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Human Capital, Exports, and Wages

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Abstract

This paper tests whether manufacturing exporters pay more to educated workers in an effort to ascertain whether the productivity of human capital is raised by exports. Using a panel of matched employer-employee data from Morocco, we fail to find convincing evidence that exporters pay more to educated workers. Although exporters pay more on average, much of the wage differential can be explained by the fact that exporters have a larger workforce and more capital. We also find that the wages of educated workers do not increase faster among exporters. Finally, educated workers who start working for an exporter do not experience a larger wage increase relative to their previous job. We discuss why our results differ from the literature.

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1. Introduction

Much attention has been devoted to human capital and its role in development (e.g. Lucas 1993, Mankiw, Romer and Weil 1992, Barro and i Martin 1992). There has also been considerable interest in the role of international trade in fostering rapid growth and productivity gains (e.g. Young 1991, Coe and Helpman 1995, Tybout and Westbrook 1995, Baldwin 2003).[1] Several explanations have been proposed for the observed relationship between trade and growth. One of them is that international trade facilitates the transfers of technological and market knowledge, thereby leading to an increase in firm productivity (e.g. Grossman and Helpman 1991, Das, Roberts and Tybout 2001, Cameron, Proudman and Redding 2005, Topalova 2004).[2] It is natural to expect educated workers and managers to play a crucial role in this transfers because they are in the position to translate knowledge into new products and procedures (e.g. Tybout 2000, Liu and Tybout 1996). Human capital and exports thus appear to go hand in hand in the growth process (e.g. Johnson and Stafford 1999, Acemoglu 2003, Aw, Roberts and Winston 2001, Feenstra 2000, Epifani and Gancia 2004, Denny, Harmon and Lydon 2002, Batista 2005).

These observations are the starting point for this paper. We examine the link between exports and human capital using survey data on manufacturing firms in Morocco. At the root of our testing strategy is the simple idea that, if educated workers are more productive in exporting firms, exporters should pay them more. Comparing the earnings education premium between exporting and non-exporting firms therefore provides an indirect test

[1] See also Keller (1998) for evidence undermining the evidence presented by Coe and Helpman (1995), and Rodriguez and Rodrik (2001) for evidence that trade openness and growth are statistically unrelated.

[2] Some studies, however, have found that, while exporting firms were more productive before exporting, the fact of exporting need not increase firm productivity (e.g. Clerides, Lach and Tybout 1998, Fafchamps, El Hamine and Zeufack 2007, Soderbom and Teal 2000).

that human capital is essential for trade-related productivity grains. The maintained hypothesis behind our approach is that firms share some of their productivity rents with workers, an idea that has gained widespread acceptance (e.g. Oi and Idson 1999, Bigsten, Collier, Dercon, Fafchamps, Gauthier, Gunning, Isaksson, Oduro, Oostendorp, Patillo, Soderbom, Teal and Zeufack 2003). The details of the process through which rents are shared does not matter for our analysis. What matters is that firm-specific worker productivity is partly reflected in individual wages.

Using matched employer-employee data from Morocco, we examine the earnings education differential in the manufacturing labor market. Morocco is useful study case because it is fairly representative of other moderately open, middle income economy with manufacturing exports concentrated in labor intensive sectors – i.e., textile, garment, and leather products. Its proximity to Europe and trade agreement with the European Union also provides a useful comparison to Mexico, where the earnings skill gap has been shown to increase with trade openness to the US (e.g. Hanson and Harrison 1999, Verhoogen 2007, Kaplan and Verhoogen 2006).

Using a Mincerian earnings regression, we first show a strong positive association between the export status of a firm and the average wage it pays to its workers. Since Clerides et al. (1998) and, more recently, Fafchamps et al. (2007) have shown that Moroccan exporters are on average more productive than non-exporters, this consistent with the idea that firms share productivity rents with their workers. The exporter wage premium remains if we control for individual worker characteristics such as occupation within the firm, gender, education, experience, length of tenure, and vocational training. Much of the exporter wage premium can be explained by size differences between firms (e.g. Oi

and Idson 1999, Fafchamps and Soderbom 2006).

Having found a systematic wage differential between exporters and non-exporters, we investigate whether this differential is larger for educated and trained workers. We estimate firm fixed effect regressions in which the export status of the firm is interacted with worker education and vocational training. Contrary to expectations, we find that, if anything, exporters pay *less* to educated workers. Similar results obtain for vocational training: exporters do not pay higher wages to workers who have received vocational training from a previous employer. Furthermore, although exporting firms employ slightly more people in middle management positions, they do not pay them more than other firms. We do find that, controlling for education, exporters pay more to skilled production workers relative to unskilled ones, but the occupational definition of skill has little to do with education.

To check the robustness of our findings, we investigate several alternative specifications. First we hypothesize that exporting firms may pay workers less than other firms of comparable size because they are expanding faster than non-exporters and therefore have a less experienced labor force. If this is the case, over time their wage structure may catch up and overtake that of non-exporters. To investigate this possibility, we examine whether exporting firms have a faster wage growth, especially for educated workers. Using worker fixed-effect regressions, we show that wage growth is slightly higher in exporting firms. But during the period studied, Moroccan exporters were not on average expanding faster than other firms.

