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# Wages and Human Capital in Exporting Firms in Morocco<sup>†</sup>

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## Abstract

We study the relationship of wages and education and training practices in Morocco in a context of trade and liberalisation reforms in a matched worker-firm data of eight exporting firms in two industrial sectors: Metallurgical-Electrical industries and Textile-Clothing. We find that the specific characteristics of the surveyed firms little affect worker wages. Moreover, the textile sector does not appear to be a significant channel for promoting skills in the economy. The minimal wage legislation is found to exert a positive pressure on wages. Also, some evidence of gender wage gap exists in the data. In these data, the effects of education and experience on wages are quite limited below the third quantile of wages, as well as the role of apprenticeship. In contrast, On-the-Job Training (OJT) much contributes to labour productivity as measured by wage levels. Most of the OJT is concentrated in the Metallurgical-Electrical industries. Education is positively correlated to OJT. Moreover, estimates of explanatory relationships of task organisation (chain gangs, teams, supervision and executive workers) show the powerful sector and educational determinations of job organisation in the firms. Then, our results suggest that the impact of worker education may take indirect routes and not only appear through education coefficients in wage regressions.

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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, large inter-urban and rural-urban migrations take place. These features make the Moroccan labour market very tight in the peri-urban areas of cities where the exporting firms are often concentrated. However, if the job searchers are abundant, the qualification of 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 augment their earnings in two specific industries: Textile-clothing and Electrical-Mechanical industries. While half of the population works in agriculture, the Textile industry is 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 it contributes to 11 percent of exports (Intermon, 2003). Most garment companies are small sized, family entities where the minimal wage, social security and contracts do not exist. However, a minority of modern firms concentrate most human capital investment in the textile sector. We shall focus on these firms and on the sector of electrical-mechanical industries, another pillar of exporting industry in Morocco.

During the last decade, social indicators substantially improved due to growth in public social expenditure and focus 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 partly caused by a series of 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. Moreover, from 1989, a large privatisation program of public firms went under way. All these economic transformations are expected to have affected wages and employment. Although aggregate wages do not seem to have suffered much, wages in firms oriented towards export have been found heavily affected (Currie and Harrison, 1997). In this paper, we focus on the latter type of firms, which are believed to be more efficient than the standard firms, in part due to self selection (Clerides, Lach and Tybout, 1998).

In 1986-91, one of the main factors explaining poverty reduction is the fast expansion of jobs in the manufacturing exportable sector, mostly clothing and textile and electrical-mechanical industries. The expansion in employment mainly came from low-skill, low-pay temporary jobs. This may explain why real wages have almost stagnated in the 1990s.

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 played a crucial role for the formation of wages in the recent period. This has not always been the case since real wages of the Moroccan manufacturing sector declined while the real SMIG increased of about 25 percent during the 1980s. During the 1990s, the distribution of wages roughly stuck to the evolution of the SMIG. More precisely, the SMIG adjustments over time rather followed the evolutions of the mean urban wage more than proportionally (The World Bank, 1994). Thus, the differential between mean urban wage and SMIG partly vanished, which contributed to reducing the global dispersion of wages. Also, the increase of about 52 percent of the SMIG between 1989 and 1994 cannot be explained by the sole change in the cost of living (35 percent during this period). The monthly SMIG had not been updated (1659 Dirhams<sup>1</sup>) since 1996, but was raised by 10 percent in 2000. It is also important to note that the minimum wage is not effectively enforced in the informal sector of the economy. By contrast, it is fairly 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 months salary, including bonuses, each year.

Lane, Hakim and Miranda (1999) underline the stagnation of the average wage in the manufacturing sector over the 1990s. Considerable gaps in average wages persist

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<sup>1</sup> 147 US dollars of 2001.

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 average wage in the latter sectors is, in 1995, more than three times higher than that of the Confection Sector<sup>2</sup>. The stagnation of wages may be partly explained by the fact that the least remunerative industries have had the biggest part of job creation during the past decade. Then, the government may face a trade off between wage rise and limitations of unemployment.

