers		Average Index job
		Total	% of workers without job benefits	
A	Agriculture	10,616	93.4	0.12
B	Fishing	114	78.1	0.31
C	Mining and quarrying	41	61.0	0.41
D	Manufacturing	3,786	73.9	0.56
E	Electricity, gas and Water supply	63	27.0	0.89
F	Construction	1,727	85.6	0.21
G	Wholesale and Retail trade	5,034	86.7	0.51
H	Hotels and Restaurants	749	73.7	0.45
I	Transport, storage and communications	745	74.1	0.49
J	Financial Internmediation	126	7.9	0.92
K	Real estates, renting and bussiness activities	489	41.9	0.66
L	Public administration and defence	588	8.3	0.70
M	Education	957	27.3	0.59
N	Health and Social work	342	34.2	0.73
O	Other community, social and personal activities	835	80.8	0.47
P	Private households with employed persons	946	88.8	0.12
Q	Extra-territorial organizations and bodies	63	27.0	0.79

Source : Authors' calculations based on ENCOVI-2006 survey

Table 7: Job-benefits indicator in the manufacturing sector

ISIC	Description	Workers		Average	Job- benefit description									
			without job benefits	Job-benefit	Social security		Paid transport		Paid Uniforms		Bono Productivity		Permanent Job	
		Total	%	index	workers	%	workers	%	workers	%	workers	%	workers	%
15	Manufacture of food products and beverages	1234	70.7	0.57	294	23.8	94	7.6	172	13.9	72	5.8	203	16.5
17	Manufacture of textiles	179	78.8	0.39	34	19.0	2	1.1	12	6.7	7	3.9	25	14.0
18	Manufacture of wearing apparel; dressing and dyeing of fur	1299	77.7	0.41	262	20.2	59	4.5	41	3.2	69	5.3	194	14.9
19	Tanning and dressing of leather; manufacture of luggage,	71	74.6	0.46	17	23.9			5	7.0	7	9.9	9	12.7
20	Manufacture of wood and of products of wood and cork,	201	78.6	0.29	35	17.4			4	2.0	4	2.0	23	11.4
21	Manufacture of paper and paper products	25	16.0	0.75	21	84.0	2	8.0	4	16.0	5	20.0	14	56.0
22	Publishing, printing and reproduction of recorded media	56	58.9	0.54	18	32.1	1	1.8	3	5.4	6	10.7	10	17.9
23	Manufacture of coke, refined petroleum products	3	66.7	0.44		0.0			1	33.3			1	33.3
24	Manufacture of chemicals and chemical products	65	30.8	1.00	37	56.9	11	16.9	22	33.8	9	13.8	32	49.2
25	Manufacture of rubber and plastic products	19	31.6	0.84	11	57.9	1	5.3	9	47.4	1	5.3	9	47.4
26	Manufacture of other non-metallic mineral products	118	59.3	0.78	43	36.4	19	16.1	26	22.0	8	6.8	26	22.0
27	Manufacture of basic metals	6	16.7	1.06	5	83.3	2	33.3	2	33.3	2	33.3	3	50.0
28	Manufacture of fabricated metal products,	152	80.9	0.28	13	8.6	3	2.0	11	7.2	6	3.9	13	8.6
29	Manufacture of machinery and equipment nes	27	51.9	0.80	9	33.3	5	18.5	5	18.5	2	7.4	6	22.2
32	Manufacture of radio, tv and communication equipment	19	94.7	0.10									1	5.3
36	Manufacture of furniture; manufacturing nes	304	88.8	0.17	21	6.9			5	1.6	8	2.6	21	6.9
37	Recycling	8	37.5	0.64	3	37.5	2	25.0			1	12.5	1	12.5

