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Wages and Human Capital in Exporting Firms in Morocco

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WAGES AND HUMAN CAPITAL IN EXPORTING FIRMS IN MOROCCO[1]

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ABSTRACT

We study the relationship between wages, human capital accumulation and work organisation in Morocco using matched worker-firm data for Metallurgical-electrical and Textile-clothing firms. While wages are found to rise with all human capital characteristics, returns to education and experience are much higher for the upper wages. Participation in on-the-job training is constrained by: a relevant industrial location; a minimal educational background; and an appropriate family situation. Moreover, work organisation and on-the-job training are dependent on the education process. Finally, we find strong interactions of human capital accumulation with involvement in chain gangs, team work and supervision.

Key Words: Africa, Morocco, Wages, On-the-job training, Human capital, Workplace organisation, Matched worker-firm data.

RESUME

Nous étudions le lien entre salaires, accumulation du capital humain et organisation du travail au Maroc en utilisant une enquête couplant des informations sur les entreprises et les employés de deux secteurs manufacturiers. Bien que les salaires soient sensibles à toutes les variables de capital humain, les rendements de l'éducation et de l'expérience sont beaucoup plus élevés pour les travailleurs à hauts revenus. La participation à la formation sur le tas du travailleur est favorisée par son secteur d'appartenance, son niveau d'éducation et sa situation familiale lorsqu'elle est favorable. De plus, l'organisation des tâches sur le lieu de travail (à la chaîne, en équipe) découle aussi du niveau de capital humain des salariés.

Mots-clefs : Maroc, Salaires, Formation sur le tas, Capital humain, Organisation du travail, Données liées employeurs-employés.

JEL Code : J24, J31, O12

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1. INTRODUCTION

Morocco is a semi-developed economy with a rapidly evolving working population. About one third of the Moroccans are under 15 years old, while the decreasing fertility rate is still at 3.1 percent in 2000. Moreover, there are large inter-urban and rural-urban migrations. For these reasons, the Moroccan labour market is tight in the peri-urban areas where exporting firms are often concentrated. However, although job searchers are abundant, the qualification of the Moroccan manpower is limited. More than 50 percent of adults are illiterate, much more for women.

In this paper, we examine whether raising human capital of Moroccan workers is likely to stimulate their earnings in two industries: Textile-clothing and Electrical-Mechanical industries. While half of the population works in agriculture, the Textile industry stands as a major employment sector (42 percent of industrial employment, 60 percent for female labour force). Textile production has increased by 7.75 percent per year between 1986 and 1998, and contributes to 11 percent of exports (Intermon, 2003). Most garment companies are small sized family entities where the minimal wage, social security and legal contracts are not enforced. In contrast, a few modern firms account for the bulk of human capital investment in the textile sector. We focus on some of these firms and on electrical-mechanical industries, another pillar of the exporting industry in Morocco.

During the last decade, social indicators substantially improved following growing public social expenditure and better focus of social policies on rural areas (The World Bank, 2001). Yet poverty and vulnerability were found to be on the rise. The incidence of poverty was 13.1 percent in 1990/91 and 19 percent in 1998/99. Explanations of these high poverty figures can be found in sluggish GDP growth, drop in agricultural value-added after several droughts, collapse in employment creation and growing inequality in rural areas. This morose economic context hampered the progress of labour earnings. An open question is whether better education and training can lead to large wage increases in such situation.

The restructuring of the Moroccan economy towards an export orientation started at least from 1984. Foreign trade has been liberalized as early as 1986, culminating with several association agreements with the European Union, the free trade agreement with the US and the new industrial port in Tanger in 2005. Moreover, from 1989, a large privatisation programme of public firms went under way. In 2003, China entered in the WTO, generating fierce competition for Moroccan products in Europe. Besides, the quotas of the multi-fibre agreement were eliminated. These events are new threats on the Moroccan textile and other exporting firms. In the textile sector, 75,000 jobs were destroyed in 2005 in Morocco, and several firms closed. Only firms producing small series and luxury products seem to be able to compete with the Chinese competition, in the absence of modernisation. All these economic transformations have affected wages and employment. Although aggregate wages do not seem to have suffered much, wages in firms oriented towards export have sometimes dropped (Currie and Harrison, 1997). In this paper, we focus on the latter type of firms, which are believed to be amongst the most efficient ones, in part due to self selection since inefficient firms cannot compete on international markets (Clerides, Lach and Tybout, 1998).

In 1986-91, one factor contributing to poverty alleviation is the fast expansion of jobs in the manufacturing export-oriented sector, mostly in Clothing and Textile and Electrical-Mechanical industries. However, job creation mainly came from low-skill, low-pay temporary jobs, which may be why real wages have almost stagnated in the 1990s (Lane et al., 1999). Meanwhile, the low education and training level of the Moroccan manpower hampers the competitiveness of exporting Moroccan firms, implying low remuneration in these sectors (Royaume du Maroc, 2004).

Can better education and on-the-job training provide an easy way to combat wage stagnation in the dynamic segment of the exporting industry in Morocco? We explore this question in this paper. We discuss wages and the labour market in Morocco in Section 2. In Section 3, we present the data and comment on the estimation results in Section 4. Finally, Section 5 concludes.

2. WAGES AND LABOUR MARKET

In Morocco, the labour legislation underpins the level of wages. Unions have a strong influence and the presence of an official minimum wage (SMIG: salaire minimum interprofessionnel garanti) has been a crucial element of wage determination in the recent period. This was not always the case: during the 1980s real wages in the Moroccan manufacturing sector declined while the real SMIG increased by about 25 percent. During the 1990s, the SMIG adjustment over time followed the changes in the mean urban wage more than proportionally (The World Bank, 1994). Thus, the partial vanishing of the differential between mean urban wage and SMIG contributed to reducing the global dispersion of wages. The 52 percent increase of the SMIG between 1989 and 1994 cannot be explained by the sole change in the cost of living (35 percent over this period). The monthly SMIG had not been updated (1,659 Dirhams[2]) since 1996, then was raised by 10 percent in 2000. Although the minimum wage is not enforced in the informal sector of the economy, it is well implemented throughout the industrialised, unionised sectors in which most workers' earnings stand above the minimum wage. These workers are generally paid between 13 and 16 salary months per year, including bonuses.