However, according to the World Bank (1996), the constant augmentation of the SMIG put pressure on urban unemployment and, in particular, on the least educated working population. The recommendations of the World Bank in 1996 were the fixation of the SMIG, thus increasing its gap with the average urban wage, in order to create jobs in the formal sector and raise the competitiveness on the international markets. In 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 priority today is not so much to focus the wage policy on the reduction of salary costs but rather to concentrate the efforts on raising workers' productivity. A natural route to raise labour productivity is to enhance the human capital of workers.

Skills of the workforce as well as exposure to competition (as in Clerides et al., 1998) doubtless much explain wage disparities across sectors. Our survey covering two different sectors confirm it. Meanwhile, other factors might play a role, as the employment duration, the seasonal feature of jobs and on-the-job training. Indeed, legally, the minimum wage is not applied for certain types of employees, such as young

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<sup>2</sup> 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.

workers below 18 years old, temporary workers or trainees. Furthermore, in 1986, at least half of the firms of the Moroccan private manufacturing sector and 40 percent of large companies (more than 100 employees) pay unskilled workers an average wage lower than the SMIG<sup>3</sup>. 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 that it was very expensive to dismiss permanent workers<sup>4</sup>. The law provided for a 48-hour maximum workweek with not 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.

Today, the labour market may 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, for the reasons mentioned above, employers hesitate to hire permanent workers. The use of temporary workers gave considerable flexibility to the Moroccan labour market (Lane et al., 1999), although this flexibility has been acquired at the cost of employment stability and therefore of further investment in human capital<sup>5</sup>. Indeed, job precariousness reduces personal implication of the worker for her training in the firm, but

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<sup>3</sup> The World Bank (1994). Females are more likely than males to receive a wage below the SMIG.

<sup>4</sup> Workers are considered permanent when they can justify more than a year of job seniority.

also the training investments by employers. Statistics of the *Direction de la Statistique* on creation of industrial employment in 1995 demonstrate the pre-eminence of seasonal jobs at a rate of 80 percent. These jobs, contributing at 19 percent to the total employment in the transformation industries, grew by 8 percent as compared to 1994, while permanent jobs increased only by 1 percent.

As for hiring, much of the working population expresses its desire to participate in the labour market through informal networks, frequently relying on family or personal contacts (El Aoufi, 1997). Finally, several studies showed that the former Labour Code, with its out-of-date dispositions combined with the slow pace of the law, generally contributed to making more expensive the management of human resources in Morocco (The World Bank, 1999). We now turn to the data we use.

### **3. The Moroccan matched data**

The objective of the survey was to constitute a sample of matched worker-firm data. These data were collected directly at the employee's workplace<sup>6</sup>. The questionnaire provides precise information about the career of each worker: individual characteristics (matrimonial situation, number of dependent children, geographic origin), wages, educational investment (years of schooling at the primary, secondary, and high school levels, university or vocational degrees), post-school training (possible periods of

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<sup>5</sup> High welfare costs in the structured private sector (from 21,7 to 35 percent of gross wage) also increased the cost of permanent workers and discouraged firms of the informal sector to get integrated into the formal economy.

<sup>6</sup> 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.

apprenticeship, preliminary internships, formal training within the current firm), total experience in the labour market and occupation in the current firm. Moreover, the data combine these workers' characteristics with the characteristics of the firms in which they work.

187 individuals were first interviewed during Summer 1997 (Nordman, 2000). 1997 was an exceptionally good agricultural year, which stimulated the whole economy. Thus, the survey was completed in January 2000 while the employees of a new firm were added to the former sample. The final sample used in our study is then composed of 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. The firms which were not exporting their production and those with entirely foreign capital were not retained in the final sample. Employers have been asked about the characteristics of their firm: workforce composition, work organisation, training and communication practices, organisational or technical innovations, competitive situation of the firm.