We then examine whether firms that switch from non-exporter to exporter status increase wages in the following year. We find that they do not. Next we investigate

whether workers who switch job enjoy a larger pay increase if they start working for an exporter. We find the opposite: workers who move to a new employer earn significantly more on average, but those who move to an exporting firms tend to enjoy a smaller wage increase. Finally, we hypothesize that the lack of earnings education differential between exporters and non-exporters may be because of job reclassification, i.e., because exporters promote workers more readily. We investigate whether this is the case but find no significant difference between exporters and non-exporters in their propensity to promote workers across occupation status.

These findings stand in contrast with much of the empirical literature. Focused on the Americas, the literature has tended to find a positive relationship between trade and the earnings skill differential (e.g. Bernard and Jensen 1997, Hanson and Harrison 1999, Verhoogen 2007). This difference with our findings may be due to the nature of Moroccan manufacturing exports, which remain concentrated in light industries such as textile and garments where wages are low compared to those paid in Morocco's main export markets. Cheap and disciplined labor appears to be what brings exporters to Morocco, a finding consistent with the work of Fafchamps and Soderbom (2006) on labor management. Standard comparative advantage seems to account better for the Moroccan experience to date than models of human capital, trade and technology transfer. While this provides some hope for countries with low levels of human capital wishing to initiate manufacturing exports, it may also explain why Moroccan manufacturing exports have not climbed the quality ladder and have failed to grow over time.

The paper is organized as follows. In section 2 we outline our estimation strategy. The data is presented in Section 3. Econometric results are discussed in Section 4. In

Section 5 we interpret our results in the light of the existing literature and speculate as to why our approach yields results that seem at odds with those found using a different methodology.

2. Estimation strategy

The starting point of our analysis is a standard Mincerian earnings function of the form:

$$\log w_{ijt} = \alpha H_{ijt} + \eta D_{ijt} + \theta X_j + \beta Z_{jt} + \varepsilon_{ijt} \tag{2.1}$$

where w_{ijt} denotes the earnings of worker i in firm j at time t, H_{ijt} denote a vector of human capital variables specific to worker i, Z_{jt} is a vector of firm characteristics, D_{ijt} is a vector of occupational dummies, and ε_{ijt} is a residual. The export status of the firm is written as X_{jt}. A positive coefficient θ means that exporting firms pay more to workers in general.

To test whether exporting firms pay more to workers with more human capital, we add regressors of the form $H_{ijt}X_{jt}$:

$$\log w_{ijt} = \alpha H_{ijt} + \eta D_{ijt} + \theta X_{jt} + \gamma H_{ijt}X_{jt} + \beta Z_{jt} + \varepsilon_{ijt} \tag{2.2}$$

If γ is significantly larger than 0, this constitute evidence of a larger earnings skill gap within exporting firms – a sign that human capital is more productive in exporting firms.

It is traditional to include occupation dummies in Mincerian wage regressions. The reason is that the wage workers receive is affected by the tasks they undertake and their

position in the firm's hierarchy. To the extent that exporting firms have a systematically different mix of occupations, omitting D_{ijt} may result in omitted variable bias. The bias, however, may also go the other way. The occupational classification of workers within the firm is to some extent at the firm's discretion. Exporting firms may decide to reclassify educated workers in higher categories without changing their job description simply in order to pay them more. For this reason we report results with and without occupation dummies.

Regression model (2.2) does not control for firm-specific unobserved heterogeneity. Given that we have matched employer-employee data, we can control for this by adding a firm-specific fixed effect u_j to the model. The regression then takes the form:

$$\log w_{ijt} = \alpha H_{ijt} + \eta D_{ijt} + \beta Z_{jt} + \gamma H_{ijt} X_{jt} + u_j + \varepsilon_{ijt} \tag{2.3}$$

Equation (2.3) does not permit the inclusion of time-invariant firm-specific variables in the regression. In our data, the export status X_{jt} of firms hardly changes over time. Consequently, it is not possible to estimate θ precisely from (2.3). To obtain an estimate of θ, we follow Wooldridge (2002) and regress fixed effects on time-invariant firm-characteristics. For this procedure to yield a consistent estimate of θ, X_{jt} can be correlated with u_j but must not be correlated with ε_{ijt}. We have no compelling reason to suspect that it is.

It is also possible that results are affected by worker unobserved heterogeneity correlated with the regressors. This would arise, for instance, if more able workers are hired by exporting firms. To control for this possibility, we use wage information which we have for

two time periods for each worker and we reestimate the model with worker fixed effects:

$$\log w_{ijt} = \alpha H_{ijt} + \eta D_{ijt} + \beta Z_{jt} + \gamma H_{ijt} X_{jt} + v_{ij} + \varepsilon_{ijt} \tag{2.4}$$

It goes without saying that once we control for worker fixed effects, time-invariant worker-specific regressors have to be dropped. This is true, for instance, of education, gender, and vocation training received from previous employers. We can nevertheless examine whether better educated workers enjoy faster growing wages than uneducated ones, and whether the growth rate of wages vary between exporters and non-exporters.

3. The data

With a GDP per head of approximately 4300 US$ in 2005 and an annual growth rate of 2% over the last five years, Morocco is a good example of intermediate economy. Its geographical proximity to Spain, stable regime, and decent infrastructure make it a good candidate for serving the European market with cheap manufactured goods. Furthermore, Morocco is engaged in a far-reaching program of trade integration with the European Union. The question is whether its relatively uneducated workforce is sufficient for the country to take advantage of expanded export opportunities with Europe. The country already experimented with trade liberalization in the late 1980's and early 1990's (e.g. de Melo, Haddad and Horton 2001, Clerides et al. 1998). Currie and Harrison (1997) have shown that this liberalization tended to reduce employment in exporting firms.