Only few articles, beyond the ones already mentioned, deal with labour markets in Morocco. Lane et al. (1999) underline the stagnation of the average wage in the manufacturing sector over the 1990s. Considerable gaps in average wages persist across sectors. The least remunerative industrial sectors are those of Leather and Confection, while the most profitable are the sectors of Drinks and Tobacco. The mean wage in the latter sectors is, in 1995, more than three times higher than that of the Confection Sector[3]. The stagnation of wages may be partly explained by the fact that the least remunerative industries have had the largest share of job creation during the past decade. In these conditions, the government may face a trade off between wage rise and unemployment.

However, according to the World Bank (1996), the constant augmentation of the SMIG put pressure on urban unemployment, especially for the least educated workers. The recommendations of the World Bank in 1996 were the fixation of the SMIG in order to create jobs in the formal sector and raise competitiveness on international markets. By contrast, in 1999, the World Bank underlines the necessity to reduce non-salary costs and to maintain an effective social welfare system. Hence, in Morocco, it seems that the wage policy could move away from the consideration of salary costs and rather concentrate on raising workers' productivity. A natural way of improving labour productivity is to enhance workers' human capital.

The skills of the workforce as well as exposure to competition doubtless much explain wage disparities across sectors (as in Clerides et al., 1998). Our survey covering two sectors confirms it. Meanwhile, other factors intervene as employment duration and on-the-job training (OJT). Indeed, legally, the minimum wage is not applied for certain types of employees, such as young workers below 18 years old, temporary workers or trainees. Furthermore, in 1986, at least half the firms of the Moroccan private manufacturing sector and 40 percent of the large companies (over 100 employees) pay unskilled workers an average wage below the SMIG[4]. On the other hand, only 3 percent of the firms of this sector pay skilled workers below the minimum wage.

The statutory frame of the Moroccan labour market is stiff. Until recently, working relations were governed by a legislation dating 1921 which strongly emphasised job security, so much so that dismissing permanent workers was expensive[5]. The law provided for a 48-hours maximum workweek with no more than 10 hours any single day, premium pay for overtime, paid public and annual holidays, and minimum conditions for health and safety, including the prohibition of night work for women and minors. As with other regulations and laws, these are not universally observed in the informal sector.

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[2] 147 US dollars of 2001.

[3] In the industrial sector, the annual average wage - ratio of mass salary to permanent employment - amounted in 1995 to 34,963 dirhams, that is 2,914 monthly dirhams.

[4] The World Bank (1994). Females are more likely than males to receive a wage below the SMIG.

[5] Workers are considered permanent when they can justify more than a year of job seniority.

Several studies showed that the former Labour Code, with its old-fashioned dispositions combined with the slow pace of the law contributed to making more expensive the management of human resources in Morocco (The World Bank, 1999).

The labour market may now benefit from the recently adopted labour code (July 2003), which encourages flexibility and contains procedures for conciliation. The new code also reflects international conventions regarding the protection of children, women, handicapped people, workers and unions' rights.

However, since employers hesitate to hire permanent workers, temporary workers gave considerable flexibility to the Moroccan labour market, although this flexibility has been acquired at the cost of employment stability and accompanying investment in human capital (Lane et al., 1999)[6]. Indeed, job precariousness not only diminishes the personal implication of the worker for her training in the firm, but also deters training investment by employers. Statistics of the *Direction de la Statistique* on the creation of industrial employment in 1995 exhibit the prominence of seasonal jobs at a rate of 80 percent. These jobs, contributing for 19 percent to total employment in the transformation industries, grew by 8 percent as compared to 1994, while permanent jobs increased only by 1 percent. Moreover, much of the labour force access the labour market through informal networks, frequently relying on family or personal links (El Aoufi, 1997). We now discuss the data used in the estimation.

3. THE MOROCCAN MATCHED WORKER-FIRM DATA

A specific survey at the employee's workplace was undertaken to produce a sample of matched worker-firm data in Morocco[7]. The data include information about the career of each worker in the surveyed firms: individual characteristics (matrimonial status, number of dependent children, geographic origin), wages, educational investment (years of schooling at the primary, secondary, tertiary levels, university or vocational degrees), post-school training (apprenticeship, internships, formal training within the current firm), experience in the labour market and occupation in the current firm. The data combine these workers' characteristics with the characteristics of the firms in which they work.

187 individuals were interviewed during Summer 1997 (Nordman, 2000). 1997 was an exceptionally good agricultural year, which stimulated the whole economy. The survey was completed in January 2000 while the employees of an additional firm were included in the sample, which now amounts to 203 individuals matched with 8 firms. The firms were selected on criteria of size (not less than 50 employees), activity, vocation to export and capital ownership. Firms not exporting their production or foreign owned were not retained in the sample[8]. Employers have been asked about their firm's characteristics, including: workforce composition, work organisation, training and communication practices, organisational or technical innovations, competitiveness. The observed occupational structure within each firm was used to constitute representative sub-samples of their workers. Workers were randomly chosen within each occupation strata and not less than 10 percent of the manpower was interviewed.

In these data, four firms belong to the Textile-clothing sector located in Tanger area and four firms to the Mechanics, Metallurgical, Electrical and Electronics Industries (IMMEE or Electical-Mechanical industries to shorten) in Casablanca area. The average size of the visited establishments is 230 employees. 54.1 percent of the employees work in the Textile sector and 45.9 percent in the IMMEE. The proportion of female in the overall sample amounts to 49.8 percent.

[6] High welfare costs in the formal private sector (from 21.7 to 35 percent of gross wage) increased the cost of permanent workers and detered firms of the informal sector of joining the formal economy.

[7] The methodology of the Moroccan survey is in Destré and Nordman (2002). Definitions and descriptive statistics of the variables used in this paper are in Tables 1 and 2 of the Appendix.

[8] The survey was designed to concentrate on Moroccan exporting firms, i.e firms belonging to the formal manufacturing sector of the Moroccan economy. The survey purpose was to investigate the conditions under which employees' workplace learning occurs and its association with the firms' organisational features. Therefore, firms with too few salaries were excluded from the investigation.