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

The average of the years of schooling is 9.8 years over the sample of employees (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. This number of years of schooling is the same for male and female and corresponds to the first



year of High School. Calculating this variable from the age acquired at the end of school (on which we deduct 6 years), the average number of years of schooling is close to 13 years. We take into consideration the number of unsuccessful years of education<sup>7</sup> in order to avoid overestimating education<sup>8</sup>. Then, the education variable we use is net from repeated classes. As a matter of fact, 5.4 percent of the workers have had no schooling, 16.7 percent have completed only a primary level of education (1 to 5 years), 65.5 percent have obtained an educational level of 6 to 12 years (secondary school) and 11.8 percent have completed studies in higher education (university level). The proportion of employees with a vocational diploma related to their current job reaches 33 percent.

The average tenure in the current firm is 6 years. It is only 4.3 years for females, but is higher for males (7.4 years). 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, and 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 ratio of tenure to the overall work experience, 69 percent, is explained by a large number of young, first-time workers. Indeed, the average age of the sample is only 30 years. Despite this youth of the labour force, only six workers are observed under 17 years old, none under 15 years old. Only 17 individuals are paid under the SMIG of 1996: 1659 Dirhams. Then, the studied firms do not seem to massively employ workers under age and pay worker below the SMIG, practices sometimes mentioned in Morocco (Intermon, 2003).

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<sup>7</sup> Angrist and Lavy (1997) estimate the number of repeated classes at 2 to 3 years in Morocco.

<sup>8</sup> See on this point Behrman and Birdsall (1983).

Let us examine some characteristics of the wage sample. The average monthly wage declared by the employees is equivalent to 228 US dollars<sup>9</sup>. On average male workers' wages are 1.5 times higher than female workers'. The average wage in the IMMEE is 1.3 times greater. 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 some of the wage gap may stem from their lower experience in the labour market.

#### **4. The Estimation Results**

The estimates are based on OLS and quantile regressions. For the OLS, firm fixed effects have been introduced in some version, and not in other ones, 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.

Interestingly, the role of firm fixed effects is limited in this Moroccan data set, as opposed to most results found in other countries. It has even been often stated that using

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<sup>9</sup> 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% of the sample and of December 1999 for the rest.

matched data is important because of the systematic and strong effect of firm dummies in wage regressions (Abowd and Kramarz, 1999).

Our results in Table 3 show that it is not systematically the case. In our regressions including firm dummies, only one or two of these dummies are significant at the 5 or 10 percent levels. In this context, the individual characteristics appear prominent to explain wages, and firm characteristics have only minor input, at least for the observed firms. However, introducing firm fixed effects has a significant impact on the estimates of tenure coefficients, and on the coefficients of some organisation and training variables. This justifies considering the firm effect model as our preferred OLS estimates.

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 in this case would provide a biased picture of the returns to human capital<sup>10</sup>. Then, we shall focus on comment of the OLS estimators on the equations incorporating quartile specific effects.

Another way to account for differences in the effects of regressors on different areas of the wage distribution is to consider 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 difference across estimates corresponding to different quartiles. The results again show that significant differences in estimated coefficients are obtained for differences in distribution locations.

Let us now turn to Table 4 for analysing the effect of workers' human capital characteristics across the wage distribution. The estimates show that there is a return to

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<sup>10</sup> Note, however, that only the dummy of the first quarter is significant for quartiles not crossed with human capital variables.

education for all quartiles and to a smaller extent to experience. For high wages in OLS estimates, returns to education are high, albeit they are much lower for the other quartiles. Returns to tenure and experience are also found higher for the fourth quartile in these estimates. In 1986-91, the main factor explaining poverty reduction is the fast expansion of jobs in the manufacturing exportable sector, mainly clothing and textile. The expansion in employment mainly came from low-skill, low-pay temporary jobs. Real wages have almost stagnated in the 1990s. These three stylised facts may explain some of our results, notably the limited impact of some human capital variables except for high wages.