The data used in this paper comes from the Firm Analysis and Competitiveness Survey (FACS) conducted from September to December 2000 by the Moroccan Ministry of

Commerce, Industry and Telecommunications (MCIT) and the World Bank (e.g. MCI et Banque Mondiale 2001, Fafchamps and El Hamine 2005). The author was directly involved in designing and pre-testing the questionnaire, selecting the sample, and training the enumerators. The sampling frame from which FACS is drawn is the annual census of manufacturers conducted every year by MCIT. Since responding to the census questionnaire is a legal obligation, census coverage is virtually universal, except for small informal firms.

Firms with fewer than 10 employees are excluded from the FACS sampling frame. This suits our purpose well because small firms are extremely unlikely to export and they often have different wage setting practices such as unpaid family labor and apprentices. Seven sectors of activity are covered by the FACS survey: food processing, textiles, garments, leather, electrical machinery, chemicals, and plastics. This list includes all the most important manufacturing sectors in Morocco, and all the dominant export industries.

To minimize survey costs, the FACS survey focused on manufacturing firms located in the six regions: Casablanca, Rabat, Tangiers, Nador, Fes, and Settat. The first four are located on the coast; Fes and Settat are inland.[3] Census data shows that these six regions account for over 90% of the country's manufacturers. More than half of the country's manufacturers are located in and around the town of Casablanca alone. The resulting sampling frame includes around 1400 firms from which 859 firms were drawn at random, without any stratification, to constitute the FACS sample. This ensures that the sample is self-weighting for the sampled population.

[3]To facilitate interpretation, we refer to regions by the name of their main city rather than using the Moroccan names for the region itself, with which the reader is less likely to be familiar.

A lengthy questionnaire was administered through face-to-face interviews with the firm's manager and accountant. The questionnaire gathered information about many aspects of the firm's operation, including detailed information about exports and manpower over the two years preceding the survey. In addition to the firm questionnaire, ten workers were individually interviewed in each firm. These workers were selected at random by the enumerator assisted by the firm's human resource manager. Enumerators were instructed to select at least one worker in each of the main occupational categories of the firm. As a result upper management employees tend to be overrepresented (see Table 1). Although enumerators probably did not rely on formal random sampling, we have no reason to suspect any systematic sample selection bias. In particular, enumerators were not aware that the data would be used to examine the relationship between exports and wages.

For each worker information is available on a variety of worker characteristics as well as on current earnings, earnings one year prior to the survey, earnings at the time of hiring, and last earnings from the previous employer, if any. The matched employer-employee data have been used, together with similar data from other countries, to study the earnings education gap (Fafchamps, Soderbom and Benhassine 2006) and to investigate labor management and supervision issues (Fafchamps and Soderbom 2006).

The main characteristics of the surveyed firms can be summarized as follows. Sixty percent of the FACS sampled firms are in the textile and garment sector; sixty percent are located in and around Casablanca. Average sales amount to US$2.4 million per year. Average employment is 123 permanent and 13 temporary workers. Firms have been in existence for 16 years on average. See Fafchamps and El Hamine (2005) and MCI et Banque Mondiale (2001) for more details.

Regarding exports, 56% of respondent firms sell all or part of their output abroad. Sampled firms export on average 43% of their output. Of all 7 sectors studied, the garment sector is the most oriented towards exports: on average, garment firms export 80% of their output. Textile and leather manufacturers export, on average, 37-40% of their output. Food processors export a third. The remaining three sectors export less than 10% of their output on average.[4] Large firms export more (68% of output), small firms export less (33%).

Using the FACS data, Fafchamps et al. (2007) have shown that exporting manufacturers in Morocco are primarily young firms geared towards export markets from their inception. Specialization in exports or domestic sales is indeed the norm: 47% of all firms do not export any of their output while 34% export all their production. Only 17% of manufacturers serve both the domestic and export markets. 83% of all exports go to Europe, 46% to France alone; 6% of exports go to neighboring Maghreb countries, 5% to other destinations - primarily sub-Saharan Africa. Most exports leave Morocco by road (MCI 2000); the rest leaves by sea.

4. Econometric analysis

For each worker we have information on earnings at the time of the survey and one year prior to the survey. This results in observations on earnings for 7850 workers in two consecutive years – approximately 15,700 observations in total.[5] Given the way the sample

[4] There are also strong differences across regions. Firms located in Rabat and Tangier export on average more than half of their production. Firms in the Casablanca or Nador regions export on average 40% of their output. Those located in Fes and Settat export on average 30% and 15% on average, respectively.

[5] This is slightly less than the theoretical maximum of $10 \times 859 = 17180$ because some workers have not been employed for a year or more.

of workers is constructed, workers in small firms and in less common occupations are over-represented. To correct this bias, all regression results presented here are weighted by the size of the firm's employment in each occupational category. This information is available from the firm questionnaire. We also correct standard errors for clustering by firm and stratification by occupation.[6]

Descriptive statistics for the worker sample are presented in Table 1, for the two years combined. To illustrate the importance of proper weighting, we report weighted and unweighted results. Weighted average monthly earnings are USD 271. The average age of workers is 33 years. Workers have on average 8 years of education and 7 years of tenure with the present firm. Education refers to completed years of schooling. Tenure is the number of years of employment with the current employer. Experience is the number of years elapsed since finishing school, minus the time spent out of the labor force or in unemployment.