The mean schooling year is 9.8 years (standard deviation 9.7). It is calculated from the workers' questionnaires, using the available information on the highest level of education reached by the workers. When this variable is calculated from the age of end of school, from which we deduct 6 years, the average number of years of schooling is close to 13 years. The education variable we use is net from repeated classes (accounting for the observed number of unsuccessful years of education[9]) in order to avoid overestimating education[10]. 5.4 percent of the workers have had no schooling, 16.7 percent have completed only primary education (1 to 5 years), 65.5 percent have reached an educational level of 6 to 12 years (secondary school) and 11.8 percent have completed studies in higher education. 33 percent of employees have a vocational diploma related to their current job.

The average tenure in the current firm is 6 years (4.3 years for females, 7.4 years for males). Total professional experience is on average 8.7 years (10 years for males, 6 years for females). Previous experience off the current job is on average 2.7 years (1.2 years for females, 3.9 years for males). 14 percent of the employees have worked in their firm for at least three years without any previous work experience. The overall ratio of tenure to overall work experience, 69 percent, is due to a large number of young, first-time workers. This leads to an average age of workers equal to 30 years, although only six workers are observed under 17 years old, none under 15 years old. 17 individuals are paid under the SMIG of 1996: 1659 Dirhams. The studied firms do not massively employ under age or pay below the SMIG, practices sometimes mentioned for Morocco (Intermon, 2003).

Let us examine some characteristics of the wage sample. The average monthly wage stated by the employees is equivalent to 228 US dollars[11]. The average wage in the IMMEE is 1.3 times greater. Moreover, on average male workers' wages are 1.5 times higher than those of female workers. Differences in human capital endowments across gender and sector contribute to explaining these wage differentials. Indeed, the workers' average education in the textile sector is 11.1 years against 15 years in the IMMEE. Given that the clothing sector is the lowest wage manufacturing sector in Morocco, the inter-industry wage differential could explain some of the gender wage gap. However, the proportion of female workers in the two sectors is similar. This reinforces the suspicion about the persistence of wage discrimination against females even if they generally have lower experience in the labour market.

4. THE ESTIMATION RESULTS

The estimates are mainly based on OLS and quantile regressions. For the OLS, firm fixed effects have been introduced in some versions only to assess the importance of using matched data. For OLS and quantile regressions, we present results with dummies of wage quartiles (indicating the relative position of each worker in the wage distribution) crossed with human capital variables and without quartiles. Indeed, returns to human capital can vary across wage categories[12].

However, OLS and quantile regression estimates cannot be straightforwardly compared as they are anchored around the quantiles of different distributions. Introducing the quartile dummies in OLS allows us to estimate coefficients that characterize the corresponding intervals of wage levels. In contrast, the quartiles used for quantile regressions express that quantile regressions are centered on quantiles 0.25, 0.50 and 0.75 of the *conditional* wages, i.e. of error terms in the regressions. It is therefore difficult to directly compare the two sets of estimates of which interest is to inform on different aspects of the joint distribution of wages and their regressors. In that sense, when distinct effects appear in OLS and quantile regressions, even for similar quantiles, this must not be interpreted as a contradiction, but rather as complementary information on the joint distribution of variables.

[9] Angrist and Lavy (1997) estimate the number of repeated classes at 2 to 3 years in Morocco. In our survey, this number is about 4 years and is calculated from the highest school certificate or diploma and the age at the end of studies.

[10] See on this point Behrman and Birdsall (1983).

[11] The average monthly wage corresponds to 1.6 times the minimum wage (SMIG). The declared monthly wages are those of May and March 1997 for 90 percent of the sample and of December 1999 for the rest.

[12] For instance, high wage workers should not benefit from the same return to experience than low wage workers since the latter may have fewer incentives to make further on-the-job investment in human capital because they only deal with basic tasks. Alternatively, more educated individuals – generally with higher wages – may have greater incentive to invest in training because they learn more quickly.

We investigate the issue of the sample selectivity by using the following truncated regression model.

(1) $Y_{1i} = X_{1i}\beta_1 + u_{1i}$ if $Y_{1i} \geq Y_{2i}$

(2) $Y_{2i} = X_{2i}\beta_2 + u_{2i}$ otherwise,

where Y_{1i} is the log observed wage of each worker *i* while Y_{2i} denotes her unobserved log reservation wage. β_1 and β_2 are parameter vectors. X_{1i} and X_{2i} are two line vectors describing the worker's observable characteristics. While X_{1i} contains the usual covariates present in Mincer-type wage regressions, such as education, labour market experience and training variables, X_{2i} also includes socio-demographic characteristics not present in X_{1i} (for example, the number of dependent children, marital status, and geographic origin such as rural or urban) that can be used to identify the reservation wage. In our case the number of dependent children is our crucial variable to identify the possible selectivity. We assume that $(u_{1i}, u_{2i}) \approx N(0, \sigma_1^2, \sigma_2^2)$.

This model is based on two assumptions that allow the identification of the sampling truncation process. First, the error term is assumed to be normal, an usual assumption shared with many methods for correction of self-selection in wage equations. The credibility of this assumption is enhanced by the introduction of the dummy for the proximity to the minimum wage that contributes to redress irregularities in the lower tail of the error distribution. Second, we assume that the number of dependent children can be used to identify the reservation wage of which comparison with the current wage determines the data truncation[13].