Source : Authors' calculations based on ENCOVI-2006 survey

Table 8: hourly income by Occupational categories and broad economic groups

Code	Occupation	Hourly income*								
		Agriculture			Commerce			Manufacturing		
		Male	Female	Diff. %	Male	Female	Diff. %	Male	Female	Diff. %
	Total	**14.5**	**9.5**	**34.7**	**16.5**	**10.2**	**38.5**	**17.3**	**16.4**	**5.3**
41	Clerks	31.4	9.7	69.0	20.0	23.4	(16.8)	26.9	52.7	(95.7)
43	Warehouseman of assembly factory							28.8		
51	Personal service workers	11.6	13.0	(12.3)	17.0	12.0	29.4	12.9	14.4	(12.1)
52	Salesperson, wholesale establishment				15.5	10.1	34.8	24.2	7.6	68.7
61	Farm. workers, skilled agricultural	5.7	8.9	(55.0)	16.6	4.3	74.2	20.1	26.3	(30.9)
64	Farm. workers, coffe crops	13.8	3.9	71.4						
71	Officers & operators, extractive industries	16.9			33.9			10.7	9.2	14.1
72	Operators, metallurgic	20.8			14.5	5.5	61.7	16.7	30.7	(84.0)
73	Mecanic operator, precision grinding				24.5	4.7	80.8	12.8	4.3	66.2
74	Operators & artisans, mechanics crafts	8.1	12.2	(51.6)	11.4	11.8	(4.1)	10.7	6.1	43.0
75	Machine operators, automated assembly line							26.0	22.5	13.3
76	Operator assembly-line/automated							19.8	17.2	13.0
79	Other operators in assembly							20.4	19.4	4.5
81	Stationary plant and machine operator	22.1						20.3		
82	Machine operators	14.9	21.3	(42.6)	10.0	10.5	(4.4)	20.9	9.6	54.1
83	Driver-vehicles & operators equipments	19.3			16.4			20.0		
91	Unskilled workers	11.8	2.5	78.9	10.5	10.3	1.6	16.9	10.0	41.2
92	Agricultural, forestry and fishering labourers	6.2	5.4	12.6	15.1	4.3	71.5	11.8	4.7	60.1
93	Labourer, mining, construccion, manufacturing & transport	14.4	13.6	5.8	9.6	14.8	(54.7)	15.9	11.1	30.4
94	Agricultural labourers in coffe crops	5.8	4.0	30.3						

Source: Authors' calculations based on 2006 Guatemalan Survey (ENCOVI 2006)

*/ Average of hourly income is expresed in Quetzal

Table 9: Assembly apparel industry: composition of households by poverty levels

Group of HH workers	Number of Household whose income come from									
	Assembly & non-assembly (a)					Entirely assembly (b)				
	Ext-Poor	Poor	Non- Poor	Total	%	Ext-Poor	Poor	Non- Poor	Total	%
Female	2	17	6	25	45.5	6	28	54	88	42.1
Male	4	12	12	28	50.9	4	29	57	90	43.1
Both	1		1	2	3.6	1	8	22	31	14.8
Total	7	29	19	55	100.0	11	65	133	209	100.0
%	12.7	52.7	34.5			5.3	31.1	63.6		
Shares */										
Female	28.6	58.6	31.6			54.5	43.1	40.6		
Male	57.1	41.4	63.2			36.4	44.6	42.9		
Both	14.3	0.0	5.3			9.1	12.3	16.5		

Source: Authors' calculations based on Guatemalan's Household Survey (ENCOVI-2006)

*/ share as percentage of total households by poverty level

Table 10: Contribution to average household's earnings by gender and poverty levels

Group of workers	Average hourly earning (Quetzal)					
	HH with assembly & non-assembly incomes (a)			HH with only assembly income (b)		
	Ext-Poor	Poor	Non- Poor	Ext-Poor	Poor	Non- Poor
Female	2.29	9.26	21.94	4.19	9.33	16.89
Male	12.37	16.12	27.92	6.07	11.38	20.65
Both						
Female	1.67		22.90	1.02	10.32	17.34
Male	9.09		21.75	4.2	10.5	20.74
	Share */					
Female	20.7	41.8	42.6	100.0	100.0	100.0
Male	54.8	51.4	49.2	100.0	100.0	100.0
Both						
Female	11.7		14.6	19.5	49.6	45.5
Male	63.4		13.9	80.5	50.4	54.5

Source: Authors' calculations based on Guatemalan's Household Survey (ENCOVI-2006)

(a) Based on hourly earning of maquila's workers who belonging to households that also obtain incomes from other non-maquila activities

(b) Based on hourly earning of maquila's workers belonging to households whose income come entirely from the assembly industry

*/ share as percentage of total HH hourly income

Table 11: Income equation estimation (dependent variable: log hourly earnings)