The effect of tenure is the least discriminatory across quartiles. The first quartile stands apart with significantly lower return to tenure. From a more general perspective, higher returns to human capital for high wage categories are consistent with finding in 16 industrial countries, although this is not the case for the almost negligible returns we find for other education and experience in the other wage categories (Martins and Pereira, 2004).

The situation is less clear cut in quantile regression estimates showing that inferences based on wage location and on conditional wage locations can lead to substantially different conclusions. Also, quantile regression estimates are often less efficient than OLS in this context, which prevent from distinguishing significant effects across quantiles. Nonetheless, what arise with quantile regressions are higher returns of education and tenure for the low wages at the first conditional quartile as compared to conditional medians or third conditional quartile. What is the interpretation of such results? It may partly come from the lack of accuracy of quantile regression estimates with such small sample. Also, the first conditional quantiles may be characterised by

greater unobserved social and environment handicaps, leaving more ground to returns to education and tenure.

In this situation, the effect of human capital on wage inequality is unclear. However, one may expect an inequality raise with human capital if the strong effect of education on high wages dominates the other determinants of inequality. Thus, the third quartile appears to be rather disadvantaged in terms of the effects of the three observed dimensions of human capital: education, tenure and experience. This may be the sign of a human capital poverty trap preventing middle classes to access high wage jobs.

Besides, if education, experience and tenure describe acquired human capital levels, more information can be extracted from observations on vocational training. 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, past apprenticeship is never significant, neither in OLS estimates nor in quantile regressions. These results raise doubts about the usefulness of apprenticeship for working in this type of firms.

Other worker characteristics are of interest as potential determinants of wage levels. Female workers are significantly less paid than male workers when considering OLS estimates at 5 and 10 percent level. This wage gap situation is less significant when looking at the quantile regressions<sup>11</sup>. Note that the coefficients of the gender dummies and other variables that are significant in OLS and not in quantile regressions become significant (with the same sign) as well in quantile regressions when the internship variable is omitted. As mentioned earlier, the lack of significance of quantile regression estimates may come from a too small sample size preventing us to disentangle the role of

the introduced variables. Finally, executive or supervisor employees are much better paid, as expected.

In that situation, promoting on-the-job training seems a more promising policy than general education, except for very high wages.

What could explain the positive impact of OJT and almost null effect of education on wages for wage levels below the third quartile? It is difficult to answer with certainty with such a limited data. This feature is consistent with empirical evidence finding that trade liberalisation may generally deplete wages in the traded sector while high wages may rise, perhaps because imported technology raises the relative demand for highly skilled labour (Arbache, Dickerson and Green, 2004). Thus, the impact of general human capital may be stiffened by liberalisation for most wage categories and stimulated for high wages only which correspond to specific skills with increasing demand. As for OJT, since it can better be adjusted in the short run to the new international market demands than general education, it may affect positively wages at all wage levels.

To better understand how OJT occurs, we estimate Probit equations of participation in this type of human capital accumulation. Column 1 of Table 5 shows the estimation results. Most 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. In contrast, working in the Textile-clothing sector appears to be detrimental to participation in OJT, while the education level is positively correlated with participation. Thus, well educated workers in IMMEE are more likely to have been involved in OJT. This suggests first to coordinate long term general education

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<sup>11</sup> See Nordman (2004) for gender issues on this data.

policies with policies addressing vocational training. Moreover, OJT does not occur as densely in all industries and public encouragement to OJT should be designed so that it answers to genuine industrial needs. Interestingly, to be married is negatively associated with participation in OJT (at 10 percent level). Although this result is hard to interpret, it may come from the additional stress on time use caused by OJT, which is detrimental to family life.