In this model, the first two truncated centered moments for the first equation can be written as
$E(y_i \mid i \text{ non truncated}) = x_{1i}\beta_1 + \rho\sigma_1\varphi(x_{2i}b_2/\sigma_2)/\Phi(x_{2i}b_2/\sigma_2)$ and
$V(y_i \mid i \text{ non truncated}) = \sigma_1^2 + (\rho\sigma_1)^2[-x_{2i}c_2\,\varphi(x_{2i}c_2)/\Phi(x_{2i}c_2) - (\varphi(x_{2i}c_2)/\Phi(x_{2i}c_2))^2]$,

where $c_2 = b_2/\sigma_2$. Clearly, the generalised inverse Mills ratio (φ/Φ) in the first moment equation is hard to estimate since the non-participants are not observed. However, we know that x_{2i} include the number of dependent children (*enft*). Since this variable is crucial for identification of the selectivity, we can use it to detect if selectivity is likely to affect wage estimation in a simple statistical test. Indeed, the role of *enft* in determining the generalised inverse Mills ratio can be approximated by a polynomial in *enft*. To allow for sufficient approximation, we use a polynomial of degree 5. Powers of *enft* of order 1 to 5 are thus added to the estimated equations and Fisher tests of their joint significance are implemented from the results of quasi-generalised least-squares estimation. It happens with our data that these terms are found non-significantly different from zero (the P-values of the tests are respectively 0.125, 0.227 and 0.115 for such augmented equations corresponding to equations (1), (3) and (4) in Table 3. Tests based on Weighed Least-Squares estimates to account for the influence of *enft* in the variance of the truncated sample still yield stronger non-rejection of the hypothesis of absence of selectivity. These results suggest that there is no compelling evidence of selectivity bias in these data. We are now ready to comment the estimates of the wage equations without selectivity terms.

Interestingly, the role of firm fixed effects is limited in this Moroccan data set, as opposed to most results found in other countries (Abowd and Kramarz, 1999). In our regressions including firm dummies in Table 3, only one or two of these dummies are significant at the 10 percent level. The individual characteristics prominently explain wages, and firm characteristics have only a minor role, for the observed firms. However, introducing firm fixed effects significantly changes the estimates of the coefficients of tenure, and of some organisation and training variables. This justifies considering the firm effect model as our preferred specification.

In contrast, wage quartiles, crossed or not with human capital variables, are generally significant, notably for assessing the effects of education and experience. Omitting to distinguish between different domains of the wage distribution would provide a misleading picture of the returns to human

[13] See Bougroum and Ibourk (1998) for discussions related to the reservation wage in Morocco.

capital. Then, we focus on the OLS estimators on the equations incorporating quartile specific effects. These are our principal specifications.

However, we also attempt to account for differences in the effects of regressors on different areas of the wage distribution by using quantile regressions anchored at different wage quantiles (instead of introducing wage quartiles). In that case, this is the location of the conditional wage that determines the differences across estimates corresponding to different quartiles. We consider these are secondary specifications only, first because some estimation accuracy is lost when using quantile regressions with such small sample, and second because the interpretation of conditional quantiles is hard to communicate to non-specialists.

Let us now turn to Table 4 for analysing the effect of workers' human capital characteristics across the wage distribution. The OLS estimates show that there is a return to education (also for quantile regressions) for all quartiles and to experience, while smaller. For high wages in OLS estimates, returns to education are high, while they are much lower for the other quartiles. Returns to tenure and experience are also higher for the fourth quartile in these estimates. This is in contrast with usual decreasing returns to human capital found in developed economies. One explanation of such differences may stem from the imperfection of labour markets in Morocco, partly due to sluggish administration, customary inertia and the concentration in the modern productive sector. Another possibility is the occurrence of estimation biases associated with the possible endogeneity of quartile variables, a point to which we shall return when commenting quantile regression results. The effects of tenure less differ across quartiles. The first quartile stands apart with significantly lower return to tenure. Higher returns to human capital for high wages are consistent with findings in 16 industrial countries, although this is not the case for the low returns we obtain for other education and experience in the other wage categories (Martins and Pereira, 2004). In 1986-91, the main factor explaining poverty reduction seems to be the fast expansion of jobs in the manufacturing exportable sector, mainly clothing and textile (The World Bank, 2001). The employment growth predominantly came from low-skill, low-pay temporary jobs. Meanwhile, real wages have almost stagnated in the 1990s. These stylised facts may contribute to explain the limited impact of some human capital variables, except for high wages, perhaps because they are somewhat isolated from the general labour market conditions.

One issue in OLS estimates is that quantile dummies, and perhaps human capital and training variables, may be endogenous, yielding inconsistent estimates. Unfortunately, we do not avail of instrumental variables (IV) to deal with this problem. Our attempts at estimating 2SLS versions of the OLS estimates produced altogether insignificant results, useless for any inference purpose. There is just not enough information to use IV estimators in this data. The possible endogeneity of quartile dummies brings the most serious endogeneity problem, we try to deal with it by estimating quantile regressions instead of OLS. In quantile regressions, the quartile location is directly incorporated in the definition of the estimator and do not cause any endogeneity problem. One shortcoming of this approach is that quantile regressions correspond to conditional quantiles, i.e. wage quartiles corrected for the effect of regressors. This is the price to pay for being able to do something about the endogeneity of distribution location.

In the case of human capital variables, there is nothing that can be done to alleviate the endogeneity problem. However, how serious this problem is, is unclear. Some authors (Card, 1999) end up suggesting that OLS estimates may often be superior to IV estimators in the absence of exceptional instruments that are very rarely found in empirical work. We follow Card's approach.

Having firm effects in quantile regressions is a way to control for firm characteristics in the determination of conditional wage quantiles. In that case, estimators defined as 'difference estimators' or 'within estimators', useful with least-squares approaches, would be invalid here, and this is not what is done. Adding firm dummies in quantile regressions is here tractable because of the small number of firm fixed effects introduced[14].

[14] For problems with large numbers of fixed effects in quantile regressions, see Koenker (2004).

Our quantile regression estimates show that inferences respectively centered on wage locations and conditional wage locations can lead to substantially different conclusions[15], which is natural since different statistical characteristics are estimated. Also, quantile regression estimates are often less efficient than OLS in this context, which prevents from distinguishing significant effects across quantiles. Quantile regressions exhibit higher returns of education and tenure for the low wages at the first *conditional* quartile as compared to *conditional* medians or third *conditional* quartile. Since the quantile regressions are centered on quantiles of *error terms*, the first conditional quartile may be characterised by greater *unobserved* social and environment handicaps, leaving more ground to returns to education and tenure. Another element of the interpretation of quantile regression results is that quartile endogeneity is no longer an issue here and the returns to human capita are unbiased (as opposed to OLS), although for categories of households defined in terms of their unobserved characteristics in log-wage equations.

On-the-job formal training corresponds to a strong positive and systematic impact on wage levels, in all specifications. Internship spells in past work positively and significantly affect wages except in the quantile regressions. On the contrary, the coefficient of past apprenticeship is never significant, neither in OLS estimates nor in quantile regressions. These results raise doubts about the relevance of apprenticeship for working in these firms, while they support internship as a way to raise workers' earnings.