About a 51% of the weighted sample of workers are women, many of whom are illiterate. Using regression analysis controlling for worker characteristics, Fafchamps et al. (2006) have shown that in Moroccan manufacturing the wage received by women is on average 19% lower than that of men. Yet the share of women in labor force is higher in exporting sectors. This is at prima facie inconsistent with the idea that exporting manufacturers rely on better skilled, highly paid workers.

A small proportion of workers received vocational training from a previous employer.

[6] Given the large number of individual effects in some regressions, fixed effects are not controlled for by introducing dummies in the survey regressions but by differencing the data with respect to the weighted mean and applying the survey regression to the differenced data. Experimentation shows that coefficient estimates and standard errors are identical to those obtained by including individual dummies.

This variable is used to examine the return to training. Vocational training provided by the current employer is excluded from the analysis because of potential endogeneity bias: in the Moroccan case, employers seem to be providing training mostly to inexperienced, underqualified workers.

The breakdown of the sample by occupational category shows that production workers – skilled and unskilled – represent the bulk of manufacturing employment. We see that, because of stratification, management and administrative workers are overrepresented in the sample. For this reason, throughout the analysis we weigh observations by occupational category within each firm.

As emphasized in the modeling section, some variables of interest – such as education and gender – vary across workers but not over time. Others such as age, experience, and length of tenure vary by the same increment each year. Other variables in contrast vary over time but not across workers, such as the capital, employment, or export status of the firm. These variables also vary more across firms than over time for a given firm. These features must be kept in mind in the analysis.

We begin by estimating model (2.1) controlling for sectoral fixed effects. This is equivalent to comparing wages within sectors. We wish to investigate whether exporters pay higher wages. The variable of interest is whether the employer is an exporter. Since a spurious correlation between exports and wages may arise because exporters tend to be larger firms and larger firms pay more on average, we control for firm size by including firm capital and total employment as additional regressor. A large number of worker characteristics are included as control variables. Following current best practice, worker age, experience, and length of tenure enter the regression in quadratic form. A gender-

education interaction term is included to capture the idea that returns to education differ by gender, a point emphasized by Fafchamps et al. (2006). We do the same thing for vocational training received from a previous employer. The number of previous employers is included as additional regressor to control for job search effects. We also include two dummy variables to account for the way the wage information was collected. The first dummy takes value 1 if the worker reported his or her earnings net of taxes, 0 otherwise. Since earnings enter the regression in log, the coefficient of the dummy represents the average percentage gap between net and gross earnings. The second dummy takes value 1 if the worker reported receiving a premium or allowance in addition to reported earnings. The sign of this dummy variable is a priori unclear: to the extent that the premium or allowance is a wage substitute, the effect should be negative; but it may be positive if premia and allowances are used as additional rewards for highly productive workers. A year dummy is included as well.

The results from this regression are shown in the first column of Table 2. We find that, as anticipated, exporting firms pay more on average to otherwise observationally equivalent workers. Since we know that exporting firms are more productive than non-exporters (e.g. Fafchamps et al. 2007, Soderbom and Teal 2000), this provides indirect evidence that exporting firms share productivity rents with workers (see also Bigsten et al. (2003)).

Other estimated coefficients are by and large in line with other empirical studies, suggesting that our data are not remarkable. As in most of the literature, we find that firms with more capital pay higher wages on average. Worker characteristics typically have the expected sign, and many are significant. Education, for instance, is highly significant.

Results indicate decreasing returns to experience and non-linear age effects. Wages are also found to increase significantly with the number of previous employers, suggesting that workers who switch employer raise their wage over time. This is probably because of selection effects. All these results are in line with much of the available evidence. The education and gender wage gaps in these data are examined in detail by Fafchamps et al. (2006), so we need not discuss them further here.

Next we test whether firms that begin exporting pay workers more. To this effect, we reestimate model (2.1) controlling for firm-level fixed effects.[7] In this case, identification of the export coefficient is achieved from firms that begin or stop exporting between the two consecutive years for which we have individual worker earnings. Results are reported in the second column of Table 2. The coefficients of worker specific regressors remain by and large unchanged, except that standard errors are somewhat larger. But we see that firms that switch into (out of) exporting do not raise (lower) wages in that year. These findings are not unusual: other authors have found that switching in or out of exporting does not have an immediate wage effect. Bernard and Jensen (1997) even find a negative relationship between the two.

The relationship between earnings and export thus seems to arise from differences across firms, not within firms over time. To investigate this issue further, we regress log earnings on worker characteristics and time-specific firm-level fixed effects u_{it} (i.e., 859×2 fixed effects). These fixed effects measure the firm-specific wage premium, correcting for workers' observable characteristics. This regression is not shown here to save space. We

[7] To this effect we difference the data with respect to the firm-specific mean and apply the Stata survey regression command to the differenced data. This method yields the same result as including firm-specific dummies but is much faster.

then recover the $\widehat{u}_{it}$ and regress them on sector dummies, export status, capital, and labor. This procedure is discussed in detail in Wooldridge (2002). Results, presented in Table 3, show that exporting firms have, on average, a higher firm-specific wage premium. But the effect of exporting status disappears once we control for labor and capital. This suggests that exporting firms pay workers more because they are on average larger and more capital intensive than non-exporters.