We now turn to the prevalence of two exclusive kinds of work organisation: chain gangs and work teams<sup>12</sup>. Columns 2 of Table 6 show the estimation results of a multinomial logit (MNL) model where the base alternative is ‘working neither in chain gangs nor in work teams’. The relative probability of working in chain gangs is significantly positively associated (at 10 percent level) with the Textile-clothing sector, being female worker and having only studied in a Koranic school. It is negatively associated (significantly at 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 variables: being supervisor, apprenticeship and working in the Textile-clothing.

The MNL estimates well illustrate the links of the organisation of work tasks in the firm with the industrial technology on one hand, and the educational and training characteristics of workers. Other socio-demographic and labour market characteristics have insignificant effects. Thus, understanding workers remuneration should pass through the analysis of work organisation inside the firm sector by sector.

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<sup>12</sup> An individual was considered as working in teams when he/she declared performing his/her tasks in collaboration with at least two other workers with similar activity. Workers in chain gangs are attached to standalone workstation and are subject to the rate of the production process.

We then consider the estimates of a probit model of being executive or supervisor. The results 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 such position. It is interesting to observe that three given firms are associated with a significantly smaller probability of being executive or supervisor, all else being equal. This can be explained by the following characteristics of the firms 1, 4 and 8. First, these three firms are older than the average with, respectively, 46, 20 and 18 years of existence<sup>13</sup>. Their workers are older and have higher levels of experience than the workers in the other firms. In these firms, an old-fashioned management system may imply few promotions according to merit. Firms 1, 4 and 8 have fewer employees than the other firms of the sample (respectively 104, 100 and 50 employees as compared to 228 on average). This may also diminish opportunities of internal promotions. Finally, they display the smallest proportions of employees working in chain gangs which, apparently, does not imply internal barriers for promotions.

Finally, neither the other observed socio-demographic and human capital characteristics, nor the proximity to the SMIG, significantly affect the probability of being supervisor-executive.

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<sup>13</sup> The sample mean is 17.6 years.



## 5. Conclusion

We study the relationship of wages and education and training practices 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.

We find that the specific characteristics of the surveyed firms little affect worker wages as opposed to most results found in other countries. We also show that omitting to distinguish between different domains of the wage distribution would provide a biased picture of the returns to human capital. In these data, the effects of education and labour market experience on wages are quite limited below the third quantile of wages, as well as the role of apprenticeship. During the late 1980s and the 1990s, the fast expansion of employment in the manufacturing exportable sector, coming mainly from low-skill and low-pay temporary jobs, as well as the near stagnation of real wages may explain the limited impact of the commonly used human capital variables on low wages. In particular, the textile sector does not appear to be a significant channel for promoting skills in the economy.

Moreover, one may expect an inequality surge with human capital if the strong effect of education on high wages dominates the other determinants of inequality. Indeed, the third quartile is characterised by low returns in the two dimensions of human capital (education and experience). This may be the sign of a human capital poverty trap preventing middle classes to access high wage jobs.

In contrast, on-the-job training (OJT) much contributes to labour productivity as measured by wage levels. Most of the OJT is concentrated in the Metallurgical-Electrical industries. Education is positively correlated to OJT. Our interpretation of the limited effect of education for wage levels below the third quartile is that the effect of general education may be stiffened by trade liberalisation for most wage categories and stimulated for high wages only, which correspond to specific skills with increasing demand. As for OJT, since it can swiftly be adjusted in the short run to international market demands, it can affect positively wages at all wage levels.

The minimal wage legislation is found to exert a positive pressure on wages. This seems consistent with the fact that the SMIG adjustments over time followed the evolutions of the mean urban wage more than proportionally (The World Bank, 1994). Also, some evidence of gender wage gap exists in the data.

Finally, estimates of explanatory relationships of task organisation (chain gangs, teams, supervision and executive workers) show the powerful sector and educational determinations of job organisation in the firms. Then, our results suggest that the impact of workers' education may take indirect routes and not only appear through education coefficients in wage regressions.