Other worker characteristics are of interest as potential determinants of wage levels. On one hand, female workers are significantly less paid than male workers when considering OLS estimates at the 5 and 10 percent levels[16]. On the other hand, executive or supervisor employees are much better paid, as expected.

In that situation, promoting on-the-job training (OJT) seems a promising policy. Indeed, OJT can adjust to the new international market demands faster than general education, while it positively affects wages at all wage levels. This is important because trade liberalisation in Morocco may generally deplete wages in the traded sector (Arbache, Dickerson and Green, 2004).

To better understand how OJT occurs, we estimate a Probit model of participation in OJT. The independent variables are a combination of demographic characteristics associated with workers' preferences and family constraints, past education variables, again related to preferences but also to the worker's capability to be involved in additional training, tenure, experience and unemployment spells that may affect his/her selection for training in the firm. Column 1 of Table 5 shows the estimation results. Most included socio-demographic characteristics (age, age squared, number of children and gender) and some labour market personal characteristics (internship, unemployment, tenure, experience, dummy for executive workers, proximity to SMIG) have non-significant coefficients. Working in the Textile-clothing sector appears to be detrimental to participation in OJT, while the education level is positively correlated with participation. This is consistent with what is known about these sectors: Textile-clothing and IMMEE industries differ by decisive workforce characteristics. Workers in the branch of clothing are predominantly female, while most of the workers in IMMEE firms are male. In Morocco, much of the human capital accumulation, at school and on the job, is directed in priority towards males. Textile-clothing is little capital intensive, while highly unskilled labour intensive. Moroccan garment companies were very few to provide formal OJT in 1997. In contrast, the IMMEE sector is relatively human capital intensive, especially its electronics branch. It is therefore more prone to provide OJT, notably during the introduction of new technology.

Interestingly, to be married is negatively associated with participation in OJT (at 10 percent level). This result may come from the additional stress on time use caused by OJT, detrimental to family life. In that sense, single workers may be more available for additional training.

[15] However, the coefficient of the 0.75 quantile regression in Table 4 for education and experience is almost a mean of the coefficients in columns 3 and 4.
[16] See Nordman (2004) for gender issues on this data.

As we mentioned above, with these data we cannot know the importance of the simultaneity in OJT and salary choices by workers and firms. However, the lack of significance in the OJT Probit results of the effect of minimum wage, and of all variables strongly determining wages, suggests that such simultaneity, if it exists, is not extreme. Moreover, marital status has no significant effect in wage equations and has been omitted. Thus, there seems to be fundamental differences between wage determination and OJT determination processes.

Our results on OJT in Table 3 suggest that the government should coordinate long run general education policies with policies addressing vocational training since both OJT and education affect wages. However, our results about OJT participation show that OJT does not occur as densely in all industries and families. This implies that public aid to OJT could benefit from being designed so that it answers to industrial needs in a way that accounts for the relevant technological and family constraints. For example, developing training for female workers may be efficient only if those workers can be relieved from some of their domestic tasks and if mentalities about the role of women in society can be changed.

Better understanding workers remuneration may be obtained by analysing organisation inside the firm, sector by sector. Let us consider two exclusive forms of work organisation: chain gangs and work teams. An individual was considered as working in a team when he/she stated performing his/her tasks in collaboration with at least two other workers carrying out complementary tasks. Workers in chain gangs are attached to standalone workstation and are fully restricted by the rhythm of the production process on this workstation. Columns 2 of Table 5 present the estimation results of a multinomial logit (MNL) model where the base alternative is 'working neither in chain gangs nor in work teams'. We obtain information on the correlates of the relative probabilities of workers being observed in the two considered forms of work organisation. The relative probability of working in chain gangs is positively associated (significantly at the 10 percent level) with the Textile-clothing sector, being female worker and having studied in a Koranic school only. It is negatively associated (significantly at the 5 percent level) with past relevant internship, apprenticeship or being executive or supervisor. As for the probability of participation in team work, it is significantly negatively related to three worker characteristics: being supervisor, apprenticeship and working in the Textile-clothing sector.

The MNL estimates show that the organisation of tasks in the firm is related to the type of industrial technology used in the firm. Chain gangs are routinely used in textile industries, where the treated fibres are successively transformed along the chain to yield the final products. In this industry, each worker is generally responsible for a precisely delimited task and working in a team is exceptional. The results also elicit the role of the educational and training characteristics of workers. Typically, uneducated workers (often female) are employed in chain jobs in the considered sectors in Morocco. These jobs are seen as little attractive and many workers are confined to them because of strict gender roles in the Moroccan labour context or low human capital. In contrast, past internship or apprenticeship would allow the worker to access more skilled jobs.

Work supervision has been found more efficient in Morocco than in some South-Saharan countries (Fafchamps and Söderbom, 2004). This justify estimating a Probit model of being executive or supervisor, where the independent variables are similar to the ones chosen for explaining OJT and work organisation. Highly insignificant effects have been omitted, while firm dummies have been introduced. The results in Table 4 show that educated workers, with high tenure and experience, and having been in internship are significantly more likely to be executive or supervisor. This is consistent with the high human capital level necessary to occupy these positions. Firms 1, 4 and 8 are associated with a significantly smaller probability of being executive or supervisor, everything else equal. These three firms are also older than the average with, respectively, 46, 20 and 18 years of existence[17]. Their workers are older and have higher levels of experience than the workers in the other firms, perhaps justifying that they require less supervision. These firms have fewer employees than the other firms of the sample (respectively 104, 100 and 50 employees as compared to 228 on average), which may also diminish supervision needs. Finally, they display the smallest proportions of employees working in chain gang, a work organisation system that necessitates close supervision. Neither the other observed

[17] The sample mean is 17.6 years.

socio-demographic and human capital characteristics, nor the proximity to the SMIG, significantly affect the probability of being supervisor-executive.

5. CONCLUSION

In this paper, we study the relationship of wages, human capital accumulation and work organisation in Morocco in a context of trade and liberalisation reforms using a matched worker-firm data of eight exporting firms in two industrial sectors: Metallurgical-Electrical industries and Textile-clothing.