The last column of Table 2 reports results from a worker fixed effect regression. This regression compares identical workers over time. Its purpose is to test whether individual workers get paid more when their employer begins to export. Most worker characteristics drop out of the regression as they either do not change over time or are collinear with the year dummy. From the coefficient of the year dummy we see that wages increased on average by 5.8% between the two survey years. However, workers in firms that *began* exporting between the two years experience a wage growth slower by 3.4 percentage points. In contrast, firms that increased total employment increased wages by even more than 5.8%.

Taken together, results so far suggest that there is a positive relationship between wage earnings and exporting status. But this relationship is due, at least in part, to the larger size of exporters. If anything, firms that initiate exporting pay identical workers less, not more. These results may be misleading, however, because the measured effect of exporting status fails to account for differences in the education level of workers. Our hypothesis is that the return to human capital is higher among exporters, and hence that exporters pay educated workers more.

To test this conjecture, we proceed as outlined in equation (2.2) and reestimate the

three regressions presented in Table 2 with cross terms between exporter status and human capital. Because exporters employ many women, we also include an interacted gender term. Results are shown in Table 4. We find that exporters, contrary to expectations, do not pay significantly more to educated workers. They do, however, pay less to women who, as we have emphasized earlier, are overrepresented in exporters' workforce. One result appears to go in the direction of our hypothesis: in the worker fixed effect regression, we see that workers who received training from a previous employer get higher pay if their current employer begins exporting. This finding, however, hinges on 12 observations only and is not robust.

The results presented in Tables 2 and 4 do not control for the occupation status of the worker within the firm. Conceivably, this may lead to a bias if exporters have a different hierarchical structure and hence a different mix of occupations than non-exporters. This may even explain our lack of evidence of higher returns to human capital among exporters if exporters employ more low education workers in better paid middle management jobs. To investigate this possibility, we begin by regressing the share of a firm's workforce in each occupational status on an export dummy, the log of capital, the log of employment, and sector dummies. Results, not shown here to save space, confirm that exporters have more middle management than non-exporters. To test whether differences in workforce composition can account for our results so far, we reestimate the models presented in Table 4 with occupational dummies. Results, which are shown in Table 5, suggest that a massive wage premium is paid to management categories. They also show (last column) that promotion is associated with a large wage increase. But otherwise they do not modify our earlier findings concerning the absence of higher wages to educated workers among

exporters.

Comparing the wages worker receive from their current employer to the wages paid by their previous employer also provide a way of testing the relationship between exporting and wages. If workers receive more when their new employer is an exporter, especially if they are well educated, this would suggest that identical workers are paid more by exporters compared to non-exporters. We do not have panel data following workers across firms and thus do not know the exporter status of the previous employer of workers in our database. But we know the last wage paid by the previous employer, if any. This information alone enables us to identify an exporter wage effect provided that the export status of the employer is not perfectly correlated across employers of the same worker.

We proceed as follows. We estimate three worker fixed effect regressions comparing earnings of individual workers between the current employer and the previous one. The dependent variable is the (log of the) last wage paid by the previous employer and the (log of the) wage paid to the worker when he or she began working for the current employer.

In the first regression we only include a new job dummy and interaction terms between this dummy, education, and vocational training. The coefficient of the new job dummy yields the percentage increase in earnings resulting from the change of employer. The interaction terms measure whether this percentage increase is larger for educated and trained workers, respectively. Regression results are presented in the first column of Table 6. We see that workers who shift employer enjoy on average a 10.5% wage increase. The education interaction term is positive but non-significant. The wage increase is much smaller for workers who received vocational training from their previous employer. This is consistent with the idea that vocational training is provided mostly as an attempt to

upgrade the skills of low productivity workers. It therefore proxies for below average productivity. This issue is discussed more in detail in Fafchamps et al. (2006).

We then test whether the difference in earnings between the employers is higher when the current employer is an exporter. To this effect we introduce an interaction term between the new job dummy and the export status of the employer. Export status is measured as follows. If the current employer is an exporter, exporting status is 1, and 0 otherwise. For the previous employer, we set the exporter status to 0.5, which is the proportion of exporters among the surveyed firms. This is equivalent to assuming that the export status of the employer is uncorrelated over time. It is immediately clear that the strength of this test depends critically on the amount of actual correlation in the export status of the employer – something we unfortunately cannot test. The results, presented in the second column of Table 6, indicate that, if anything, workers receive a smaller wage increase when they begin working for an exporter. The effect, however, is not significant.

We also investigate whether the wage change is higher for educated workers, as would be expected if human capital has a higher productivity among exporters. To this effect, we interact the exporter status variable with education. Results, shown in the third column of Table 6, show that being educated does not lead to a higher wage increase when starting to work for an exporter.