Mechanisms for closing the skill gap in Morocco have traditionally been articulated in policy designs in terms of supply side reform: improving the quality of the educational system so that more young people become educated, and helping existing workers to gain qualifications through formal learning processes, such as courses and/or accreditation services provided by the OFPPT (*Office de la Formation Professionnelle et de la Promotion du Travail*). However, such provision is now characterised as being so subject to supplier capture (the diversity of vocational schools and diploma, either private

or public) that it is not always responsive to the needs of employers. Thus, the perceived solution to the Moroccan's skill and productivity problems is still cast in terms of further reform of the qualifications system and supply side delivery mechanisms. Nevertheless, our results suggest the importance of work organisation and on-the-job training in skill formation process. In particular, there has been a growing interest in workplace learning processes that are variously described as 'informal' or 'nonformal' 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 work organisational changes and comes along with an evolution of the employment structures (Black and Lynch, 1996; Fleisher, Dong and Liu, 1996).

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# Appendix

**Table 1. Descriptive statistics of the workers' characteristics**

<i>Definitions of the variables</i>	<i>Mean</i>	<i>Std dev.</i>	<i>min</i>	<i>max</i>
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 situation (MARI, 1: if married; 0 if divorced, widowed or single)	0.42	0.49	0	1
Number of dependant children (ENFT)	0.79	1.36	0	7
Individual never went to school, neither general nor Koranic (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
Periods of internship related to the current job (STAGA, in years)	0.14	0.33	0	2
Periods of internship not related to the current job (STAGAN, in years)	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
Periods of unemployment (CHOMA, in years)	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
Date of start 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
<i>Firms' fixed effects</i>				
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)**

<i>Definitions of the variables</i>	<i>Mean</i>	<i>Std dev.</i>	<i>min</i>	<i>max</i>
Monthly wage	2689	2019	750	20000
Monthly wage in IMMEE	3101	1930	750	12000
Monthly wage in Textile-clothing	2281	2030	750	20000
<i>Mean wage in:</i>				
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