By confronting several estimation methods, such as OLS and quantile regressions of wage equations, probit model of on-the-job training (OJT) and multinomial logit model of task organisation in the workplace (chain gang, team work, supervision), we can reach results robust to the diverse specifications tried.

Returns to education, experience and tenure in log-wage equations estimated by OLS are much higher for the quartile of wages. In the studied firms, investing in the general dimensions of human capital accumulation only pays for high wage workers and seems little likely to improve the situation of other categories of workers. In this respect, the diverse studied firms are similar as shows the limited influence of firm dummies on the estimation. Moreover, female workers are generally paid less than male workers of similar education level. This gender wage gap cumulates with the already substantial gender education gap that contributes to confine female workers to mediocre jobs in these firms.

There may therefore be some opportunity of using on-the-job training (OJT) to promote the wages of low and medium wage workers. OJT is also interesting because it can allow firms to quickly adapt to the new international competition, notably with China on European textile markets following the admission of this country in the WTO and the removal of the MFA quotas.

In these data, our results show that OJT is constrained by three conditions: relevant industrial location (in textile industries little formal OJT is required owing to the task simplicity); a minimal educational background; and an appropriate family situation (single workers can adapt more easily to the additional time constraints brought by OJT).

Our estimates of models of the probability of being involved in chain gangs, in team work, or in supervision tasks, elicit strong interaction of human capital accumulation with these occupation characteristics. Low human capital workers are more often confined to chain gangs than other workers, or need to work with the support of team workers. Whatever their education level, female workers in textile firms are observed particularly often working in chains, while they work more often in teams when in mechanical firms. In contrast with the determinants of these low paid occupations, education, tenure, experience and past internship are important factors to access executive or supervisor positions, characterised by high earnings levels.

On the whole, the estimated results invite researchers to investigate further about the links of education, OJT and the organisational characteristics of jobs in Morocco. However, for this task, more extensive data is necessary.

Meanwhile, the elicited relationship between the considered work characteristics supports that there may be room for joint monitoring and joint policies addressing these distinct dimensions of the Moroccan labour markets. Such approach could be concretised through training policies accounting for firm types characterised by specific organisational constraints, and for worker types in terms of human capital, and socio-demographic characteristics.

Mechanisms for closing the skill gap across categories of workers in Morocco have traditionally been articulated in terms of supply-side reforms: improving the educational system so that more young people become educated, and helping existing workers to enhance skills through formal learning, such as classes and accreditation services provided by the OFPPT (*Office de la Formation Professionnelle et de la Promotion du Travail*). However, such provision is often believed to be so subject to supplier capture (as suggests the diversity of vocational schools and diploma, either private or public) that it does not respond to employer needs.

Our results exhibit the dependence of work organisation and on-the-job training on the education process. Vice versa, there has been a growing interest in workplace learning processes that are variously described as 'informal' in the literature. For instance, several empirical studies show that the impact of training is greater on the firm performances when training takes place in connection with changes in work organisation and comes along with an evolution of the employment structures (Black and Lynch, 1996; Fleisher, Dong and Liu, 1996). In a Moroccan context of rapid opening to international competition, the adaptation of exporting Moroccan firms to this new situation should gain from better knowledge of the simultaneous determinants of classical human capital accumulation, OJT and work organisation practices (as in Bresnahan, Brynjolfsson and Hitt, 2002). This paper is a first step in the exploration of these issues.

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APPENDICES

Table 1: Descriptive statistics of the workers' characteristics

	Mean	*Std dev.*	*min*	*max*
Age of individual (AGE)	30.41	8.23	16	59
Sex (FEMALE, 1: female; 0 male; conversely for MALE)	0.46	0.50	0	1
Geographical origin (PROVE, 1: rural area; 0 otherwise)	0.82	0.37	0	1
Matrimonial status (MARI, 1: if married; 0 if divorced, widowed or single)	0.42	0.49	0	1
Number of dependent children (ENFT)	0.79	1.36	0	7
Individual never went to school (ANALPHA, 1: yes; 0 otherwise)	0.05	0.22	0	1
Individual went to Koranic school only (KORAN, 1: yes; 0 otherwise)	0.10	0.30	0	1
Years of schooling (EDUCATION)	9.78	9.78	0	18
Previous apprenticeship in a firm (APPRENTI, 1: yes; 0 otherwise)	0.18	0.38	0	1
Years of internship related to the current job (STAGA)	0.14	0.33	0	2
Years of internship not related to the current job (STAGAN)	0.06	0.29	0	2
Vocational degree related to the current job (ETUTPA; 1: yes; 0 otherwise)	0.33	0.47	0	1
Vocational degree not related to the current job (ETUTP; 1: yes; 0 otherwise)	0.13	0.34	0	1
Unemployment Years (CHOMA)	1.53	2.28	0	10
Previous relevant experience (EMSIM, 1: yes; 0 otherwise)	0.46	0.50	0	1
Previous potential professional experience (EXPERIENCE, in years)	5.49	7.12	0	49.08
Starting date in the current firm (ENTREE)	1990.69	5.11	1975	1998
Tenure in the current firm (TENURE, in years)	6.00	5.30	0	21.25
Formal On-the-Job Training in the current firm (FORMAD ; 1: yes; 0 otherwise)	0.30	0.45	0	1
Formal On-the-Job Training in the current firm (FORMAA, in years)	0.12	0.249	0	2
Work in team (EQUIPE, 1: yes; 0 otherwise)	0.41	0.49	0	1
Work in chain gangs (CHAINE, 1: yes; 0 otherwise)	0.15	0.36	0	1
Executive or supervisor (ENCADR, 1: yes; 0 otherwise)	0.24	0.42	0	1
Proximity to the minimum wage (SMIG, 1: if 1600<=SAL<=1700; 0 otherwise)	0.17	0.37	0	1
Firms' fixed effects				
Firm 1	0.079	0.270	0	1
Firm 2	0.197	0.399	0	1
Firm 3	0.143	0.351	0	1
Firm 4	0.133	0.340	0	1
Firm 5	0.167	0.374	0	1
Firm 6	0.099	0.299	0	1
Firm 7	0.103	0.305	0	1
Firm 8	0.079	0.270	0	1