5. Discussion

These results presented in this paper contribute to the existing literature in several ways. Many authors have found a positive relationship between the earnings skill differential and

trade liberalization (e.g. Atanasio, Goldberg and Pavcnik 2004, Epifani and Gancia 2004, Denny et al. 2002, Bernard and Jensen 1997, Robbins and Gindling 1999, Gindling and Robbins 2001, Hanson and Harrison 1999, Verhoogen 2007, Kaplan and Verhoogen 2006). There are some exceptions, however. Gonzaga, Filho and Terra (2006), for instance, find that, in Brazil, the earnings skill gap fell with trade liberalization. Pavcnik, Blom, Schady and Schady (2004) similarly find not relationship between the skill premium and the level of trade openness in Brazil. Soderbom and Teal (2000) come to a similar conclusion in their study of manufacturing export patterns in sub-Saharan Africa. Robbins, cited in Hanson and Harrison (1999), reportedly finds that the relative wages of skilled workers rose following trade liberalization in Chile, Colombia, Costa Rica, and the Philippines, but was stable or fell in Argentina and Malaysia.

Most of these findings are obtained by examining how the earnings skill differential evolves over time during episodes of trade liberalization. Tariff reduction is seen as a 'quasi-natural experiment'. Identification is achieved through a regression discontinuity design, i.e., the technological and institutional factors driving earnings differentials are assumed to change less rapidly than trade openness. This approach is appealing because it takes care of general equilibrium effects. But it is susceptible to omitted variable bias since the researcher does not observe what would happen in the absence of trade liberalization.

We focus instead on differences across firms at a single point in time. Identification is predicated on the assumption that, if the productivity of individual workers is at least partly reflected in their wages and if skilled workers are more productive than unskilled workers in exporting firms, then we should observe a different earnings gap for educated workers among exporting and non-exporting firms.

With the exception of Kaplan and Verhoogen (2006), research on this issue has focused on data aggregated at the sectoral level, perhaps because of the dearth of matched employer-employee data in developing countries. The work of Kaplan and Verhoogen (2006) is an exception but, for confidentiality reasons, the authors only have limited firm-level data. We rely here on matched employer-employee data using a dataset that we collected and that contains detailed information about both firms and workers. We obtain results that are different from most of the existing literature, namely that the earnings differential for educated workers is not larger in exporting Moroccan firms.

This raises the question of why the two approaches yield different results. One possible explanation is that the exporting sectors in Morocco differ from those of countries such as Mexico where the earnings skill gap is positive. Verhoogen (2007), for instance, describes in great detail the effect of trade liberalization on Mexican car manufacturing. Morocco does not export cars, however – only labor intensive garment, textile, and leather products using a largely illiterate female workforce. This may explain why human capital does not play as important a role in Morocco compared to Mexico.

Another possible explanation is suggested by the work of Bernard and Jensen on US exporters. Comparing the wages paid by US exporters and non-exporters, Bernard and Jensen (1995) find that exporters pay 8% more to production workers and 7.3% more to non-production workers (who, on average, are more skilled). This means that the skilled to unskilled wage gap is slightly smaller among US exporters, a result similar to ours. Yet, applying a time series approach to the same US exporters, Bernard and Jensen (1997) find an increase in US manufacturing exports in the 1980's associated with an increase in the wage gap between high- and low-skilled workers. The authors note that much of

the increased wage gap is driven by increases in employment at exporting plants. The apparent contradiction between the two results can be explained by compositional effects.

To see why, imagine a simple situation in which manufacturing is small so that general equilibrium effects on wages can be ignored. Let $d > 1$ be the *within-firm* earnings skill differential, meaning that if an uneducated workers earns w in firm i, an educated worker in the same firm earns on average wd. Assume that d is constant across firms and let $x > 1$ be the wage premium paid by exporters to all their workers, skilled and unskilled. Further let $\eta < 0.5$ be the proportion of workers employed by exporters. Finally, let $0 < S_x < 1$ and $0 < S_n < 1$ be the share of skilled workers in the workforce of exporters and non-exporters, respectively. The average earnings skill differential D in the economy is:

$$D = d\frac{S_n(1-\eta) + xS_x\eta}{(1-S_n)(1-\eta) + x(1-S_x)\eta}\frac{1-S}{S}$$

where $S \equiv S_n(1-\eta) + S_x\eta$. It can be shown that, for most values of $\eta < 0.5$, the average earnings skill differential D increases with employment in the export sector η whenever $S_x > S_n$. This is because, when $S_x > S_n$, a rise in exports increases (decreases) the proportion of skilled (unskilled) workers working in exporting firms that pay more to all workers.

What this example shows is that, even if the skilled-unskilled wage gap is the same for exporters and non-exporters, it is possible to observe a rise in the average earnings skill differential – as in Mexico – or a fall – as in Brazil – depending on whether $S_x > S_n$. This interpretation is consistent with what Gonzaga et al. (2006) report regarding the relative skill intensity of export and non-export sectors. In Morocco we similarly find

that exporters are no more likely to employ educated workers than non-exporters.

6. Conclusion

We have sought to test whether returns to human capital are higher in exporting firms. To this effect, we have manufacturing exporters pay educated workers more. Using a panel of matched employer-employee data from Morocco, we failed to find convincing evidence that educated workers earn higher wages when working for exporters. We also found that, although exporters pay more on average, much of the difference can be explained by the fact that exporting firms are on average larger – they have a larger workforce and more capital. These findings differ from the literature which has often found a positive relationship between trade liberalization and the skill earnings gap.