Independent variables	OLS				Quantile regressions (bootstrap: 20)		
					Firm fixed effects models		
	(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*** (66.01)	6.906*** (61.41)	7.382*** (49.13)	7.368*** (45.79)	6.961*** (50.11)	7.117*** (46.90)	7.326*** (39.88)
EDUCATION	0.043*** (6.03)	0.045*** (6.34)	0.048*** (5.53)	0.047*** (5.39)	0.034*** (3.11)	0.029* (1.89)	0.023 (1.49)
Quartile1	–	–	-0.296* (1.71)	-0.337* (1.83)	–	–	–
Quartile2	–	–	0.065 (0.33)	0.034 (0.17)	–	–	–
Quartile3	–	–	0.312 (1.53)	0.268 (1.32)	–	–	–
EDUCATION*Quartile1	–	–	-0.047*** (4.13)	-0.037*** (3.12)	–	–	–
EDUCATION*Quartile2	–	–	-0.040*** (3.11)	-0.033** (2.54)	–	–	–
EDUCATION*Quartile3	–	–	-0.045*** (3.55)	-0.038*** (3.04)	–	–	–
TENURE	0.034*** (2.73)	0.048*** (3.85)	0.023* (1.76)	0.031** (2.26)	0.047*** (2.83)	0.030* (1.76)	0.023 (0.89)
TENURE <sup>2</sup>	-0.000 (0.14)	-0.001 (1.24)	-0.000 (0.27)	-0.000 (0.59)	-0.001 (1.28)	-0.000 (0.45)	0.000 (0.09)
TENURE*Quartile1	–	–	-0.012 (0.62)	-0.008 (0.43)	–	–	–
TENURE*Quartile2	–	–	-0.020* (1.69)	-0.017 (1.38)	–	–	–
TENURE*Quartile3	–	–	-0.018** (2.22)	-0.019** (2.32)	–	–	–
EXPERIENCE	0.022*** (3.15)	0.023*** (3.55)	0.025*** (4.03)	0.026*** (4.04)	0.011 (1.13)	0.016 (1.50)	0.016 (1.10)
EXPERIENCE <sup>2</sup>	-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)
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** (2.03)	0.243** (2.30)	0.193*** (2.96)	0.210*** (2.71)	0.335*** (3.03)	0.364*** (3.44)	0.213 (1.40)
Dummy for executive or supervisor (ENCADR)	0.324*** (5.88)	0.317*** (5.95)	0.116*** (2.94)	0.124*** (2.87)	0.194*** (2.74)	0.344** (2.34)	0.417*** (3.26)
Dummy for female	-0.176*** (3.73)	-0.161*** (3.22)	-0.071** (2.18)	-0.066* (1.71)	-0.111 (1.36)	-0.118 (1.51)	-0.113* (1.66)
Dummy for proximity to minimum wage (SMIG)	0.043 (0.68)	0.075 (1.29)	0.314*** (5.14)	0.295*** (4.83)	0.043 (0.88)	-0.011 (0.18)	-0.045 (0.64)
Dummy for past apprenticeship (APPRENTI)	0.085 (1.38)	0.089 (1.54)	0.036 (0.87)	0.049 (1.15)	0.083 (1.38)	0.109 (1.09)	0.027 (0.51)
Past work relevant internship (STAGA)	0.170** (2.53)	0.173*** (2.77)	0.086* (1.87)	0.107** (2.26)	0.066 (0.51)	0.091 (0.80)	0.185 (0.99)
Firm1	–	0.072 (0.62)	–	-0.035 (0.39)	0.007 (0.04)	0.212 (1.17)	0.260 (1.10)
Firm2	–	-0.182** (2.03)	–	-0.124* (1.84)	-0.192 (1.19)	-0.167* (1.76)	-0.130 (1.16)
Firm3	–	0.233*** (2.72)	–	0.013 (0.19)	0.198* (1.71)	0.216** (2.28)	0.302** (2.05)
Firm4	–	-0.147 (1.53)	–	-0.082 (1.16)	-0.134 (1.32)	-0.078 (0.76)	-0.137 (1.02)
Firm5	–	0.036 (0.46)	–	-0.035 (0.61)	0.049 (0.37)	0.062 (0.92)	0.004 (0.08)
Firm7	–	-0.032 (0.35)	–	-0.021 (0.32)	-0.140 (1.11)	-0.065 (0.54)	0.018 (0.16)
Firm8	–	-0.117 (1.08)	–	-0.161* (1.94)	-0.020 (0.11)	0.041 (0.25)	0.003 (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)**

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

<sup>a</sup>: returns are computed at the average point of the sub-sample. <sup>b</sup>: mean of the effects for the different quartiles.

<sup>ns</sup>: no significantly different from zero at 10% level.

<sup>nd</sup>: no significantly different from the coefficient of the 4<sup>th</sup> quartile at 10% level.

**Table 5. Probit and Multinomial Logit Models**

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

Periods of unemployment (CHOMA)	0.0797 (0.76)	0.1053 (0.62)	0.1507 (0.80)	–
TENURE	0.1236 (1.53)	0.4177 (1.58)	-0.1051 (0.50)	0.1773** (2.54)
TENURE <sup>2</sup>	–	-0.0045 (0.36)	0.0112 (1.13)	–
EXPERIENCE	0.0577 (0.62)	0.1191 (0.61)	-0.0826 (0.40)	0.1244** (1.98)
EXPERIENCE <sup>2</sup>	–	0.0014 (0.27)	0.0101 (1.17)	–
Dummy for executive or supervisor (ENCADR)	0.0989 (0.28)	-6.9549*** (3.63)	-1.4770** (2.23)	–
Proximity to the minimum wage (SMIG)	0.1856 (0.37)	1.0234 (0.98)	-0.1518 (0.13)	-0.6726 (1.23)
Dummy for Textile- clothing	-1.7703*** (4.73)	1.7931* (1.67)	-3.2312*** (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'.