Table 2: Descriptive statistics of monthly wages (in dirhams)

	Mean	*Std dev.*	*min*	*max*
Monthly wage	2689	2019	750	20000
Monthly wage in IMMEE	3101	1930	750	12000
Monthly wage in Textile-clothing	2281	2030	750	20000
Mean wage in:				
Firm 1 (IMMEE)	4586	3237	2200	12000
Firm 2 (IMMEE)	2337	1120	750	7500
Firm 3 (IMMEE)	3398	1791	1700	9000
Firm 4 (Textile-clothing)	2192	761	1150	5000
Firm 5 (Textile-clothing)	1974	813	750	5000
Firm 6 (Textile-clothing)	1888	519	1500	3500
Firm 7 (Textile-clothing)	3267	4168	1040	20000
Firm 8 (IMMEE)	2984	1015	1250	4500

Table 3: Wage equations

Dependent variable: Log monthly wage

	OLS				***Quantile regressions*** (bootstrap: 20) Firm fixed effects models		
Independent variables	(1)	Firm fixed effects model (2)	(3)	Firm fixed effects model (4)	0.25 Quantile (6)	0.50 Quantile (7)	0.75 Quantile (8)
Constant	6.970***	6.906***	7.382***	7.368***	6.961***	7.117***	7.326***
	(66.01)	(61.41)	(49.13)	(45.79)	(50.11)	(46.90)	(39.88)
EDUCATION	0.043***	0.045***	0.048***	0.047***	0.034***	0.029*	0.023
	(6.03)	(6.34)	(5.53)	(5.39)	(3.11)	(1.89)	(1.49)
Quartile1	_	_	-0.296*	-0.337*	_	_	_
			(1.71)	(1.83)			
Quartile2	_	_	0.065	0.034	_	_	_
			(0.33)	(0.17)			
Quartile3	_	_	0.312	0.268	_	_	_
			(1.53)	(1.32)			
EDUCATION*Quartile1	_	_	-0.047***	-0.037***		_	_
			(4.13)	(3.12)			
EDUCATION*Quartile2	_	_	-0.040***	-0.033**		_	_
			(3.11)	(2.54)			
EDUCATION*Quartile3	_	_	-0.045***	-0.038***		_	_
			(3.55)	(3.04)			
TENURE	0.034***	0.048***	0.023*	0.031**	0.047***	0.030*	0.023
	(2.73)	(3.85)	(1.76)	(2.26)	(2.83)	(1.76)	(0.89)
$TENURE^2$	-0.000	-0.001	-0.000	-0.000	-0.001	-0.000	0.000
	(0.14)	(1.24)	(0.27)	(0.59)	(1.28)	(0.45)	(0.09)
TENURE*Quartile1	_	_	-0.012	-0.008	_	_	_
			(0.62)	(0.43)			
TENURE*Quartile2	_	_	-0.020*	-0.017	_	_	_
			(1.69)	(1.38)			
TENURE*Quartile3	_	_	-0.018**	-0.019**	_	_	_
			(2.22)	(2.32)			
EXPERIENCE	0.022***	0.023***	0.025***	0.026***	0.011	0.016	0.016
	(3.15)	(3.55)	(4.03)	(4.04)	(1.13)	(1.50)	(1.10)
$EXPERIENCE^2$	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(1.40)	(1.35)	(0.30)	(0.16)	(0.12)	(0.84)	(0.32)

Table 3: Wage equations (Contd.)

	OLS				***Quantile regressions*** (bootstrap: 20) Firm fixed effects models		
Independent variables	(1)	Firm fixed effects model (2)	(3)	Firm fixed effects model (4)	0.25 Quantile (6)	0.50 Quantile (7)	0.75 Quantile (8)
EXPERIENCE*Quartile1	–	–	-0.022***	-0.018**	–	–	–
			(2.81)	(2.24)			
EXPERIENCE*Quartile2	–	–	-0.023***	-0.024***	–	–	–
			(3.24)	(3.39)			
EXPERIENCE*Quartile3	–	–	-0.024***	-0.023***	–	–	–
			(3.29)	(3.19)			
On-the-Job Training (FORMAA)	0.194**	0.243**	0.193***	0.210***	0.335***	0.364***	0.213
	(2.03)	(2.30)	(2.96)	(2.71)	(3.03)	(3.44)	(1.40)
Dummy for executive or supervisc (ENCADR)	0.324***	0.317***	0.116***	0.124***	0.194***	0.344**	0.417***
	(5.88)	(5.95)	(2.94)	(2.87)	(2.74)	(2.34)	(3.26)
Dummy for female	-0.176***	-0.161***	-0.071**	-0.066*	-0.111	-0.118	-0.113*
	(3.73)	(3.22)	(2.18)	(1.71)	(1.36)	(1.51)	(1.66)
Dummy for proximity to minimum wage (SMIG)	0.043	0.075	0.314***	0.295***	0.043	-0.011	-0.045
	(0.68)	(1.29)	(5.14)	(4.83)	(0.88)	(0.18)	(0.64)
Dummy for past apprenticeship (APPRENTI)	0.085	0.089	0.036	0.049	0.083	0.109	0.027
	(1.38)	(1.54)	(0.87)	(1.15)	(1.38)	(1.09)	(0.51)
Past-work relevant internship (STAGA)	0.170**	0.173***	0.086*	0.107**	0.066	0.091	0.185
	(2.53)	(2.77)	(1.87)	(2.26)	(0.51)	(0.80)	(0.99)
Firm1	–	0.072	–	-0.035	0.007	0.212	0.260
		(0.62)		(0.39)	(0.04)	(1.17)	(1.10)
Firm2	–	-0.182**	–	-0.124*	-0.192	-0.167*	-0.130
		(2.03)		(1.84)	(1.19)	(1.76)	(1.16)
Firm3	–	0.233***	–	0.013	0.198*	0.216**	0.302**
		(2.72)		(0.19)	(1.71)	(2.28)	(2.05)
Firm4	–	-0.147	–	-0.082	-0.134	-0.078	-0.137
		(1.53)		(1.16)	(1.32)	(0.76)	(1.02)
Firm5	–	0.036	–	-0.035	0.049	0.062	0.004
		(0.46)		(0.61)	(0.37)	(0.92)	(0.08)
Firm7	–	-0.032	–	-0.021	-0.140	-0.065	0.018
		(0.35)		(0.32)	(1.11)	(0.54)	(0.16)
Firm8	–	-0.117	–	-0.161*	-0.020	0.041	0.003
		(1.08)		(1.94)	(0.11)	(0.25)	(0.02)
Observations	203	203	203	203	203	203	203
R-squared	0.63	0.71	0.85	0.86			
Pseudo R-squared					0.40	0.46	0.52

Absolute values of *t* statistics are in brackets. *, ** and *** mean significant at 10%, 5% and 1% respectively.