The question now is: how to reconcile these contrasted findings? One possibility, discussed above, is that the relationship between trade liberalization and the skill earnings differential is driven by composition effects: exporters pay more on average to all workers and trade liberalization raise employment in exporting firms. Another possibility is that rent sharing operates at the level of the firm, not of the individual worker: firms that redistribute average productivity rents to their workforce may not do across the board, without differentiating between high and low productivity workers. This would break the link between wage and the firm-specific productivity of individual workers, thereby explaining why we could not find the anticipated relationship between exports, human capital and earnings. Disentangling these possibilities require more specific data and is left for future research.

A third possible explanation is that returns to human capital vary across sectors and thus across countries, depending on what they export. In the traditional trade literature, the emphasis was put not on human capital but on cheap labor as a driving force behind export success (e.g. Baldwin 1992, Feenstra 2004). This view finds some support in our data: much of the export wage premium can be attributed to a firm size effect; and exporting firms in Morocco rely heavily on female workers, who are paid less than men and who have very low levels of education.

This leaves us with two sharply contrasted views of export success, the first emphasizing the role of human capital and the second the role of cheap labor. To a country trying to break into export markets, which of these two views is correct has profound implications for policy regarding education, vocational training, wage control, and labor regulation. These two views need not be incompatible, however. The work presented here suggests that returns to human capital are not particularly high in labor intensive export industries such as the ones found in Morocco. Instead we find circumstantial evidence that export success is linked to an abundant supply of cheap uneducated female labor.

The low level of human capital present in Moroccan firms may nevertheless explain why manufacturing exports from that country have remained focused on a few labor intensive sectors – and why they have failed to grow over time. Human capital may not be necessary to begin exporting manufactures, but it may be essential to climb the quality ladder and remain competitive when the cheap labor advantage starts to erode.

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Table 1. Characteristics of workers

	sample mean	weighted mean	standard deviation
Earnings			
Monthly earnings (US$)	328	271	373
Dummy = 1 if wage reported net of taxes	35%	31%	
Worker characteristics			
Years of education	9	8	5
Age	35	33	9
Years of tenure	7	7	6
Years of experience	19	18	11
Female	39%	51%	
Received training in previous job	2%	2%	
Breakdown of the sample by occupation:			
Upper management	5%	0%	
Middle management	9%	2%	
Skilled workers	40%	50%	
Unskilled worker	30%	43%	
Support and administrative staff	16%	5%	
Number of observations	15700		

Table 2. Earnings regressions

	Sector fixed effects		Firm fixed effects		Worker fixed effects	
Firm characteristics	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Dummy=1 if firm exports	0.0501	**2.44**	-0.0588	-0.86	-0.0337	**-2.74**
Log of capital	0.0466	**5.06**	0.0054	0.28	0.0143	1.47
Log of total manpower	0.0133	0.87	0.0909	1.17	0.0442	**1.83**
Worker characteristics						
Years of completed education	0.0338	**9.09**	0.0224	**5.45**		
Dummy=1 if training by previous employer	0.1747	**2.15**	0.1289	1.58		
Female dummy	-0.0007	-0.02	-0.0662	-1.34		
Female dummy x education	-0.0131	**-3.73**	-0.0065	-1.48		
Female dummy x training by pr. employer	-0.0924	-0.97	-0.1084	-1.15		
Age	-0.0132	-1.50	-0.0097	-1.14		
Age squared	0.0003	**2.59**	0.0003	**2.53**	-0.0001	-0.21
Years of tenure	0.0049	1.42	0.0150	**4.98**		
Years of tenure squared	0.0003	**2.00**	-0.0001	-1.21	-0.0000	-0.08
Years of experience	0.0147	**3.76**	0.0120	**3.23**		
Years of experience squared	-0.0004	**-4.63**	-0.0004	**-4.76**	-0.0004	**-2.34**
Log (number of previous employers+1)	0.0840	**5.85**	0.0604	**5.87**		
Dummy=1 if wage reported net of taxes	-0.0461	**-2.04**	-0.0398	-1.08	-0.0430	-1.42
Dummy=1 if receives premium/allowance	0.0463	**1.79**	0.2386	**6.13**		
Time dummy						
Year 2 dummy	0.0223	1.10	0.0153	**2.29**	0.0579	**4.45**
Number of observations	12496		12496		14068	
R-squared (within)	0.3263		0.2245		0.1079	

Estimator is weighted regression (see text for details).

Table 3. Firm fixed effects regressed on firm characteristics

Firm characteristics	Coef.	t-stat	Coef.	t-stat
Dummy=1 if firm exports	0.0931	**4.94**	0.0163	0.71
Log of capital			0.0515	**6.99**
Log of total manpower			0.0320	**2.75**
Dummies				
Year 2 dummy	-0.0018	-0.10	-0.0030	-0.18
Sector fixed effects	included but not shown			
Number of observations	1471		1381	
R-squared	0.3301		0.3169	