	Coefficient (a)		Standard Errors (b)	Adjusted Coeff. (c)
Outcome				
Sex	0.31	***	(0.038)	0.38
Age	0.07	***	(0.015)	0.10
Age squared	-0.001	***	0.000	-0.001
Education	0.04	***	(0.004)	0.04
Urban	0.09	***	(0.026)	0.10
Maya	-0.25	***	(0.026)	
Metropolitan	0.67	***	(0.059)	
North	-0.04		(0.055)	
North-East	0.06		(0.044)	
South-East	-0.03		(0.053)	
Centre	0.33	***	(0.044)	
South-West	0.12	**	(0.039)	
Agriculture and Hunting	-0.33	***	(0.085)	-0.64
Coffee crops	-0.33	***	(0.079)	-0.74
Manufacture of textiles	-0.72	***	(0.099)	-0.99
Manufacture of apparel	-0.15	**	(0.053)	-0.46
Wholesale and Retail trade	-0.68		(0.404)	-0.60
Hotels and Restaurants	-0.06		(0.063)	-0.40
Priv. HH with employed persons	0.19		(0.101)	-0.10
Constant	0.48	*	(0.198)	
Selection				
Sex	0.80	***	(0.039)	
Age	0.30	***	(0.013)	
Age squared	0.00	***	0.000	
Education	-0.04	***	(0.005)	
Urban	0.10	**	(0.037)	
Marital status	-0.19	***	(0.040)	
HH size	-0.03	***	(0.006)	
Reserve	-6.11	***	(0.295)	
Constant	5.59		(.)	
Rho	-0.22			
Sigma	0.80			
Lambda	-0.17	*	(0.07)	
Obser.	9241			
Uncensored Observ.	5361			

Notes: Robust standard errors are shown in parentheses.

Significant level of 1; 5 and 10 % are indicated by ***, ** & * , respectively

Table 12: Propensity Score Estimation (Dependent Variable: Maquila employment=1)

Variable	Total Sample		Male sample		Females sample	
	Coefficient	Std errors	Coefficient	Std errors	Coefficient	Std errors
Age	0.55 ***	(0.065)	0.54 ***	(0.089)	0.58 ***	(0.090)
Age squared	-0.01 ***	(0.001)	-0.01 ***	(0.002)	-0.01 ***	(0.002)
Education	-0.02	(0.023)	0.016	(0.025)	-0.01	(0.024)
Gender	-1.08 *	(0.506)				
Gender * age	0.03	(0.019)				
Gender * educ	0.06 *	(0.032)				
Marital status	0.25	(0.152)	-0.51 *	(0.255)	0.58 **	(0.195)
HH Size	0.01	(0.024)	-0.07	(0.038)	0.05	(0.031)
Region 2	-2.05 ***	(0.380)	-2.99 ***	(0.736)	-1.45 **	(0.450)
Region 3	-2.52 ***	(0.288)	-3.56 ***	(0.608)	-1.97 ***	(0.335)
Region 4	-1.82 ***	(0.298)	-2.02 ***	(0.425)	-1.67 ***	(0.418)
Region 5	-0.38 *	(0.152)	-0.40	(0.220)	-0.45 *	(0.215)
Region 6	-1.49 ***	(0.168)	-1.58 ***	(0.244)	-1.51 ***	(0.234)
Region 7	-1.92 ***	(0.319)	-1.95 ***	(0.456)	-1.97 ***	(0.450)
Urban	0.79 ***	(0.128)	1.17 ***	(0.187)	0.41 *	(0.176)
HH Head	0.65 ***	(0.194)	-0.08	(0.285)	0.74 *	(0.297)
Constant	-9.02 ***	(0.909)	-8.39 ***	(1.211)	-9.88 ***	(1.207)
N	9241		5257		3984	
Log Likelihood	498.2		361.09		168.77	
Pseudo R2	0.17		0.24		0.12	

Notes: Robust standard errors are shown in parentheses

Significant level of 1; 5 and 10 % are indicated by ***, ** & * , respectively

Table 13: Average Treatment Effect based on Matching approach

Effect of Working in the assemby sector		Average Hourly Earning				
	Unit	Treated	Control	ATT	Std error	t-stat
Total Sample	Log	2.36	1.96	0.397	0.07	5.49
	Quetzal	10.54	7.09			
N		340				
Male Sample	Log	2.59	2.17	0.421	0.10	4.44
	Quetzal	13.36	8.77			
N		167				
Only Females	Log	2.13	1.78	0.349	0.10	3.36
	Quetzal	8.39	5.91			
N		173				

Notes: Propensity scores were obtained from logit regressions

Estimates based on Matching approach