Table 4: Returns to human capital across wage-quartiles (with firm fixed effects)

	OLS					*Quantile regressions*		
	Quartiles							
	1	2	3	4	*Mean*[b]	*0.25 Quantile*	*0.50 Quantile*	*0.75 Quantile*
Variables								
EDUCATION	0.0097	0.0139	0.0087	0.0471	*0.0190*	0.0341	0.0285	0.0228[ns]
TENURE[a]	0.0187[nd]	0.0099[nd]	0.0080	0.0268	*0.0154*	0.0352	0.0270	0.0241[ns]
EXPERIENCE[a]	0.0070	0.0013	0.0020	0.0254	*0.0084*	0.0103[ns]	0.0127[ns]	0.0144[ns]

[a]: returns are computed at the average point of the sub-sample. [b]: mean of the effects for the different quartiles.
[ns]: no significantly different from zero at 10% level.
[nd]: no significantly different from the coefficient of the 4th quartile at 10% level.

Table 5: Probit and Multinomial Logit Models

	(1) Probit for the probability of receiving On-the-Job Training Dependent variable: FORMAD	(2) MNL for the probability of working in Chain gangs (CHAINE)	Work teams (EQUIPE)	(3) Probit for the probability of being Executive or Supervisor Dependent variable: ENCADR
Constant	-5.4295	11.0364*	8.0497	-1.7751
	(1.54)	(1.78)	(1.28)	(1.53)
Dummy for female	0.2436	5.2860***	0.4507	-0.3505
	(0.79)	(4.81)	(0.68)	(1.08)
AGE	0.1892	-0.7233	-0.1626	-0.0973
	(0.83)	(1.64)	(0.38)	(1.46)
AGE^2	-0.0054	0.0053	-0.0001	–
	(1.41)	(0.73)	(0.02)	
Matrimonial situation (MARI)	-0.8378*	1.4159	-0.0917	0.2403
	(1.84)	(1.51)	(0.11)	(0.65)
Number of dependent children (ENFT)	0.4034	-0.4253	-0.2508	0.2594
	(1.64)	(1.20)	(0.52)	(1.35)
Geographical origin (PROVE)	–	0.4097	-0.8977	-0.5065
		(0.44)	(1.01)	(1.07)
KORAN	–	2.1059*	-1.3091	0.6969
		(1.68)	(1.03)	(1.30)
ANALPHA	–	3.5479	-44.3956	–
		(1.04)	(0.00)	
EDUCATION	0.3476***	-0.0050	-0.1508	0.3135***
	(3.18)	(0.03)	(0.80)	(3.97)
Past apprenticeship (APPRENTI)	–	-2.6085***	-2.2813*	–
		(2.82)	(1.93)	
Non job related vocational degree (ETUTP)	-0.0162	-0.8369	-0.0314	-0.4853
	(0.04)	(0.88)	(0.04)	(1.19)
Job related vocational degree (ETUTPA)	-0.6039	-1.1148	0.3522	–
	(1.42)	(1.14)	(0.47)	
Past-work relevant internship (STAGA)	-0.0060	-3.5197**	-0.2400	0.7666**
	(0.01)	(2.46)	(0.30)	(2.10)
Past-work irrelevant internship (STAGAN)	-0.2793	–	–	–
	(0.66)			
Periods of unemployment (CHOMA)	0.0797	0.1053	0.1507	–
	(0.76)	(0.62)	(0.80)	
TENURE	0.1236	0.4177	-0.1051	0.1773**
	(1.53)	(1.58)	(0.50)	(2.54)
$TENURE^2$	–	-0.0045	0.0112	–
		(0.36)	(1.13)	

Table 5: Probit and Multinomial Logit Models (Contd.)

	(1) Probit for the probability of receiving On-the-Job Training Dependent variable: FORMAD	(2) MNL for the probability of working in Chain gangs (CHAINE)	Work teams (EQUIPE)	(3) Probit for the probability of being Executive or Supervisor Dependent variable: ENCADR
EXPERIENCE	0.0577	0.1191	-0.0826	0.1244**
	(0.62)	(0.61)	(0.40)	(1.98)
EXPERIENCE^2	–	0.0014	0.0101	–
		(0.27)	(1.17)	
Dummy for executive or supervisor (ENCADR)	0.0989	-6.9549***	-1.4770**	–
	(0.28)	(3.63)	(2.23)	
Proximity to the minimum wage (SMIG)	0.1856	1.0234	-0.1518	-0.6726
	(0.37)	(0.98)	(0.13)	(1.23)
Dummy for Textile-clothing	-1.7703***	1.7931*	-3.2312***	–
	(4.73)	(1.67)	(3.66)	
Firm 1	–	–	–	-1.7106**
				(2.50)
Firm 2	–	–	–	-0.2236
				(0.41)
Firm 3	–	–	–	-0.8253
				(1.46)
Firm 4	–	–	–	-2.7288***
				(2.86)
Firm 5	–	–	–	-0.0652
				(0.11)
Firm 7	–	–	–	-0.9019
				(1.47)
Firm 8	–	–	–	-2.6657***
				(3.22)
Pseudo R-squared	0.54	0.5464		0.40
Log likelihood	-56.30	-93.88		-67.10
Observations	203	203		203

Absolute value of *z* statistics are in brackets. *, ** and *** mean significant at 10 %, 5 % and 1 % respectively. In the MNL model, the reference group is individuals 'working neither in chain gangs nor in work teams'.