Table 4. Earnings regressions with export cross terms

	Sector fixed effects		Firm fixed effects		Worker fixed effects	
Worker characteristics x export status	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Education x export dummy	0.0046	1.47	0.0027	0.90	-0.0026	-1.15
Training x export dummy	-0.1093	-0.68	-0.1140	-0.86	0.1275	**3.71**
Female dummy x export dummy	-0.0817	**-3.00**	-0.0432	**-1.66**	0.0256	1.12
Firm characteristics						
Dummy=1 if firm exports	0.0493	1.54	-0.0538	-0.74	-0.0289	-1.17
Log of capital	0.0469	**5.13**	0.0055	0.28	0.0173	**1.73**
Log of total manpower	0.0137	0.91	0.0891	1.17	0.0463	**1.89**
Worker characteristics	Coef.	t-stat	Coef.	t-stat		
Years of completed education	0.0300	**7.66**	0.0202	**5.72**		
Dummy=1 if training by previous employer	0.2562	1.64	0.2194	**2.01**		
Female dummy	0.0670	**2.08**	-0.0291	-0.76		
Female dummy x education	-0.0133	**-3.79**	-0.0066	-1.49		
Female dummy x training by pr. employer	-0.0772	-0.81	-0.1025	-1.07		
Age	-0.0143	-1.62	-0.0102	-1.19		
Age squared	0.0004	**2.73**	0.0003	**2.59**	-0.0002	-0.77
Years of tenure	0.0049	1.43	0.0149	**4.94**		
Years of tenure squared	0.0003	**1.95**	-0.0001	-1.18	-0.0001	-0.50
Years of experience	0.0152	**3.84**	0.0122	**3.24**		
Years of experience squared	-0.0004	**-4.80**	-0.0004	**-4.79**	-0.0003	-1.39
Log (number of previous employers+1)	0.0835	**5.84**	0.0604	**5.92**		
Dummy=1 if wage reported net of taxes	-0.0470	**-2.07**	-0.0463	-1.32	-0.0439	-1.44
Dummy=1 if receives premium/allowance	0.0474	**1.83**	0.2381	**6.17**		
Time dummy						
Year 2 dummy	0.0216	1.07	0.0151	**2.27**	0.0596	**4.36**
Number of observations	12496		12496		14068	
R-squared	0.3283		0.2254			

Table 5. Earnings regressions with occupation dummies

	Sector fixed effects		Firm fixed effects		Worker fixed effects	
Occupation dummies (*)	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
Top management	1.0725	**16.38**	1.0425	**20.61**	0.1840	**2.04**
Middle management	0.8790	**18.81**	0.6984	**20.10**	0.0522	0.55
Unskilled workers	-0.1750	**-9.59**	-0.2363	**-18.25**	-0.0451	**-3.60**
Support staff	0.0976	**3.13**	-0.0075	-0.33	-0.0186	-1.52
Worker characteristics x export status						
Education x export dummy	0.0036	1.30	0.0025	1.13	-0.0026	-1.13
Training x export dummy	-0.0238	-0.19	-0.1527	-1.23	0.1285	**3.74**
Female dummy x export dummy	-0.0442	**-1.73**	-0.0442	**-1.79**	0.0258	1.13
Firm characteristics						
Dummy=1 if firm exports	0.0231	0.77	-0.0403	-0.96	-0.0287	-1.17
Log of capital	0.0397	**4.33**	0.0135	0.97	0.0176	**1.78**
Log of total manpower	0.0241	**1.68**	0.0432	1.22	0.0464	**1.88**
Worker characteristics						
Years of completed education	0.0192	**5.39**	0.0073	**2.44**		
Dummy=1 if training by previous employer	0.0901	0.80	0.1686	**1.78**		
Female dummy	-0.0208	-0.67	-0.0721	**-2.07**		
Female dummy x education	-0.0049	-1.46	0.0001	0.01		
Female dummy x training by pr. employer	-0.0001	0.00	-0.0598	-0.60		
Age	-0.0180	**-2.34**	-0.0110	**-1.89**		
Age squared	0.0003	**2.76**	0.0003	**3.27**	-0.0002	-0.95
Years of tenure	0.0050	1.53	0.0123	**4.28**		
Years of tenure squared	0.0003	**1.89**	-0.0001	-0.74	-0.0001	-0.34
Years of experience	0.0171	**4.68**	0.0119	**4.87**		
Years of experience squared	-0.0004	**-4.95**	-0.0004	**-6.20**	-0.0002	-1.10
Log (number of previous employers+1)	0.0863	**6.05**	0.0561	**5.40**		
Dummy=1 if wage reported net of taxes	-0.0599	**-2.72**	-0.0334	-1.05	-0.0447	-1.46
Dummy=1 if receives premium/allowance	0.0296	1.25	0.1886	**4.76**		
Time dummy						
Year 2 dummy	0.0208	1.08	0.0173	**3.22**	0.0592	**4.31**
Number of observations	12447		12447		12447	
R-squared	0.4488		0.3904			

(*) Skilled worker is the omitted category.

Table 6. Earnings differential with previous job

	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
New job dummy	0.1053	**5.06**	0.1176	**5.65**	0.1248	**6.71**
Education x new job dummy	0.0035	1.24	0.0029	1.03	0.0001	0.03
Training x new job dummy	-0.0900	**-1.73**	-0.0887	**-1.69**	-0.1787	-1.37
Dummy=1 if wage reported net of taxes	-0.0226	-0.64	-0.0428	-1.43	-0.0444	-1.47
Export status of employer (*)						
Exporter status			-0.0222	-0.82	-0.0525	-1.43
Exporter status x education					0.0037	0.68
Exporter status x training					0.1069	0.76
Nobs	11092		10987		10987	
R-squared	0.1441		0.1484		0.1495	

Estimator is weighted regression with worker-specific fixed effects.
(*) Status=0.5 for past employer. Status=export dummy for current employer.